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SOCIETY FOR PSYCHOPHYSIOLOGICAL RESEARCH

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SPR ABSTRACTS

2024 Annual Meeting of the Society for Psychophysiological Research

Pre-Conference Workshops: Wednesday, October 23, 2024
Annual Meeting: Wednesday, October 23-Saturday, October 26, 2024
Website: www.sprweb.org

This Supplement contains the abstracts from each presentation in the Symposia, Open Topic Symposium, and Poster Sessions being presented at the 2024 SPR Annual Meeting scheduled for October 23–26.

All authors are listed in the Index to Abstract Authors. In addition, abstract topics are listed in the Index to Abstract Descriptors.

The 2024 Annual Meeting Program includes three Pre-Conference Workshops, three Invited Addresses, one Presidential Address, one Open Topic Symposium, one Early Career Award Address, a Debate, and multiple Symposia. Specific research topics will be covered in the Symposia. The majority of the research reports will be discussed at the three Poster Sessions.

We would like to thank all contributors for sharing their research and making this year's Annual Meeting a rich and stimulating event!

Cristina Ottaviani & Julian Koenig
2024 Program Committee Chairs

Program Committee (2023–2024)

2024 Program Committee
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DeWayne Williams, University of California, Irvine
Lisa Gatzke-Kopp, Pennsylvania State University

Program Highlights

Wednesday, October 23, 2024

Wednesday, October 23, 2024
9:00 a.m.-4:30 p.m.
Pre-Conference Workshop 1 (available at an additional fee)
Digital Signal Processing
J. Christopher Edgar, Gregory A. Miller, Tzvetan Popov, and Song Liu

Wednesday, October 23, 2024
9:00 a.m.-4:30 p.m.
Pre-Conference Workshop 2 (available at an additional fee)
Multiverse, Multilevel, and Bayesian Data Analysis in Psychophysiology
Tania Moretta, Giulia Calignano, Luca Menghini

Wednesday, October 23, 2024
9:00 a.m.-4:00 p.m.
Pre-Conference Workshop 3 (available at an additional fee)
From the Lab to the Real World: Challenges and Opportunities with Wearables
Lauren Bylsma and Varun Mishra

5:00 p.m.-6:20 p.m.
Invited Address
The Mind–Body Connection: From Visceral Neural Control to Chronic Diseases
Nicola Montano, MD, PhD
University of Milan, Milan, Italy

6:30 p.m.-9:00 p.m.
Opening Reception, Live Music Event, and Poster Session I

Thursday, October 24, 2024

8:30 a.m.-9:40 a.m.
Concurrent Symposia I

8:30 a.m.-9:40 a.m.
Open Topic Symposium

9:50 a.m.-11:00 a.m.
Concurrent Symposia II

9:50 a.m.-11:00 a.m.
SPR Special Symposium on 100 Years of EEG Research (1): Big Team Science EEG Research

11:10 a.m.-12:30 p.m.
President's Symposium on Diversity, Equity and Representation in SPR

2:00 p.m.-3:00 p.m.
Faces of the Future

3:10 p.m.-4:20 p.m.
Concurrent Symposia III

3:10 p.m.-4:20 p.m.
SPR Special Symposium on Rodent Models in Psychophysiology: In Your Shoes: Neurobiological Mechanisms Under Behavioral and Physiological Responses to Vicarious Stressful Experiences in Rodents

4:30 p.m.-5:50 p.m.
Invited Address
Peak Psychophysiological Experiences: Scaling Connections Between Natural and Human Sciences
Jules P. Harrell, PhD
Howard University, Washington, DC, USA

6:00 p.m.-7:30 p.m.
Poster Session II

Friday, October 25, 2024

8:30 a.m.-9:40 a.m.
Concurrent Symposia IV

8:30 a.m.-9:40 a.m.
Debate: Navigating the Future of Psychophysiological Research

9:50 a.m.-11:00 a.m.
Concurrent Symposia V

9:50 a.m.-11:00 a.m.
Spr Special Symposium On 100 Years of EEG Research (2): EEG in Three Dimensions: Neural Correlates of Cognitive-Affective Processes Under Immersive Virtual Reality and Real-Life Conditions

11:10 a.m.-12:30 p.m.
President's Symposium on Psychophysiology Beyond the Usual Suspects

2:00 p.m.-3:00 p.m.
Awards Addresses

Early Career Award Address
Context-dependent dissociation of the processing stages of the emotional relevance of stimuli in the human brain
Sebastian Schindler
University Hospital Muenster, Münster, Germany

Award for Distinguished Contributions to Psychophysiology
To be announced

3:10 p.m.-4:20 p.m.
Concurrent Symposia VI

3:10 p.m.-4:20 p.m.
Program Chairs Hot Session: Research in Times of War

4:30 p.m.-5:50 p.m.
Invited Address
Late Night Conversations Between Your Heart and Brain Affect Your Cognitive and Emotional Health
Sara Mednick, PhD
University of California-Irvine, CA, USA

6:00 p.m.-7:30 p.m.
Poster Session III

Saturday, October 26, 2024

8:30 a.m.-9:40 a.m.
Concurrent Symposia VII

9:50 a.m.-11:00 a.m.
Concurrent Symposia VIII

9:50 a.m.-11:00 a.m.
SPR Special Symposium on 100 Years of EEG (3): Enhancing in EEG Methodology: Considerations for Employing Equitable Research Practices with Black and Latine

11:10 a.m.-12:00 p.m.
Presidential Address
Julian F. Thayer, PhD
University of California-Irvine

12:10 p.m.-3:00 p.m
SPR Ceremony (Business Meeting Luncheon)
(ticketed event)

NOTE: All abstracts are printed as submitted.

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ABSTRACT

Symposia Abstracts

SYMPOSIA I-1

ADVANCES IN ASSOCIATING NEURAL INDICES OF SOCIAL CATEGORIZATION WITH BEHAVIORAL BIASES

Chairs: Bruce Bartholow[1], Hannah Volpert-Esmond[2]
[1]*University of Iowa;* [2]*University of Texas at El Paso*

Assignment of individuals to social categories, such as race, during face processing gives rise to biases in judgment and behavior. Despite years of research examining the neural signatures of social categorization, limitations inherent in traditional data-analytic approaches have hindered efforts to tie these neural signatures to biases in behavior. This symposium will showcase new methodological approaches that advance understanding of how social categorization of faces facilitates stereotype-based judgments and decisions. Hannah Volpert-Esmond will present data aimed at clarifying the interpretation of the face-elicited P2 ERP as an index of ingroup and outgroup social category distinctions in an understudied Latinx population. Next, P.J. Brancaleone will present data from two experiments highlighting the predictive utility of within-person variability in the face-elicited P2 ERP for understanding variability in race bias reflected in object discrimination (study 1) and financial investments (study 2). David Amodio will discuss work from several studies elucidating the role of top-down social factors on configural processing of ingroup and outgroup faces in the service of goal-directed behavior. Finally, from a study combining fMRI, impression formation, and financial investment decisions, Sam Venezia will present findings linking flexibility in neural networks supporting social cognition with biases in trust. Together, these findings highlight the utility of neurophysiological indices of social categorization for advancing theoretical models of bias.

FUNDING: This research was supported in part by grants from the U.S. National Science Foundation (BCS 0847872 and BCS 2234319) and the U.S. Army Research Office (W911NF2020080).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.6 Racism/prejudice, 4.20 Attention, 4.24 Social factors

NEUROCOGNITIVE ATTENTION TO RACE AMONG LATINOS: OUTSIDE THE WHITE/ BLACK BINARY

Hannah Volpert-Esmond, Jayce Owens-Boone, Evan Romero, Manal Aboargob
University of Texas, El Paso

Race is an important dimension by which people categorize others. Perceivers attend to racial information in faces extremely early in the perceptual process, as evidenced in the sensitivity of the P2 ERP component to racial category distinctions. To date, few studies have examined the perception of race outside of the Black/White racial binary, and no prior studies have examined the perception of Latino faces in particular, despite Latinos composing ~20% of the U.S. population. This study, conducted in a unique, multicultural context on the U.S.-Mexico border in an understudied population, characterized Latino participants' early allocation of attention to race during categorization of Black, White, and Latino faces. Preliminary results indicate that the largest P2 amplitudes were elicited by Black faces, followed by White faces, and then Latino faces. This pattern is consistent with an outgroup sensitivity account of the P2, namely, that outgroup faces spontaneously capture attention to facilitate ingroup-outgroup distinctions in subsequent processing stages. Follow-up analyses will consider the role of racial phenotypicality on growth in P2 amplitude over time using a single trial-level multilevel modeling approach.

FUNDING: This research was supported in part by a grant from the U.S. National Science Foundation (BCS 2234319).

WITHIN-PERSON VARIABILITY IN ATTENTION TO RACE AND THE EXPRESSION OF RACE BIAS: A MULTILEVEL ANALYSIS

Paul Brancaleone, Bruce Bartholow
University of Iowa

Engaging cognitive control over race bias is subject to both chronic self-regulatory goals and in-the-moment attention control dynamics. Yet, traditional between-person approaches to characterizing bias fail to capture the role of within-person, moment-to-moment fluctuations in bias antecedents, such as early attention to racial category distinctions. I will present data from two studies linking within-person variability in attention to race, reflected in the face-elicited P2 ERP, to variability in distinct indices of race bias. In Study 1, the P2 elicited by Black faces predicted bias in White perceivers' classification of subsequently presented guns relative to tools. In Study 2, the P2 elicited by Black relative to White faces predicted White perceivers' monetary investments in Black relative to White trustees during a single-shot trust game. In both studies, multilevel models indicated that these effects were evident within persons (covarying between-person differences), such that a larger P2, relative to an individual's average P2, led to greater bias. Additionally, this basic effect was moderated in both studies by between-person individual differences in motivations to respond without prejudice, such that a larger P2 on a given trial predicted less biased responding among individuals high in internal motivation to be unbiased. Findings highlight the utility of within-person variability in processing of race-related information for understanding when bias will and will not be effectively regulated.
FUNDING: This research was funded in part by a grant from the U.S. National Science Foundation (BCS 0847872).

HOW, WHEN, AND WHY DO SOCIAL FACTORS MODULATE CONFIGURAL FACE PROCESSING?

David Amodio
University of Amsterdam

Configural face encoding, particularly as represented in the amplitude of the N170 ERP, traditionally has been considered a bottom-up process that is not amenable to the influence of top-down effects. Yet, many recent studies report effects of social factors on this early stage of face perception. How can we understand these top-down effects of social factors? And what is their function? I will present findings from my lab on the role of configural face processing—as indexed by the N170, fusiform BOLD activity, and behavior—in person perception and social behavior. Across studies, we find that configural face processing depends on perceivers' social goals. For example, the N170 elicited by faces is larger when a perceiver is motivated to individuate a stimulus person (e.g., when the face is an ingroup member or a potential threat) but smaller when a perceiver is motivated to deindividuate a stimulus person (when applying stereotypes or dehumanizing). Additional evidence from the P1 ERP suggests that this top-down modulation of the N170 may be due to strategic shifts in early attention. Importantly, these modulatory effects on configural face encoding predict goal-directed behavior. Collectively, these findings suggest that top-down effects on configural face encoding reflect a perceiver's social goals and function to facilitate goal-consistent behavior.
FUNDING: This research was funded in part by a Vici Award (016.185.058) from the Netherlands Organisation for Scientific Research (NWO).

FUNCTIONAL BRAIN DYNAMICS DURING IMPRESSION FORMATION PREDICT STATUS-BASED TRUST BIAS

Sam Venezia[1], Andrea Wilhelm[1], Eric Splan[2], Jennifer Kubota[1], Jasmine Cloutier[1]
[1]*University of Delaware,* [2]*ZS*

Impressions of others can shape later social decisions, such as trust, during subsequent interactions. However, impression formation research generally neglects to explore how impressions of others predict subsequent social behaviors. The current presentation discusses findings from an fMRI study examining how unconstrained functional brain network dynamics during impression formation predict subsequent bias in trust decisions outside of the scanner. Participants (n=62) formed impressions of perceived white men and women who differed in socioeconomic status while undergoing fMRI. Following the impression-formation task, participants played a single-shot trust game with the same 28 faces for which they previously formed impressions in the scanner. The final analysis focused on between-network flexibility in networks associated with social cognition (e.g., ventromedial prefrontal cortex) and social decision-making (e.g., orbitofrontal cortex). Using connectivity estimates of brain regions across two networks, results indicated that flexibility within both networks significantly predicted trust decisions. Moreover, connectivity within the network implicated in social decision-making predicted preferential trust decisions toward high-status individuals, converging with the behavioral results of the trust game. In sum, the current investigation suggests that unconstrained

functional connectivity during initial impression formation can be used to predict future behavior and social category preferences

FUNDING: The research described here was supported in part by the Army Research Office as part of the Army Research Laboratory Strengthening Teamwork for Robust Operations in Novel Groups (STRONG) [W911NF2020080].

SYMPOSIA I-2

BEYOND EXPLICIT DOWN-REGULATION OF NEGATIVE AFFECT: NEW AVENUES FOR EMOTION REGULATION RESEARCH

Chairs: Helen Uusberg[1], Sylvia Kreibig[2]
[1]University of Tartu; [2]Stanford University

This symposium delves into novel aspects of emotion regulation (ER), transcending the conventional focus on explicit down-regulation of negative affect. The five talks explore diverse ER goals and contexts, employing facial electromyography (EMG), electroencephalography, and functional magnetic resonance imaging (fMRI). Sylvia Kreibig examines the distinct temporal patterns of explicit neutralize and transform goals during reappraisal of unpleasant and pleasant stimuli on negative and positive affect changes as indexed by facial EMG. Maria Krajuškina demonstrates the efficacy of reappraisal in explicitly enhancing positive emotions across negative, neutral, and positive contexts, examining subjective affect, facial EMG, and the late positive potential (LPP). Annmarie MacNamara uses subjective ratings and LPP to explore the robustness of savoring when explicitly up-regulating positive emotions under varied cognitive and emotional demands and in response to stimuli of varying intensities. Helen Uusberg examines distraction, reappraisal, and mindfulness in the explicit regulation of food craving using subjective ratings, LPP, and event-related spectral perturbations. Katharina Förster shifts from explicit to implicit ER and from general to clinical populations, using fMRI connectivity analysis to illuminate neural mechanisms hindering the implicit down-regulation of negative affect in patients with major depressive disorder. Together, these talks emphasize the significance of ER in managing not only negative but also positive affective states, both explicitly and implicitly.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.2 Myography (EMG etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.23 Emotion/affect

TEMPORAL DYNAMICS OF EMOTION REGULATION: INSIGHTS FROM FACIAL ELECTROMYOGRAPHY

Sylvia Kreibig, James Gross
Stanford University

Emotion regulation (ER) is a complex process unfolding over time. In two studies, we examined how cognitive reappraisal of affective stimuli influences negative affect (NA) and positive affect (PA) dynamics. We obtained corrugator supercilii (CS) and zygomaticus major (ZM) electromyography (EMG) as objective measures of NA and PA while 156 participants viewed pictures for 8,000 ms and then either continued viewing the picture (no regulation) or reappraised it with a neutral meaning (neutralize goal) or an opposite meaning (transform goal) for another 8,000 ms. Study 1 on negative ER showed sustained CS activation for the no-regulation condition, onset of CS reduction at 1,500 ms for the neutralize goal, and onset of CS reduction at 1,000 ms with ZM increase at 4,000 ms for the transform goal. Study 2 on positive ER showed sustained ZM activation for the no-regulation condition, onset of ZM reduction at 1,000 ms for the neutralize goal, and onset of CS increase with ZM reduction both at 1,500 ms for the transform goal. Model-fitting analyses revealed sequential two-dimensional change for the transform goal, passing through a neutral emotional state upon the shift from NA reduction to PA increase for negative ER or vice versa for positive ER. The two studies indicate that while the neutralize goal primarily affects one dimension of emotion (NA or PA), the transform goal involves sequential two-dimensional change (NA->PA or PA->NA). This research highlights that different regulatory goals in the process of ER lead to distinct change of the emotional response over time.

FUNDING: This research was supported by Swiss National Science Foundation Fellowship PA00P1-139593 awarded to Sylvia D. Kreibig.

WANT TO FEEL MORE POSITIVE? SELF-REPORT, EEG, AND EMG MEASURES OF REAPPRAISAL FOR INCREASING POSITIVE AFFECT

Maria Krajuškina[1], Richard Naar[1], Andero Uusberg[1], James Gross[2], Helen Uusberg[1]
[1]University of Tartu, [2]Stanford University

Reappraisal has traditionally been studied as a method to reduce negative affect. In two complementary studies, we examined the implementation of reappraisal with the goal of increasing positive affect in different valence

contexts. To that end, participants viewed and reappraised negative, neutral, and positive images. In the online study (N = 158), participants rated their subjective experience and reported how they perceived the depicted situation on key appraisal dimensions. The laboratory replication (N = 70) also included electromyographic and electroencephalographic markers of affective experience. In both studies, reappraisal increased self-reported positive affect and decreased self-reported negative affect for all types of images (p's < .001). In the laboratory study, reappraisal also enhanced *zygomaticus major* activity for neutral and positive images, and reduced *corrugator supercilii* activity for negative and neutral images (p's < .05). Reappraisal also amplified the late positive potential in response to all types of images (p = .02) within a relatively early time window (250-750 ms), suggesting heightened attention to stimuli regardless of their valence. We also found preliminary evidence that the effect of reappraisal on subjective affect is related to appraisal shifts, or changes in cognitive evaluations of a situation. These results suggest that reappraisal with the goal of increasing positive affect is efficacious in different valence contexts, and that appraisal shifts may offer a useful framework for understanding its underlying psychological mechanisms.

FUNDING: This research was supported by Estonian Research Council grant PSG525 awarded to Andero Uusberg.

TESTING THE BOUNDARY CONDITIONS OF SAVORING: EFFECTS OF A MATH STRESSOR AND STIMULUS AROUSAL LEVEL

Annmarie MacNamara, Brandon Watanabe, Tara Driskill
Texas A&M University

Savoring is an emotion regulation technique that uses present-moment focus and experiential engagement to increase positive emotion. In the lab, savoring has been shown to increase subjective emotion and the late positive potential (LPP) elicited by positive and neutral pictures as well as imagined stimuli. Outside of the lab, people must regulate their emotions while enduring a variety of cognitive and emotional demands, and in response to more and less intense emotional stimuli. Therefore, understanding the 'boundary conditions' of savoring – i.e., the factors that may modulate its successful implementation – is important to knowing how it may translate to the real world. Here, we present new data using the LPP and ratings, showing that savoring was not compromised when performed following a difficult (N = 39) versus easy (N = 39) math stressor, (BFincl for the moderation term = .242). However, under these conditions savoring was only effective for neutral (p = .015) and not positive pictures (p = .65). In a second data set that did not employ a math stressor (N = 90), we replicated findings showing that savoring is effective for positive pictures (p = .003), and moreover, was not modulated by picture arousal level (p = .379; BFincl = .902). Results contribute to the growing literature on the neuroscience of positive emotion upregulation and suggest that savoring is relatively robust to moderators that may be encountered outside of the lab environment. Nonetheless, under certain conditions, savoring may be better suited to stimuli that are not inherently pleasant.

FUNDING: This research was supported by National Institute of Mental Health grant R01MH125083 awarded to Annmarie MacNamara.

THE EFFECTS OF DISTRACTION, REAPPRAISAL, AND MINDFULNESS ON FOOD CRAVING: COMPLEMENTARY INSIGHTS FROM SUBJECTIVE RATINGS AND DIFFERENT EEG MARKERS

Helen Uusberg, Liis Arras, Andero Uusberg
University of Tartu

Emotion regulation frameworks and paradigms can help us understand how people regulate a range of affective states beyond emotions. The present study examined the effects of different regulation strategies on food craving using subjective ratings and EEG measures. Thirty-eight women (mean age 29.21 years, SD = 10.1; mean BMI 23.26 kg/m2, SD = 5.65) viewed images of low- and high-calorie foods and used distraction (recalling names beginning with the same letter as the food), reappraisal (thinking about the long-term consequences of eating the food), and mindfulness (focusing on the experience in an accepting manner) to regulate their craving for high-calorie foods. Subjective craving was decreased by reappraisal and distraction but increased by mindfulness. The amplitude of the centroparietal late positive potential (LPP) was larger for high- than low-calorie foods. Regarding regulation, only distraction significantly attenuated the LPP compared to the view condition, suggesting that neither reappraisal nor mindfulness altered the prioritized processing of high-calorie foods. However, event-related spectral perturbations (ERSPs) showed that all three strategies decreased central beta activity (linked to reward sensitivity) and increased midfrontal theta activity (linked to cognitive control). These effects were strongest for distraction but also significant for reappraisal and mindfulness. The findings suggest that the incorporation of ERSPs in

addition to LPP may offer a more comprehensive understanding of the effects of different regulation strategies on food craving.
FUNDING: This research was supported by Estonian Research Council grant PSG525 awarded to Andero Uusberg.

LONGITUDINAL ALTERATIONS OF FRONTO-LIMBIC ACTIVITY AND CONNECTIVITY IN YOUNG PATIENTS WITH DEPRESSION - A FUNCTION OF RUMINATIVE EMOTION REGULATION

Katharina Förster[1], Maxi Stiller[1], Dominik Grotegerd[2], Stefan Ehrlich[1], Andreas Jansen[3], Stefan Hofmann[3], Anna Kraus[2], Katharina Dohm[2], Susanne Meinert[2], Linda Bonnekoh[2], Georg Romer[2], Philipp Kanske[1], Udo Dannlowski[2], Elisabeth Leehr[2]
[1]Technische Universität Dresden, [2]University of Münster, [3]Philipps University Marburg

In this preregistered longitudinal study (https://osf.io/jmxyv), we aim to elucidate how ruminative emotion regulation (ER) affects the neural correlates of implicit negative emotion processing in young patients with major depressive disorder (MDD). Sixty-two participants (N = 29 MDD-patients, N = 33 healthy participants, 15-30 years) underwent fMRI while executing an implicit affective priming task with sad facial expressions at baseline and after two years. Employing a group x time x rumination model, we examined effects of group, time and ruminative ER as well as their respective interactions on brain activity in the amygdala, the dorsolateral and ventrolateral prefrontal cortex (dl-/vlPFC). We also explored effects on task-based functional connectivity between dl-/vlpfc and amygdala. We found main effects of rumination on amygdala and vlPFC activity and a group x rumination interaction on amygdala-vlPFC connectivity: Elevated Amygdala and vlPFC activity were associated with increased ruminative tendencies in both groups. While we found that rumination was associated with increased connectivity between vlPFC and amygdala in healthy people, it was associated with decreased connectivity in MDD-patients. Our results indicate that rumination in MDD-patients is selectively associated with a decoupling of vlPFC and amygdala activity during implicit negative emotion processing, suggesting that rumination reduces implicit ER in MDD patients. Thus, our neuroscientific findings indicate that rumination may be associated with more ineffective implicit ER in MDD-patients.

SYMPOSIA I-3

NATURALISTIC AND EXPERIMENTAL STRESSOR EFFECTS ON REWARD-RELATED ERPS IN PSYCHOPATHOLOGY

Chair: Richard Macatee
Auburn University

Discussant: Stewart Shankman, Northwestern University

This symposium will present naturalistic and laboratory stressor effects on reward-related ERPs across multiple forms of psychopathology. First, Richard Macatee will present data on the impact of cannabis withdrawal/early abstinence vs. continued use on the reward positivity in women with severe Cannabis Use Disorder. The reward positivity did not differentially change between conditions, but a reduced reward positivity predicted relapse. Second, Brian Albanese will present findings from a novel task that contrasts the reward positivity to winning money vs. avoiding an aversive auditory stimulus. Greater distress intolerance predicted a larger reward positivity to avoidance specifically. Third, Yinru Long will show that, among adolescents with interpersonal trauma exposure, a reduced late positive potential to positive interpersonal images is associated with greater depressive symptoms. Finally, Ha Jeong Park will present data from a novel task that manipulates predictability of reward, which revealed a unique association between depressive symptoms and blunted reward positivity to unpredictable rewards specifically. Discussant, Stewart Shankman, will highlight points of convergence in these data and their implications. Overall, this body of work presents novel insights into proximal and distal stress-related influences on reward processing ERPs, and their impact on these ERPs predictive validity.
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.10 Stress, 4.23 Emotion/affect

THE IMPACT OF EARLY ABSTINENCE ON THE REWARD POSITIVITY AND ITS ASSOCIATION WITH RELAPSE IN WOMEN WITH CANNABIS USE DISORDER

Richard Macatee, Thomas Preston, Mallory Cannon, Julia Gorday, Brandon Schermitzler
Auburn University

Cannabis use disorder (CUD) is increasingly prevalent and associated with significant disability. There is evidence of

worse withdrawal severity and greater depression/anxiety comorbidity in women compared to men, suggesting that withdrawal/early abstinence-related stress may be a potent driver of cannabis use in females with CUD. The reward positivity (rewP), an event-related potential (ERP) that occurs ~250ms after reward vs. loss feedback, is an established neurophysiological probe of reward responsivity sensitive to chronic and acute stress. In a sample of women with severe CUD (n=25) and non-user psychiatric controls (n=28), we examined whether the rewP to monetary reward [measured at baseline and days 7, 14, and 21 of the study period] a) was reduced in CUD participants compared to controls, b) changed over 21 days of abstinence (maintained via contingency management) compared to continued use (n=13 successfully abstinent; n=5 continued use), and c) predicted relapse (n=7 relapsed). The rewP was comparable in CUD vs. non-user psychiatric control participants, $F(1,102)=0.84$, $p=.36$, and it did not differentially change over 21 days of abstinence compared to continued use, $F(3,124)=0.26$, $p=.85$. Mean rewP was larger in successful abstainers vs. relapsers, $F(1,18)=4.71$, $p=.044$, $\eta_p^2=.21$, particularly when the last rewP prior to relapse was the comparator, $F(1,18)=9.04$, $p=.008$, $\eta_p^2=.33$ These results suggest the rewP is not sensitive to CUD diagnosis nor does it change during early abstinence, but may have utility in predicting contingency management response.

FUNDING: This work was supported by the Auburn University Intramural Grants Program (IGP#000903; PI Macatee).

DISTRESS INTOLERANCE IS ASSOCIATED WITH INITIAL REWARD RESPNSES TO AVERSIVE STIMULUS AVOIDANCE: EVIDENCE FROM THE REWARD POSITIVITY

Brian Albanese, Daniela Porro
Texas A&M University

Background: Research indicates that the reward positivity (RewP) can be elicited by both appetitive gain (e.g., winning money) and aversive outcome avoidance (e.g., safety from a noise blast). Yet, little work has linked these differential reward responses with avoidance-related psychopathology risk factors. The present study utilized a modified doors task to examine the associations of distress intolerance (DI), a risk factor for maladaptive avoidance-based strategies, with reward responses to appetitive gain and aversive avoidance. Methods: Participants (n=102) completed two doors tasks in which they were instructed to choose one of two doors and view feedback indicating either monetary gain/loss or avoidance/administration of an aversive noise blast. The RewP was extracted in each condition to reflect the *monetary RewP* and the *safety* RewP. Results: Greater self-reported DI was linked with a larger safety RewP (β=.35, p=.017), but not the monetary RewP (p=.545). Further, the safety RewP remained linked with DI (β=.38, p=.009) independently of the monetary RewP (β=.26, p=.008). Findings were not better explained by feedback anticipation, depression, anxiety, stress, or trauma history. Discussion: The present study showed that DI, a well-researched avoidance-related construct, is associated with exaggerated reward activation to avoidance (safety RewP) but not appetitive gain (monetary RewP). Taken together, this work advances our understanding of DI and further underscores the importance of examining both appetitive and avoidance reward disruptions in psychopathology.

NEUROPHYSIOLOGICAL RESPONSES TO INTERPERSONAL IMAGES MODERATE THE EFFECTS OF INTERPERSONAL TRAUMA ON ADOLESCENT DEPRESSION

Yinru Long, Lindsay Dickey, Samantha Pegg, Alexandra Argiros, Lisa Venanzi, Anh Dao, Autumn Kujawa
Vanderbilt University

The late positive potential (LPP) is a reliable neurophysiological measure of sustained attention towards emotional stimuli that can be applied to study alterations in emotionality in depression and other forms of psychopathology. Further, there is some evidence that alterations in the LPP may reflect a vulnerability for depression that increases risk in combination with other factors, like exposure to stress and trauma. To examine the combined effects of the LPP to emotional stimuli and trauma exposure on depression, we conducted a cross-sectional study of 201 adolescents aged 14–17 years who were oversampled for current depression and elevated risk of depression based on maternal history. Clinical interviews were conducted to assess lifetime trauma exposure, and participants reported on current depressive symptoms. EEG was continuously recorded while participants completed a previously validated interpersonal emotional images task. The association between interpersonal trauma, specifically, and depressive symptoms was moderated by the LPP to positive interpersonal images, such that trauma-exposed adolescents with blunted neural responses to such images showed the greatest symptoms. LPP to threatening interpersonal images did not significantly moderate the effects of trauma on depressive symptoms. These findings elucidate a potential vulnerability linking trauma exposure to depression risk among adolescents.

FUNDING: This work was supported in part by UL1 TR000445 from National Center for Advancing Translational Sciences/National Institutes of Health, and a Klingenstein Third Generation Foundation Fellowship and Brain and Behavior Research Foundation Katherine Deschner Family Young Investigator Grant awarded to AK. SP was supported by National Institutes of Health/ National Institute of Mental Health T32-MH18921 and National Institutes of Health/ National Institute of Mental Health F31-MH127817, and LD was supported by National Institutes of Health/National Institute of Mental Health F31MH127863-02.

REDUCED RESPONSIVITY TO UNPREDICTABLE REWARD AS A UNIQUE PREDICTOR OF DEPRESSIVE SYMPTOM SEVERITY: AN ERP STUDY

Ha Jeong Park, Annmarie MacNamara
Texas A&M University

Depression has been associated with blunted RewPs in both non-clinical and clinical samples. A key function of the RewP may be to signal the need for new learning when rewards are unpredictable (versus predictable). Knowing whether depression is uniquely associated with deficits in response to unpredictable versus predictable reward could therefore inform understanding of its maintaining factors and associated impairments in reward learning. Here, we interrogated the association between depression and predictable versus unpredictable reward using a novel no-reward (N), predictable reward (P) and unpredictable reward (U) task [NPU-Reward (NPU-R)] task. Sixty-five undergraduate students (42 female) performed the NPU-R task while EEG was recorded. Self-reported depression was measured using the Beck Depression Inventory-II (BDI-II). Principle component analysis was used to parse the RewP from overlapping ERPs. RewPs to N, P and U feedback were entered as simultaneous predictors of depression symptoms. Individuals with higher levels of depression were characterized by blunted response to U feedback ($\beta = -.392$, $p = .005$), but not P ($\beta = -.045$, $p = .777$) or N feedback ($\beta = -.038$, $p = .790$). By contrast, bivariate correlations showed that depression was associated with smaller RewPs to both P ($r = -.270$, $p = .030$) and U ($r = -.428$, $p < .001$) feedback. Therefore, although depression is associated with dampened neural responsivity to P and U feedback, unpredictable rather than predictable reward may better explain variance in depression symptoms, at least in a simple, monetary task.

FUNDING: This work was supported in party by R01MH125083 (PI MacNamara).

SYMPOSIA I-4

A CENTURY OF THE BERGER RHYTHM: THEN AND NOW

Chair: Tzvetan Popov
University of Zurich

A century ago, Hans Berger sought to answer the research question, 'How do minds communicate?' – a research agenda that still exerts foundational influence on contemporary psychophysiology. The proposed symposium delves deeper into the historical and current importance of EEG and is structured around Berger's pioneering discovery of the alpha rhythm, which today is among the most frequently used dependent measures in psychophysiological research. Specifically, *Cliodhna Quigley* will outline the early 20th-century emergence of EEG technology, highlighting Berger's discovery of alpha rhythms and its groundbreaking implications for neuroscience and psychology. *Natalie Schaworonkow* will discuss the transition from initial time-domain analysis to spectral analysis, examining both the advancements facilitated by this shift and the limitations inherent in relying solely on spectral methods. *Nathan Weisz* focuses on the specific role of alpha oscillations in processing auditory stimuli and language, underscoring the rhythm's importance in speech perception and production beyond its mere involvement in visual attention. *Alice Tomassini* explores the functional significance of alpha rhythms within the action-perception loop, providing insights into how these oscillations facilitate cognitive processing and behavioral responses. Concluding on a broader note, *Tzvetan Popov* discusses the manifestation of a dominant rhythm that enables collective behavior across taxa, in an attempt to broaden the thought horizon beyond Berger's initial question, 'How do minds communicate?'

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.6 Eye Tracking (blink, movement, size), 3.1 Observational Study: Cross-Sectional, 4.12 Sensation/perception/interoception, 4.13 Speech/language, 4.20 Attention

FORGOTTEN RHYTHMS: LEARNING FROM THE PAST

Cliodhna Quigley
University of Vienna

A century has passed since Hans Berger first recorded human brain rhythms and gave us the names for the

measurement modality (electroencephalogram, EEG) and its most clearly visible rhythmic component ('alpha waves' of around 10 cycles per second). Although much has changed since then in how we measure and analyze EEG, I argue that Berger's and others' writings on the then nascent topic are still relevant to contemporary psychophysiological research. The first decades of EEG experimentation often touched on questions we still haven't definitively answered and highlighted pitfalls and challenges that we are still regularly cautioned on today. This talk provides a brief overview of how Berger and his contemporaries characterized and interpreted alpha, emphasizing the general lessons for psychophysiology that can be gained by revisiting forgotten publications.

BERGER'S RHYTHM AND THE HARMONIC HURDLES

Natalie Schaworonkow
Ernst Strüngmann Institute (ESI) for Neuroscience

Hans Berger, the pioneer of electrophysiological recordings in humans, analyzed brain waves in the time domain, studying the temporal dynamics of electrophysiological traces recorded on paper. In search of useful summary measures for this vast amount of raw time series data, the advent of spectral analysis for EEG marked a significant paradigm shift in how electrical brain activity was analyzed and interpreted, towards examining the frequency components of EEG signals. However, this shift towards frequency domain analysis has also led to a reduced emphasis on the waveform shape and other temporal characteristics of EEG signals, potentially overlooking crucial aspects that are better captured in the time domain. Waveform shape of electrophysiological activity can convey critical information about transient dynamical states of the brain, non-linear interactions, and specific patterns associated with neurological disorders that might not be evident using spectral analysis alone. In addition, spectral components like peaks in the alpha-band and beta-band may be interpreted as independent entities, even though the beta-band peak could result from non-sinusoidal waveform shape of prominent alpha-activity and therefore constitute activity of harmonic nature. Recognizing the limitations of relying solely on spectral analysis, there's a growing interest in integrating time and frequency domain analyses to achieve a more comprehensive understanding of the complexity and richness of EEG data.

THE BERGER RHYTHM WHILE LISTENING TO SPEECH

Nathan Weisz
University of Salzburg

Traditionally associated mainly with visual or sensorimotor functions, oscillations in the alpha frequency range are now firmly established in the auditory domain. These oscillations involve both auditory and non-auditory cortical regions and are engaged in various cognitive tasks such as perception, attention, or working memory. The role of altered ongoing alpha activity is also implicated in auditory phantom perception, such as tinnitus. However, investigations into the changes of these alpha oscillations have primarily occurred in artificial listening settings. In the context of continuous naturalistic speech, modulations of alpha oscillations are less understood and are often explained by the widely recognized concept of "listening effort". In this presentation, I will first share data revealing widespread left-dominant decreases in cortical alpha activity when speech intelligibility decreases. I will argue that these changes may indicate an increased active engagement of sensory representations as listening becomes more challenging. In the concluding part of the talk, I will present recent findings indicating that eye movements "track" the envelope of attended speech, offering a potential explanation for the observed alpha modulations in listening tasks. Such a pattern could be integrated into an active sensing perspective of listening, in which precisely timed eye movements "boost" relavant auditory information.

THE (VISUO)MOTOR SIDE OF THE BERGERS RHYTHM: LINKING PERCEPTION TO ACTION

Alice Tomassini
Instituto Italiano di Technologia

A key function of the brain, essential for learning and ultimately for survival, is to explore or actively "probe" the world, and not just passively register sensory inputs. This exploratory activity consists of taking actions, examining their consequences, and using this information to plan future ones. Exploration, as defined here, describes an action-perception loop. In this presentation, I will discuss neurobehavioral evidence that alpha oscillations index relevant processing within the action-perception loop(s), and that motor output retains visible (overt) traces of the loops' internal (covert) alpha dynamics. This was revealed by recording brain activities (EEG) in human participants engaged in a dual-task condition, which involved the

simultaneous performance of sustained force control (isometric contraction) and detection of unpredictable (and unrelated) visual stimuli. Visual sensitivity was enhanced when stimuli were preceded by stronger alpha-band phase coherence between cortical activity and motor output (force). Thus, visual processing is inherently synchronized with the transmission of alpha band signals along the corticospinal system. When we asked participants to perform a visuomotor tracking task, thus making visual information functionally relevant for online motor control, alpha-band corticospinal coherence predicted readiness (RT) in countering unpredictable visual perturbations. Overall, this evidence underscores a previously overlooked *motor* side of the Berger rhythm that nonetheless "serves" *perception*, perhaps through alpha-cycling *visuomotor* loops.

WAVES BEYOND WAVEFORMS

Tzvetan Popov
University of Zurich

Contemporary psychophysiology depends on the validity of the premise that, under well-controlled experimental conditions, the Berger rhythm (alpha oscillations) varies with task-specific cognitive demands and reflects the neural support of the cognitive operation performed. In this presentation, a complementary view is discussed, exploring the hypothesis of rhythm-mediated action control. This hypothesis is based on the premise that the Berger rhythm evolved to control the movement of the brain's sensors and to register the consequences of this movement. This control of behavior is a species-independent necessity and a key survival requirement for all organisms equipped with and relying on the ability to explore the environment. Initially evolved to support physical movement, rhythm-mediated action is also utilized during higher-order cognition. Consequently, the Berger rhythm *appears* correlated with the cognitive task at hand, while in fact, it evolved primarily to support the control of behavior. Considering the primacy of action a novel perspective is offered. This perspective delves into how and why waves, beyond mere waveforms, enable collective behavior across various organizational scales, ranging from neurons to animal societies.

SYMPOSIA II-1

TOWARDS THE PRODUCTIVITY PLATEAU: EMPIRICAL ADVANCES IN THE EFFECTS OF NON-INVASIVE VAGUS NERVE STIMULATION ON NORADRENERGIC MARKERS AND ATTENTION

Chairs: Ilse Van Diest, Valentina Jelincic
KU Leuven

Discussant: Martin Dahl, Max Planck Institute for Human Development

Development of new medical technologies and interventions reliably follows the Gartner hype cycle: initial promising applications lead to inflated expectations, only for disillusionment to follow due to inconclusive empirical research and implementation failures. Transcutaneous vagus nerve stimulation (tVNS) took psychiatry by storm in the early 2010s, promising non-invasive brain-based treatment for disorders such as depression and persistent anxiety. Invasive animal studies offered a plausible mechanism - stimulating vagal afferents activates locus coeruleus (LC), the main seat of noradrenaline (NA) production in the brain, promoting attention and cognitive control. Research in humans proliferated, seeking to confirm the NA mechanism via (neuro)physiological and behavioral markers. While yielding mixed results in contrast to the initial positive effects in behavioral studies, this research stresses the importance of optimizing stimulation parameters and experimental designs. This enlightenment stage allows for transition into the 'productivity plateau', continuing to investigate the effects of tVNS with less hype, but more scientific rigor. In this symposium, we present and discuss state-of-the-art research on tVNS and LC, reporting modulatory effects of tVNS on the orienting aspect of attentional control (Cosimo Urgesi) and pupil diameter (Mareike Ludwig). Valentina Jelincic will present findings on the spontaneous and induced neural oscillations, with Martin Dahl closing the symposium with a discussion on the implications of these results and future directions for tVNS.

FUNDING: The activities of the international consortium for the promotion of tVNS research are supported by a grant from Research Foundation Flanders (FWO; WOG W001520N).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.6 Eye Tracking (blink, movement, size), 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.20 Attention, 4.25 Cognitive control/executive functions

ASSESSING THE EFFECTS OF TRANSCUTANEOUS VAGUS NERVE STIMULATION ON ATTENTIONAL CONTROL

Cosimo Urgesi[1,2], Sara Boscarol[2,3], Elisabetta Ferrari[2], Viola Oldrati[2], Niccolò Butti[2], Alessandra Finisguerra[2]
[1]University of Udine, [2]Scientific Institute for Rehabilitation Medicine, [3]University of Trieste

Transcutaneous vagus nerve stimulation (tVNS) is held to act on the activity of ascending brainstem systems and medial cortical areas, promoting the increase in GABA and noradrenergic transmission, as well as the autonomic parasympathetic (over sympathetic) activation. Here, we investigated the effects of tVNS in modulating cognitive and attentive components, namely the alerting, the orienting, and the executive control components, which are considered the proxies for, respectively, noradrenergic, cholinergic and dopaminergic activity. To this end, we used the Attentional Network Test (ANT), which allows measuring the effectiveness of the three cognitive and attentive components using the same task. In a two-session, sham-controlled, within-subjects single-blind design involving 42 participants with typical development (aged 25 +/- 5.28 years), we applied active or sham tVNS during ANT administration. The results showed that active tVNS, compared to sham stimulation, selectively boosted the alerting, but not the orienting and the executive control components. Our data provides evidence for the facilitation of the alerting response by tVNS, and this facilitation could be related to the regulation of noradrenergic activity. By considering the wide spectrum of effects induced by tVNS, encompassing also its influence on GABA neurotransmission and autonomic regulation, this finding encourages the development of future clinical studies using tVNS for addressing disorders featuring altered cortico-striato-thalamo-cortical activity (e.g., Tourette syndrome).
FUNDING: This work was supported by Fondazione Regionale per la Ricerca Biomedica (Regione Lombardia), project [ID_ 3438840 BOOST].

INCREASED PUPIL DILATION DUE TO PHASIC TRANSCUTANEOUS VAGUS NERVE STIMULATION? THE IMPORTANCE OF STIMULATION INTENSITY AND SENSORY PERCEPTION

Mareike Ludwig[1,2], Calida Pereira[1], Marius Keute[3,4], Emrah Düzel[1,5], Matthew Betts[1,2], Dorothea Hämmerer[1,2,5,6]
[1]Otto-von-Guericke University of Magdeburg, [2]CBBS Center for Behavioral Brain Sciences, [3]University of Tübingen, [4]University Hospital Tübingen, [5]University College London, [6]University of Innsbruck

Transcutaneous auricular vagus nerve stimulation (taVNS) as a non-invasive method is increasingly being investigated as a modifier of locus coeruleus (LC) noradrenergic activity markers such as pupil dilation. However, taVNS studies show high heterogeneity of stimulation effects. Therefore, a taVNS setup was established to test different frequencies (10 Hz and 25 Hz) and intensities (3 mA and 5 mA) during phasic stimulation (3 s) with time-synchronous recording of pupil dilation in younger adults (N = 24; 50% female; 22.96 +/- 2.24 years). During a resting-state task (18 min), subjects received active taVNS (cymba conchae) and sham (earlobe) stimulation in a counterbalanced order on the same day. Systematic testing of different frequencies and intensities, while keeping the pulse width constant, indicated that phasic active taVNS and higher stimulation intensity caused an increase in pupil dilation, aligning with findings from phasic invasive VNS studies in animals. Moreover, the impact of intensity on pupil dilation may be stronger than that of frequency. The involvement of sensory perception in the stimulation process has not yet been studied in detail. Therefore, the present study investigated this and showed that pupil dilation during phasic stimulation increased with the perceived stimulation intensity. It is therefore important to discuss the involvement of sensory perception in the stimulation process.
FUNDING: M.L is supported by the federal state of Saxony-Anhalt and the European Regional Development Fund (ERDF) in the Center for Behavioral Brain Sciences (CBBS, ZS/2016/04/78113). E.D has received financial support for his institution by Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) – ProjectID 425899994 – Sonderforschungsbereiche 1436 (SFB 1436), Human Brain Project, Specific Grant Agreement 3 (SGA3), Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) – Sonderforschungsbereiche 1315 (SFB 1315). M.J.B is supported by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) – Project-ID 425899994

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INCONCLUSIVE EVIDENCE FOR THE MODULATION OF SPECTRAL ALPHA DYNAMICS BY TRANSCUTANEOUS VAGUS NERVE STIMULATION

Valentina Jelincic[1], Martina D'Agostini[1,2], Diana Torta[1], Ekaterina Gorianskaia[1], Loriss Cascio[1], Carlos Ventura-Bort[3], Mathias Weymar[3], Ilse Van Diest[1], Andreas von Leupoldt[1]
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Transcutaneous vagus nerve stimulation (tVNS) is a neuromodulation technique suggested to upregulate noradrenergic (NA) activity via the locus coeruleus, affecting attentional and cognitive control. One way of investigating this modulation is by using neurophysiological markers. Recent studies show a tVNS-induced suppression of spontaneous alpha oscillations, and the modulation of parietal alpha/beta desynchronization to salient stimuli. We followed up on these results by investigating the effects of tVNS on 1) resting-state alpha dynamics, and 2) alpha synchronization in the function of top-down neural gating. On two separate days, 25 participants (19 female, aged 20 +/- 2.9 years) underwent 35Hz auricular tVNS and Sham stimulation during 45 min. We measured resting-state EEG before and after the stimulation. During the stimulation, participants breathed through a respiratory set-up with inspiratory occlusions: every 2-6 breaths, their inspiration was occluded for 150ms, twice within the same breath (ISI = 500ms). The anticipation of the second occlusion should result in alpha synchronization, reflecting neural gating of a redundant sensation. We found no changes in the resting-state alpha power or peak frequency after tVNS relative to Sham. We found a trend-level increase in alpha synchronization prior to the second occlusion during tVNS relative to Sham. These results suggest a possible effect of tVNS on top-down inhibitory function, however the small effect size and no change in resting-state dynamics invite more research and further tVNS parameter optimization.
FUNDING: This work was supported by grants from the Research Foundation Flanders (FWO), Belgium (GOA3718N; G0C1921N), by an FWO PhD fellowship (11G1320N), by an infrastructure grant from the FWO and the Research Fund KU Leuven, Belgium (AKUL/19/06; I011320N), by an FWO consortium grant (WOG W001520N) and by a project grant of the Research Fund KU Leuven (C16/23/002).

SYMPOSIA II-2

PERFORMANCE MONITORING AND FEEDBACK-BASED DECISION MAKING: NOVEL INSIGHTS FROM PSYCHOPHYSIOLOGY, PHARMACOLOGICAL CHALLENGES, AND CLINICAL GROUPS

Chairs: Markus Ullsperger[1], Tanja Endrass[2]
[1]Otto-von-Guericke University Magdeburg; [2]Technical University Dresden

Psychophysiological research on performance monitoring, a key function enabling flexible goal-directed behavior, has evolved rapidly and interactions with other cognitive functions have moved into focus. This symposium gives an overview of recent performance monitoring research ranging from the psychophysiology of error monitoring in reaction time tasks via effects on selective attention and long-term memory to feedback-based decision making. A broad diversity of converging methodological approaches is featured. Researchers at various career stages from four labs present their most recent results. After an introduction given by Tanja Endrass, Marco Steinhauser presents results from a novel target-masking variant of the flanker task independently manipulating error-related EEG components and associated phasic pupillary and heart-rate changes. Thereafter, Claudia Danielmeier addresses the effects of reward prediction errors in a reversal learning task on recognition memory using fMRI and brain stimulation. Markus Ullsperger discusses behavioral, fMRI and EEG findings on the role of acetylcholine in mediating post-error attentional regulation and error-driven encoding of stimulus associations in memory. Using model-based analyses, Hans Kirschner reports on the representations of task-relevant and task-irrelevant outcome variables in the feedback-locked EEG and the influence

of methylphenidate on feedback-based decision making. Finally, Raoul Wüllhorst presents EEG correlates of decision making under risk in healthy participants and patients with mental disorders.

FUNDING: European Research Council (101018805) Deutsche Forschungsgemeinschaft (EN 906/8-1, CRC 1436, RTG 2413).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.16 Pharmacology, 3.3 Lab Based Experiment, 4.21 Decision making, 4.25 Cognitive control/ executive functions

DISSOCIATING INDEPENDENT SYSTEMS OF HUMAN ERROR MONITORING

Marco Steinhauser[1], Julia Dumsky[1], Martin Maier[1], Francesco Di Gregorio[2]
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Errors in choice tasks have been shown to elicit two consecutive components in the human event-related potential - the error-related negativity (Ne/ERN) and the error positivity (Pe). The Ne/ERN occurs immediately after the error and reflects a fast error signal elicited in the medial frontal cortex. In contrast, the Pe emerges between 200 and 400 ms post-response and has frequently been assumed to be related to conscious error processing. Traditional views proposed that the two components constitute a cascade of error processing, in which the earlier Ne/ERN delivers the input to the later Pe. Using the target-masking paradigm - a novel variant of the flanker task, we have recently shown that these components rather represent independent systems of error monitoring, and that a Pe can be observed under conditions in which the Ne/ERN is fully suppressed. Here, we will report novel data from a series of studies using this paradigm. In these studies, we demonstrate that also the conscious detection of errors is possible without an Ne/ERN. Moreover, we provide evidence that autonomic responses to errors such as error-related heart rate deceleration and pupil dilation can be attributed to the Ne/ERN rather than the Pe. Based on these and other findings, we discuss the idea that human error monitoring relies on two dissociable systems with different functional significance.

FUNDING: German Research Foundation (DFG, STE 1708/6-1)

INTERACTIONS BETWEEN PERFORMANCE MONITORING AND MEMORY

Claudia Danielmeier, Josh Khoo, Christopher Madan, Jan Derrfuss
University of Nottingham

Adaptive behaviour after errors is supported by memory retrieval. Past memories influence future actions, e.g., when learning to use a new machine, recalling previous unsuccessful actions is helpful. Furthermore, experiencing failure might lead to enhanced memory for situations where actions went wrong. However, literature on whether errors enhance or impair memory formation is equivocal. In an fMRI study, we found that highly negative prediction errors in a probabilistic reversal learning task were associated with improved recognition memory for items presented in these trials. Analyses showed that reduced activations in the performance monitoring and default mode networks underlie enhanced memory encoding. This suggest that surprising negative feedback can enhance memory encoding under certain conditions, although competing task demands, such as making immediate response adjustments, interferes with memory encoding. We also assessed feedback effects on memory in a deterministic learning task. Participants learned to navigate mazes with unique objects at junctions. Mazes were repeated to assess learning based on previous feedback. Participants showed better object memory for well learnt maze junctions, suggesting that participants learnt more from correct trials than errors. Finally, in a brain stimulation study, we investigated if stimulation of the performance monitoring network leads to changes in working memory performance. Overall, we found evidence for interactions between performance monitoring functions and memory, but the direction of effects depends on the context.

FUNDING: British Academy grant (SG152607).

BLOCKING ACETYLCHOLINERGIC TRANSMISSION IMPAIRS LEARNING FROM MISTAKES

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Performance monitoring detects and signals the necessity to adapt cognition and behavior when actions do not yield the expected outcomes. The resulting adaptations may

result in increased selective attention as well as updating of memory contents. We hypothesize that acetylcholine (ACh) signaling from the basal forebrain to sensory cortices and medial temporal lobes mediates these adaptations. A set of experiments using a face orientation association learning task addressed the interaction of performance monitoring, selective attention, and associative memory. In an fMRI study with 30 participants we found evidence suggesting that feedback-related activity in the posterior medial frontal cortex is related to the strength of representations of relevant stimuli in visual cortices and predicts subsequent memory performance. In a follow-up pharmaco-EEG study (30 participants) we showed that blocking ACh-M1 receptors with biperiden impaired memory performance, reduced the feedback-related negativity, dampened the modulation of resting-state and post-feedback occipital alpha band oscillations, and reduced frontocentral-posterior connectivity in the theta band. In sum, ACh appears to have an important role in adaptations of selective attention and the formation of associative memories.
FUNDING: Deutsche Forschungsgemeinschaft (RTG 2413 SynAGE).

LEARNING- AND SURPRISE-SIGNALS IN HUMAN EEG

Hans Kirschner[1], Hanna Molla[2], Matthew Nassar[3], Harriet de Wit[2], Markus Ullsperger[4]
[1]Otto-von-Guericke University Magdeburg, [2]University of Chicago, [3]Brown University, [4]Otto-von-Guericke University Magdeburg

Optimal decision making in complex environments requires dynamic learning adjustments based on the surprise associated with observed outcomes. To speed up learning, we should heavily weight surprising information indicating state-action-outcome contingency changes and ignore uninformative events. How does the human brain integrate useful and biasing information to guide future behavior? We report on two investigations addressing the neurocomputational mechanism of this integration process. First, we used computational modeling and EEG to investigate learning behaviour in a probabilistic reversal learning task comprising two types of uninformative events: randomly varying pay-out magnitudes and, occasionally enhanced feedback presentation by visual surprise. We found that participants' learning performance was biased by these uninformative factors. In feedback-locked EEG, these factors are represented in dynamic and spatiotemporally dissociable effects. Later in feedback processing the different streams converged on a centroparietal positivity reflecting a final pathway of adaptation that governs future behaviour. Second, we studied the effects of increased catecholaminergic transmission on probabilistic reversal learning in a within-subject, double-blind randomised design. We found that 20 mg methamphetamine improved performance in a sub-sample of participants by adaptively shifting the relative weighting of surprising outcomes based on their statistical context. Together, these results reveal new insights into the neurocomputational mechanism of adaptive learning behavior.
FUNDING: European Research Council (101018805).

NEURAL CORRELATES OF EXPECTED VALUE FACILITATE ADAPTIVE CHOICES IN RISKY DECISION CONTEXTS

Raoul Wüllhorst, Verena Wüllhorst, Tanja Endrass
Technische Universität Dresden

Brain-behavior relationships in human risky decision making may explain how risk-preferences emerge. However, real-life dynamics, behavioral models, and the sensitivity to risky contexts are frequently neglected. Patients with alcohol use disorder (AUD), social anxiety disorder (SAD), comorbid AUD and SAD, and healthy participants performed the hot Columbia Card Task (hCCT) with EEG. This involved rounds of sequential decisions between stopping (safe option) and continuing with increasing odds of a high loss (risky option). Based on financial decision theory, we modelled expected value (EV) and risk (outcome variance) as predictors of decision-related single-trial EEG. We then examined the relationships of behavioral risk indices with EV and risk signals. Temporally distinct signals for EV (~1100 ms) and risk (~1600 ms) emerged as negative slow-waves at parietal electrodes. Reward sensitivity (turning another card with increasing EV) was associated with increased EV and reduced risk signals. Overall risk-taking (number of cards turned) was linked to reduced EV signals. No relationship emerged for risk sensitivity (turning another card with increasing risk). Participants more sensitive to reward turned fewer cards overall and earned more points. These results emphasize the significance of decision values, particularly their neural implementation, in facilitating more or less adaptive behavior in risky decision contexts. Interestingly, adaptive choice patterns selectively based on EV (rather than risk) may additionally benefit from attenuated neural sensitivity to risk.
FUNDING: German Research Foundation (DFG, grant EN 906/8-1).

SYMPOSIA II-3

EEG, EMOTION, AND VIDEOS: DEVELOPMENTS IN DYNAMIC EMOTIONAL PROCESSING RESEARCH

Chairs: Andrew Farkas[1], Hedwig Eisenbarth[2]
[1]*University of Florida;* [2]*Victoria University of Wellington*

Emotional processing has been primarily studied with stimuli that act on one sensory modality such as pictures or sounds. Simpler stimuli offer more control, yet there may be aspects of emotion that are better studied with more immersive and realistic media. Recently, new emotion videos sets have become available in parallel with developments to improve EEG measures from this medium. This research may complement findings from static stimuli, while also contributing to the efforts to use virtual reality and mobile EEG systems. In this symposium, we share recent research to harness videos and EEG to understand aspects of emotion. Research by Eisenbarth & Abdullahi-Shehu is a pertinent example as they used momentary assessments during emotional video viewing, finding that the dynamic interactions between EEG and peripheral physiology of the Emotional Arousal Pattern (EMAP) dataset are harder to predict than aggregated ratings but allow specific differentiation between processing phases. Stegmann, Wieser, & Gamer found that the amplitude of ssVEPs evoked by flickering videos are reliably altered by contextual threat condition suggesting alteration in sustained attention. Fusina, Romeo, Angrilli, & Spironelli compared emotional scenes and videos using EEG source-analyses of Alpha activity to understand laterality and gender biases in affective processing. Farkas, Sabatinelli, Jia, and Gehr curated naturalistic videos and found that a competing ssVEP stimulus can be used to reliably measure emotion with effects comparable to the Late Positive Potential evoked from scenes.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.3 Sex differences, 4.22 Learning/conditioning, 4.23 Emotion/affect

LINKING PERIPHERAL- WITH NEUROPHYSIOLOGICAL ACTIVITY DURING EMOTION PROCESSING

Hedwig Eisenbarth, Harisu Abdullahi-Shehu
Victoria University of Wellington

Autonomic and central nervous system closely interact with each other to coordinate immediate responding to internal and external changes. Despite our knowledge about each of their response patterns to external emotional stimulation, studying their interactive relationship during that would help us understand the role autonomic reactivity in response to emotionally evocative events better. In this context emotion eliciting videos constitute not a challenge but an advantage to model perception and reactivity across time. In a series of studies based on the Emotional arousal pattern (EMAP) dataset, we investigated the way we can use time courses of physiological and neurophysiological reactivity alongside of subjective evaluations. Across the 145 participants watching video clips ranging from positive to negative as well as high to low intensity, both subjective and peripheral physiological reactions showed similar changes during first and iterative presentation. Machine learning modelling showed that the relationship between autonomic and central nervous system activity on one side and between both nervous systems' activity and subjective experiences can be modelled to predict new instances of emotion processing related activity. Through a series of models, those interactions between the autonomic and the central nervous system activity can be best reflected through timecourse sensitive methods, pointing towards the role of including frame-by-frame analyses in future work.

FUNDING: Victoria University of Wellington Research Trust.

UNVEILING THE DYNAMICS OF SUSTAINED ATTENTION IN CONTEXTUAL THREAT: INSIGHTS FROM STEADY-STATE VEPS ELICITED BY FLICKERING VIDEO STIMULI

Yannik Stegmann[1], Matthias Wieser[2], Matthias Gamer[1]
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Detecting threat in ever-changing environments is crucial for adaptive behavior in animals, including humans. Accordingly, when exploring potentially threatening environments, behavioral dispositions are often characterized by a state of heightened vigilance, to facilitate rapid detection of potentially dangerous situations. However, the neurophysiological mechanisms underlying hypervigilance remain largely unexplored. A suitable means to induce anxiety experimentally is context conditioning: In one context (CTX+), an unpredictable aversive stimulus (US) is repeatedly presented, in contrast to a second context (CTX−), in which no US is ever presented. Here we present an EEG study, that examined the neural correlates of sustained attention in 38 participants subjected to a context conditioning paradigm. Flickering video stimuli were used to evoke steady-state visual evoked

potentials (ssVEPs) as an index of visuocortical engagement. Analysis of electrocortical responses revealed successful induction of the ssVEP signal by the flickering video presentations. Additionally, we observed clear indices of context conditioning and extinction learning on a subjective level, while cortical processing of the CTX+ was unexpectedly reduced during video presentation. The differences between CTX+ and CTX− diminished during extinction learning. Together, these results indicate that the dynamic sensory input of the video presentation leads to disruptions in the ssVEP signal, which is greater for motivationally significant, threatening contexts.

COMPARING DIFFERENT METHODS FOR INDUCING EMOTION: THE EFFECT OF SLIDES VS. SHORT CLIPS ON EEG HEMISPHERIC ASYMMETRY AND GENDER BIAS IN AFFECTIVE PROCESSING

Francesca Fusina, Zaira Romeo, Alessandro Angrilli, Chiara Spironelli
University of Padova

The study of emotional processing in laboratory settings has often been controversial due to the nature of the stimuli used to elicit it. For years, static pictures (such as those belonging to the IAPS) have been prominent in emotion studies, but fail to include the multisensory information that permeates real-world situations and that may be pivotal in ecologically eliciting emotion. Therefore, we directly compared a set of 45 static and 45 validated dynamic (short video clips) stimuli in a sample of 40 (20 women) young adults during 64-channel EEG recording. The stimuli were divided into three emotional categories according to their content: 15 stimuli were classified as Erotic, 15 as Neutral and 15 as Fear. sLORETA analysis showed differing lateralization patterns in Alpha band activity (8-12 Hz), with slide presentation eliciting greater activation of the left associative visual areas and video clips presenting an opposite pattern (greater activation on the right side). Another possible confound when studying emotion can be represented by the effect of gender on emotional processing. When dividing the sample according to gender, we found that while the video clips were associated to greater right occipital activation (lower Alpha on the left) in both groups, emotional pictures activated opposite occipital regions, with women exhibiting higher left activation. In conclusion, depending on the focus of each study, appropriate stimulus choice must be kept into account when formulating a research project on emotion.

NATURALISTIC EMOTIONAL VIDEO CLIPS STRONGLY MODULATE COMPETING STEADY STATE VISUALLY EVOKED POTENTIALS

Andrew Farkas[1], Dean Sabatinelli[2], Han Jia[2], Matt Gehr[2]
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Videos present an opportunity to study different aspects of emotional perception as compared to static scenes. A video's dynamic audio-visual elements are more realistic, but they also introduce complexity and new confounds. In two studies, we addressed these issues with naturalistic videos curated for event-related physiological recording. To quantify emotional reactivity using EEG, a steady-state visually evoked potential (ssVEP) was evoked with a black border flickering at 7.5 Hz around each video. Emotional relative to neutral videos reliably decreased the ssVEP amplitude presumably because they competed for limited capacity in visual cortex. Importantly, the modulation of the ssVEP was associated with ratings of emotional arousal and not features of the videos such as brightness, loudness, complexity, or movement. Matched pairs of videos and scenes evoked similarly large effects when comparing the ssVEP to the well-studied LPP. Scenes depicting the typically most effective content of erotica and gore unsurprisingly evoked the largest LPP amplitudes, but the ssVEP was the most affected by videos that received the highest arousal ratings (e.g., car crashes, zip-lining). This difference in reactivity suggests that scenes activate encoded representations important for emotion discrimination (of which sex and violence cues are the most salient), whereas videos engage prolonged attentional processes necessary for narrative comprehension. Thus, future research on video modulation of the ssVEP may provide different and complementary information about emotional perception.

SYMPOSIA II-4

HEDONIC AND MOTIVATIONAL INFLUENCES ON THE REWARD POSITIVITY: FROM CIRCUITS TO BEHAVIOR

Chair: Lindsay Shaffer
George Mason University

Discussant: James Cavanagh, University of New Mexico

The Reward Positivity (RewP) is an ERP component observed over frontocentral regions in response to reward feedback. Although initially conceptualized as a reward prediction error, recent accounts suggest hedonic valuation

also contributes to the computational processes represented within the RewP. It remains unknown how different factors of reward value contribute independent or interactive variance to the RewP. In this symposium, researchers will present results from studies examining how the RewP is modulated by affective or motivational value in human participants. In the first talk, Grace Allison will discuss a series of studies investigating how heterogeneous clinical presentations of psychopathology could be associated with a dysregulated reward sensitivity RewP. In the second talk, Lindsay Shaffer will discuss results from a study examining whether the RewP is modulated by reward value as a function of motivational state using an inference-based task known to probe prefrontal functioning. In the third talk, Dan Foti will present two studies examining how dietary and genetic factors associated with depression vulnerability affects RewP amplitudes. Finally, Derek Evan Nee will discuss results from a study using intermittent theta-burst transcranial magnetic stimulation on prefrontal circuits to enhance the RewP and how it relates to anhedonia. The goal of this symposium is to determine the contribution of affective or motivational reward value in the genesis of the RewP.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 2.18 Brain stimulation, 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.19 Motivation, 4.23 Emotion/affect

THE REWARD POSITIVITY DOES NOT ENCODE CURRENT REWARD VALUE

Lindsay Shaffer, Holly Crowder, Peter Kakalec, Lam Duong, Craig McDonald, James Thompson
George Mason University

Successful behavioral adaptation requires an ongoing assessment of rewarding outcomes based on one's current state. A frontocentral ERP associated with reward feedback, the reward positivity (RewP), has been linked to reflect information about reward value and motivational states. It's unclear whether changes in the RewP are influenced by changes in reward value as a function of motivational state. To examine this, hungry subjects (n=31) completed two rounds of a modified Doors Task during EEG recordings and obtained feedback about cues associated with sweet and savory food reinforcers equally matched in pleasantness and desirability. Subjects underwent reinforcer devaluation, a paradigm in isolating inference-based behavior based on decreasing reward value, in between rounds by eating one of the foods to satiety. Prior to devaluation, subjects were hungry and rated both food reinforcers equally pleasant. After devaluation, subjects were sated and rated the devalued food significantly less pleasant but not for the non-devalued food, suggesting a sensory-specific change in reward value. Logistic regression of win-stay/lose-switch behavior during the Doors Task show participants made sensory-specific adjustments in food preferences during post-devaluation. Non-parametric permutation tests based on the tmax statistic performed on frontal, central, and parietal electrodes revealed no significant differences in RewP amplitudes, suggesting the RewP is insensitive to reinforcer devaluation. These findings suggest that the RewP might reflect cached representations of reward value.
FUNDING: NIH R01DA003431; NSF #192557.

REWARD CIRCUIT-TARGETED INTERMITTENT THETA-BURST STIMULATION INCREASES THE REWARD POSITIVITY IN INDIVIDUALS WITH ANHEDONIA

Derek Nee[1], Brittney Thompson[1], Austin Gallyer[2], Jonathan Ryan[3], Noah Fletcher[1], F. Kozel[1], Greg Hajcak[1]
[1]Florida State University, [2]Utah Education Policy Center, [3]Emory University

Individuals experiencing anhedonia show reduced motivation and sensitivity to rewards. These symptoms have been linked to dysregulations of the reward circuit. Remediating reward circuit function may therefore alleviate anhedonic symptoms. Previously, we found that intermittent theta-burst transcranial magnetic stimulation (iTBS) targeting the reward circuit led to enhanced reward-related scalp potentials (reward positivity; RewP) in healthy individuals. Here, we sought to replicate these findings in individuals experiencing anhedonia and test whether modulations of the RewP also improve anhedonic symptoms. Individuals with a Dimensional Anhedonia Rating Scale (DARS) score below 46 underwent 5 days of reward circuit-iTBS and 5 days of inion-iTBS (control) with each iTBS week followed by a five-day washout period (order counterbalanced). DARS and RewP were collected at baseline and at the end of each week. Reward circuit-iTBS was guided by a combination of fMRI connectivity with the nucleus accumbens and e-field modeling yielding a cortical target in the rostromedial prefrontal cortex. Replicating past work, we observed increases in the RewP following reward circuit-iTBS relative to inion-iTBS. DARS scores improved over time. However, there was no evidence that DARS improvements were related to reward circuit-iTBS. Collectively, these data causally link the RewP with the reward circuit and validate a non-invasive intervention to modulate reward circuit function. However, additional manipulations

may be necessary to translate changes in brain function to changes in symptoms.
FUNDING: NIH R21MH129653.

REWARD DYSFUNCTION ACROSS CLINICAL PHENOMENA: IMPLICATIONS FOR UNDERSTANDING THE REWP AND LINKS TO BEHAVIOR

Grace Allison, Anna Weinberg
McGill University

Abnormalities in reward sensitivity, observed using the reward positivity (RewP), are detected across multiple, clinically distinct forms of psychopathology and behaviors, and may play a mechanistic role in the development of illness. However, it is unclear how the same abnormality can result in multiple outcomes. In the present studies, we seek to understand a) whether the RewP can be used to identify more specific phenotypes of risk and b) how the RewP can be associated with different behavioral profiles. Study one examines the intergenerational transmission of the RewP among mothers with or without a history of depression and their never-depressed, adolescent daughters. Transmission of a blunted RewP appeared most prominent among mothers with a history of early-onset depression. Study two aims to disentangle the association between the RewP and various forms of suicidal thoughts and behaviors; results suggest that a suicide attempt history shows specific associations with a blunted RewP, adjusting for the presence of lifetime ideation and other suicidal behaviors. Finally, results from study three suggest a quadratic association between the magnitude of the RewP and risk taking among adolescents, potentially explaining why some individuals struggle to make optimal decisions. Overall, results suggest that different clinical presentations may be associated with a similar marker of risk, indicating the need for more discussion of the functional significance of individual differences in neural reward responsiveness.
FUNDING: CIHR, Canada Research Chair, Healthy Brains Healthy Lives, Fonds de Recherche du Québec, Société et Culture.

EXPLORING THE CLINICAL TRANSLATIONAL POTENTIAL OF THE REWARD POSITIVITY

Roslyn Harold[1], Kimberly Kinzig[1], Bridgette Kelleher[1], Elizabeth Berry-Kravis[2], Ulrike Dydak[1], Gianna Nossa[1], Xiaopeng Zhou[1], Dan Foti[1]
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The reward positivity (RewP) is an ERP that captures the initial evaluation of outcome valence, and it has been widely applied as a measure of depression vulnerability. Here, we present preliminary findings from two recent studies that explore the clinical translational potential of the RewP in novel contexts relevant to depression. First, we present data on change in RewP amplitude following eight weeks of induced ketosis. The popularity of the ketogenic diet stems in part from its putative antidepressant effects, yet empirical evidence is lacking. We measured RewP amplitude before and after assignment to a ketogenic diet; ketosis was confirmed through urine analysis. Contrary to expectations, RewP amplitude was reduced at the end of the diet intervention, which goes against anecdotal reports of antidepressant effects. Second, we present data in which we leverage the RewP to examine depression etiology among a genetically-defined high-risk group. Adult female carriers of the FMR1 premutation are at high risk for adult-onset depression, but it is unclear why. We tested RewP amplitude as a candidate process of depression risk that may be shared with the general population, alongside targeted neurotransmitter concentrations in the cerebellum that are idiosyncratic processes unique to premutation carriers. In our pilot cohort, premutation carriers exhibited a combination of blunted RewP amplitude and elevated cerebellar glutamate. Together, these studies highlight the utility of the RewP in a wide range of clinical applications, spanning etiology and intervention research.
FUNDING: Indiana Clinical and Translational Sciences Institute, NIH UL1TR001108, the National Center for Advancing Translational Sciences, and the Clinical and Translational Sciences Award.

Symposia II-5: SPR SPECIAL SYMPOSIUM ON 100 YEARS OF EEG RESEARCH (1): BIG TEAM SCIENCE IN EEG RESEARCH

Chairs: Yuri Pavlov[1], Faisal Mushtaq[2]
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Psychophysiology has faced issues with replicability, generalizability, and reproducibility. A big team science approach could help tackle many of these issues through the pooling of resources to enable the delivery of larger, more

robust studies. This symposium showcases four speakers discussing their experiences from three large-scale multi-site EEG studies, highlighting challenges and opportunities in big team psychophysiology. From the #EEGManyLabs initiative, Katharina Paul will present a large-scale replication of the role of reward expectancy and valence on the feedback-related negativity (FRN) and P300 and Nicolas Langer reports on a replication of seminal study on contralateral delay activity (CDA) and individual working memory capacity. From the CoScience EEG-Personality Project, Corinna Kührt will report on how personality traits related to effort motivation correlate with EEG indices of effortful control. Finally, as part of the Cognitive Neuroscience Task Reliability and Clinical applications for Serious mental illness (CNTRaCS) Consortium, Molly Erickson tests the hypothesis that abnormal prestimulus oscillatory alpha fluctuations contribute to attention lapsing in psychotic patients. Collectively, these talks will highlight the opportunities afforded by moving away from small-scale, single-lab experiments to large, collaborative studies and cover some of the challenges that need to be navigated to increase the uptake of community-driven, high-powered collaborations in psychophysiology.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.11 Personality, 4.18 Memory, 4.25 Cognitive control/executive functions

REVISITING THE ELECTROPHYSIOLOGICAL CORRELATES OF VALENCE AND EXPECTANCY IN REWARD PROCESSING – A MULTI-LAB REPLICATION

Katharina Paul
University of Hamburg

Understanding feedback processing heavily relies on analyzing event-related brain potentials, such as the feedback-related negativity (FRN) and the P300. Recent studies, along with the Reinforcement Learning Theory (Holroyd & Coles, 2002), indicate that FRN amplitudes peak for negative and unexpected outcomes, while P300 amplitudes peak for positive and unexpected ones. However, Hajcak et al. (2005) observed that FRN amplitudes were higher for negative outcomes, regardless of expectancy, and P300 amplitudes were larger for unexpected outcomes, regardless of valence. We aimed to replicate these findings within the #EEGManyLabs network (Pavlov et al., 2021), assessing 360 participants across thirteen labs worldwide. Our results replicated the original study, revealing large expectancy effects for the P300 (peaking for unexpected outcomes). Importantly, diverging from Hajcak et al., we also found moderate expectancy effects for the FRN and large valence effects for the P300 component. These findings were consistent across various analytical approaches, including alternative preprocessing, PCA, and Bayesian multilevel modeling, therein combining a direct replication with the application of more contemporary standards. Also, the meta-analysis revealed that the effects did not vary substantially across labs. Our study underscores the significance of well-powered research in detecting subtle effects and emphasizes the importance of replication efforts across multiple sites to ensure the reliability and generalizability of neuroscience findings.

INSIGHTS FROM A MULTI-SITE EEG REPLICATION STUDY ON THE CONTRALATERAL DELAY ACTIVITY AS A NEUROPHYSIOLOGICAL MARKER OF VISUAL WORKING MEMORY CAPACITY

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In an era where the reproducibility of research findings and collaborative science are at the forefront of scientific integrity, multi-site studies have emerged as a pivotal methodology. As part of the #EEGManyLabs initiative, we tested replicability of the seminal finding that contralateral delay activity (CDA) is linked to individual working memory capacity (Vogel and Machizawa, 2004). We conducted a large-scale multi-site study (10 labs, 250 subjects) with standardized procedures and a pre-registered analysis plan to validate the original study's results, emphasizing the advantages of leveraging diverse participant pools and varied laboratory settings to enhance the generalizability and reliability of EEG findings. However, conducting EEG research across multiple sites introduces a unique set of challenges, including standardizing data collection protocols, ensuring the comparability of EEG setups, and navigating the complexities of data integration and analysis across disparate groups. This talk will present the first results and explore strategies to overcome these challenges.

DISPOSITIONAL COGNITIVE EFFORT INVESTMENT AND ACTUAL EFFORT EXERTION: A LARGE-SCALE, MULTI-LABORATORY APPROACH WITHIN THE COSCIENCE EEG-PERSONALITY PROJECT

Corinna Kührt[1], Alexander Strobel[1], Christoph Scheffel[1], André Beauducel[2], Jürgen Hennig[3], Johannes Hewig[4], Andrea Hildebrandt[5], Erik Mueller[6], Roman Osinsky[7], Katharina Paul[8], Elisa Porth[9], Johannes Rodrigues[4], Cassie Short[5], Jutta Stahl[9], Jan Wacker[8]
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The study is part of the CoScience EEG-Personality Project, which aims at increasing the replicability in personality neuroscience. In this multi-site EEG study, ten different laboratories across Germany are involved and collaborate according to the principles of cooperative Forking Path Analysis (cFPA). Exemplarily, we present results of a study that focusses on individual differences in cognitive effort investment, i.e. dispositional willingness and tendency to exert effortful control. Cognitive effort investment integrates the traits need for cognition, intellect, self-control and effortful control in order to predict effort investment in goal-directed behavior. The study examines trait effects on performance (i.e. reaction time, accuracy) and the amount of cognitive effort actually invested (i.e. frontal midline theta power, P3 and N2 amplitudes derived from EEG) in a flanker task. Analyses of N ~ 780 participants reveal that differences between subjects explain 8 to 26 % of the variance. However, the results yield neither a main effect of cognitive effort investment nor an interaction effect for cognitive effort investment × demand. These results were robustly shown across the cFPA, i.e. independent of pre-processing or analytical choices. Data collection was distributed across different labs; data collection procedures were highly standardized (including material and training of experimenters). We will present an analysis of how different sources of variability between the labs influence the outcomes.

MULTISITE EEG STUDIES IN CLINICAL POPULATIONS: RESULTS AND RECOMMENDATIONS FROM THE CNTRACS CONSORTIUM

Molly Erickson[1], Megan Boudewyn[2], Deanna Barch[3], Cameron Carter[4], Michael Frank[5], James Gold[6], Angus MacDonald[7], Daniel Ragland[8], Steven Silverstein[9], Andrew Yonelinas[8], Steven Luck[8]
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The aim of the Cognitive Neuroscience Task Reliability and Clinical applications for Serious mental illness (CNTRaCS) Consortium is to develop reliable tasks that can be used to understand cognitive deficits and their neural correlates in people with psychosis. In the present study, we implemented a visual working memory task while EEG was recorded from 72 people with schizophrenia, 49 with bipolar disorder, 55 with major depressive disorder, and 95 healthy controls. Participants' data was collected from five testing sites across the United States. Using a novel modeling approach, we tested the hypothesis that abnormal trial-by-trial fluctuations in pre-stimulus oscillatory alpha constitutes a mechanism of elevated attention lapsing in patients. We found that, although total alpha power during the pre-stimulus period significantly predicted attention lapsing, this effect was primarily driven by the aperiodic components of the EEG signal - not oscillatory alpha. This pattern was broadly consistent across sites, although the effect size was variable. To minimize between-site variability in EEG quality and ensure adequate model fit at the single trial level, we implemented several quality control practices that are described here and can be found in more detail in Boudewyn, Erickson, et al. (2023). We observed some variability in model fits across testing sites; however, there were no significant group differences in model fit (p's>0.30), indicating that between-site variability does not account for the observed group effects on pre-stimulus alpha power.

SYMPOSIA III-1

APPLICATIONS OF PSYCHOPHYSIOLOGICAL METHODS TO UNDERSTANDING HEALTH DISPARITIES IN MINORITIZED POPULATIONS

Chairs: Yinru Long, Autumn Kujawa
Vanderbilt University

Minoritized populations, including those who identify as racial, ethnic, sexual and/or gender minorities, often face discrimination, marginalization, and other chronic stressors, which contribute to health disparities. Although we have increasingly recognized the nuanced ways in which psychological stressors manifest through physiological responses, relatively little research has applied psychophysiological methods to better understand the health needs of minoritized populations. This symposium will include a series of talks that use a variety of psychophysiological methods to advance research on minority stress and health disparities in both youth and adults, with the goal of identifying potential intervention targets. Presenter 1 will discuss associations between discrimination, heart rate variability (HRV), and health outcomes in Native Hawaiian and Pacific Islanders; Presenter 2 will describe the interaction between social reward positivity (RewP) measured by EEG and family support in SGM youth; Presenter 3 will expand on the prior talk addressing RewP in mental health outcomes of SGM youth; Presenter 4 will describe the role of emotion regulation and social interpretation flexibility in moderating the association between skin conductance rate (SCR), discrimination and symptoms. This symposium will highlight important new developments in research on the intersections of psychophysiology, minority stress, and health disparities, with the goal of ultimately informing evidence-based approaches to improve the well-being of minoritized populations.

Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 3.1 Observational Study: Cross-Sectional, 4.4 Gender, 4.6 Racism/prejudice, 4.10 Stress

NATIVE HAWAIIAN AND PACIFIC ISLANDERS: A PRELIMINARY EXAMINATION OF HEART RATE VARIABILITY, DISCRIMINATION, RESILIENCE, AND HEALTH

Darcianne Watanabe, DeWayne Williams, Julian Thayer
University of California, Irvine

Native Hawaiian and Pacific Islanders (NHPI) have higher rates of cardiovascular disease (CVD) risk factors compared to other ethnic groups, but they are vastly underrepresented in research. Heart rate variability (HRV), body mass index (BMI), self-rated health (SRH), and everyday discrimination (ED) among minoritized groups are linked with CVD risk, but no study has analyzed these variables among NHPI. Thus, this ongoing community-based NIH-funded study examined mean differences in physiological (HRV, BMI) and socio-demographic (SRH, ED) CVD risk factors among NHPI ($n = 10$) and non-NHPI ($n = 8$). A 3-minute resting baseline HRV assessment preceded the administration of self-report questionnaires. NHPI had lower mean HRV ($p = .15$) and SRH ($p = .03$), higher BMI ($p = .002$), and reported greater ED ($p = .27$) than non-NHPI. In NHPI, Spearman correlations showed BMI was inversely associated with HRV ($r = -.58$, $p = .048$) and SRH ($r = -.43$, $p = .167$). The positive SRH-resilience link in NHPI ($r = .67$, $p = .02$) was significantly stronger ($z = -2.21$, $p = .03$) compared to non-NHPI ($r = .29$, $p = .42$). The SRH-ED link was also significantly stronger ($z = 2.51$, $p = .01$) in NHPI ($r = .70$, $p = .02$) than non-NHPI ($r = -.37$, $p = .29$). The BMI-ED link was stronger ($z = -2.23$, $p = .03$) in non-NHPI ($r = .62$, $p = .054$) than NHPI ($r = .38$, $z = .25$). These preliminary data contribute to existing knowledge on NHPIs, and suggest that for NHPI, who report greater ED, greater resilience may be related to better SRH. Additional data and correlational results will be presented.

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NEURAL CORRELATES OF ADOLESCENT MINORITY STRESS: FAMILY SUPPORT MODERATES SOCIAL REWP REACTIVITY AMONG SEXUAL ORIENTATION YOUTH

Benjamin Katz[1,2], Kirsty Clark[3], John Pachanski[4], Lea Dougherty[5], Kaylin Hill[3], Daniel Klein[1], Autumn Kujawa[3]
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The current study explores for the first time neuropsychological and behavioral measures of adolescent sexual minority stress. A community sample of 346 15-year-old teenagers (47.2% female; sexual minority: n = 36) completed measures of family support, rejection sensitivity, and the Island Getaway Task. In the task, participants recursively voted to keep or remove 11 fictive age-matched participants. Participants' votes were recorded, as were their neural responses to others' votes using a 34-electrode EEG cap (32 channels with the addition of FCz and Iz). The Reward Positivity (RewP) was calculated as a difference score in mean amplitude at Cz, 300 to 375 ms following peer acceptance or rejection. Sexual minority teens reported greater levels of rejection sensitivity, $d = .70$, $p < .001$, and were more likely than their heterosexual peers to engage in an ingratiation behavior (i.e., vote in favor of a person who voted against them), $d = 0.46$, $p = .014$. While the Island Getaway Task successfully elicited a RewP, no difference was detected in reactivity between same-sex attracted and different-sex attracted teens, $d = 0.26$, $p = .137$. However, an interaction was observed, $\beta = 0.32$, $p = 0.35$, wherein sexual minority teens with low family support had lower social RewP, than sexual minority teens with high family support or heterosexuals with low family support. This study provides novel biobehavioral insight into sexual minority behaviors and perceptions in the face of social evaluation, particularly with regard to rejection and for those with lower family support.

FUNDING: Funding Research reported in this article was supported by the National Institutes of Mental Health (NIMH) under Awards R01MH069942 and R01MH069942-12S1 (D. N. Klein) and the David R. Kessler, M.D. '55, Resource Fund for LGBTQ Mental Health at Yale. During completion of this work, K. A. Clark was partially supported by NIMH under Award K01MH125073, K. E. Hill was supported by NIMH under Award T32MH18921, and B. A. Katz was supported by the National Institutes of Health under Award K12GM102778 and the Israel Science Foundation Award 80/22.

NEURAL SOCIAL REWARD RESPONSIVENESS AND ELEVATED RISK OF DEPRESSION AND SUICIDAL IDEATION IN SEXUAL AND GENDER MINORITY ADOLESCENTS

Yinru Long[1], Samantha Pegg[1], Andrew Kittleson[2], Kirsty Clark[1], Autumn Kujawa[1]
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Sexual and gender minority (SGM) youth are at increased risk of depression and suicidal ideation (SI), due in part to exposure to discrimination and other forms of stress. Psychophysiological measures are well suited to capture risk and resilience factors that impact mental health of SGM youth, but little research has examined this possibility. We conducted a cross-sectional study of 165 adolescents (22.42% identifying as SGM) to examine both neural processing of social feedback and perceived social support as potential moderators of the association between SGM identity, depressive symptoms, and suicidal ideation (SI). Participants self-reported symptoms and social support satisfaction. Electroencephalogram (EEG) was recorded while participants completed a computerized peer interaction task in which the reward positivity (RewP) component was measured in response to social acceptance feedback. Social RewP moderated the associations between SGM identity, depressive symptoms, and SI ($ps < .05$), such that SGM youth with blunted neural responses to social acceptance had the highest symptoms. In contrast, high levels of social support were protective in the association between SGM identity and SI ($p < .05$) but not significant for depressive symptoms ($p = .06$). This is among the first studies to use affective neuroscience methods to examine social processes in SGM youth and our findings underscore the role of social factors, measured by EEG, in informing intervention targets to reduce the risk for psychopathology.

FUNDING: This work was supported by a Klingenstein Third Generation Foundation Fellowship and Brain and Behavior Research Foundation Katherine Deschner Family Young Investigator Grant awarded to A.K. It was also supported in part by UL1 TR000445 from NCATS/NIH. S.P. was supported by NIMH F31-MH127817 and T32-MH18921 during the completion of this work.

BLUNTED SKIN CONDUCTANCE RESPONSE DURING ACUTE STRESS IS LINKED WITH CHRONIC EXPOSURE TO DISCRIMINATION AND TRANSDIAGNOSTIC SYMPTOM OUTCOMES: EXAMINING THE ROLE OF EMOTION REGULATION AND FLEXIBILITY

Wisteria Deng, Yutong Zhu, Tyrone Cannon, Jutta Joorman
Yale University

While prior work has associated blunted autonomic reactivity under acute stress with trauma exposure and heterogenous symptom outcomes, less understood is the affective-cognitive mechanisms underlying such associations. This study examined the moderating effects of emotion regulation ability and social interpretation flexibility on the link between skin conductance response (SCR) under acute stress and chronic exposure to discrimination. Community participants ($N=119$) were randomly assigned to either the experimental condition with brief electrical stimulations delivered at a pseudo-randomized order, or the control condition, while completing a social interpretation revisioning task. Affective and post-traumatic stress-related symptoms were measured, along with skin conductance at baseline (i.e., before the experiment) vs. during the trials. Findings revealed that individuals exposed to more frequent discrimination observed blunted SCR responses in the experimental condition (i.e., exposed to acute stress of shocks), also reporting more severe symptoms (i.e., depression, anxiety, and post-traumatic stress response). Such association was amplified by emotion regulation difficulties and social interpretation inflexibility. In particular, the blunted SCR under stress is linked with inflexibility in endorsing novel negative information. These results highlight the treatment relevance of teaching emotion regulation strategies and promoting social interpretation flexibility, especially for individuals experiencing chronic discriminations.

SYMPOSIA III-2

LESSONS LEARNED: NAVIGATING DEVELOPMENTAL PSYCHOPHYSIOLOGY FROM INFANCY TO ADULTHOOD

Chairs: Ty Lees[1], Miranda Lutz[2]
[1]McLean Hospital; [2]Erasmus University Rotterdam

Psychophysiology offers powerful tools that can be used to investigate children/adolescents and their development. However, using these tools in such cohorts also presents unique challenges. In this symposium, researchers will present results from recent developmental psychophysiology studies, and discuss challenges that can be encountered in such research and possible solutions. To start, the organizers will give a brief introduction covering the importance of adapting psychophysiological approaches and designs to developmental perspectives. Following this, Danielle Rice will present a study investigating developmental changes in HRV across middle childhood and discuss how the functional implications of such parameters may need to be considered in a developmental context. Thereafter, Olga Boer will use a recent study examining cognitive control in over 2500 adolescents to discuss the constraints and challenges faced in collecting, processing, and handling large developmental datasets. In the third talk, Emilio Valadez will use recently collected fMRI data to discuss the practical data collection and processing considerations necessary for conducting such studies in developmental samples. Echo Xu will then conclude the talks by discussing a newly developed tool for estimating the reliability, effect size, and data quality of EEG data in infants and children. Finally, the symposium will conclude with a panel discussion regarding developmental psychophysiology and its challenges. Our aim for this symposium is to emphasize the use of psychophysiology in developmental research.

Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/ Interviews, 3.2 Observational Study: Longitudinal, 4.2 Development, 4.26 Other

DEVELOPMENTAL CHANGES IN RESTING HEART RATE VARIABILITY PREDICTING PEER SUCCESS: FROM AN INDEX OF ENVIRONMENTAL SUSCEPTIBILITY IN KINDERGARTEN TO EMOTION REGULATION IN 1ST GRADE

Danielle Rice, Lisa Gatzke-Kopp
The Pennsylvania State University

Resting HRV has been associated with emotion regulation capacity among adolescents and adults, but findings have been less consistent among young children leading to the postulation that associations between low resting HRV and risk for psychopathology are developmentally emergent. We examined how resting HRV related to children's ability to make friends in early elementary school, and whether the socioemotional context (teacher closeness) moderated this association, from two theoretical frameworks of HRV: 1) in an emotion regulation framework

higher HRV would buffer environmental effects on children's peer success, 2) in a differential susceptibility framework higher HRV would have positive effects on peer success in the context of high teacher closeness, but negative effects in the context of low teacher closeness. 339 children (M_{age} = 66.32 months [SD_{age} = 4.13], 70.2% Black, 64.3% male) were recruited in Kindergarten(K), including resting HRV, teacher-reported closeness, and peer sociometrics. Assessments were repeated annually through 2nd grade to examine whether the functional association of HRV changed across this developmental period. Results in K were consistent with the different susceptibility framework such that higher resting HRV was associated with lower peer success in the context of low teacher closeness. However, in 1st grade results were consistent with the emotion regulation framework where higher resting HRV had a main effect on peer success. Results suggest that the functional implications of HRV may need to be considered in a developmental context.

FUNDING: Funding for this research was supplied by the Pennsylvania Department of Health and the Pennsylvania State University Social Science Research Institute.

VALIDATING EEG MEASURES OF COGNITIVE CONTROL AMONG A SAMPLE OF OVER 2500 ADOLESCENTS

Olga Boer[1,2], Miranda Lutz[1,2], Hanan El Marroun[1,2], Greg Hajcak[3], Ingmar Franken[1]
[1]University Medical Center Rotterdam, [2]Erasmus University Rotterdam, [3]Santa Clara University

Characterizing the dynamics and individual differences in neural markers of cognitive control is a key interest within the cognitive and clinical neurosciences. However, few studies have examined how these neural markers manifest during adolescence, and large population-based electroencephalographic (EEG) studies are scarce. This study aims to validate the N200, p300, error-related negativity and error positivity observed during a go/no-go task in a large sample (N = 2625, M_{age} = 18.4, age range 16-20). Preliminary results will be presented, including associations between child and family characteristics and ERP parameters. In addition, several practical considerations (e.g. the use of a low-density EEG set-up) as well as EEG preprocessing pipeline decisions will be discussed. This large-sampled study provides unique insights into task and sample characteristics of performance monitoring experiments, as well as indications for choosing covariates and confounders in adolescent EEG studies.

FUNDING: Stichting Volksbond, Rotterdam, the Netherlands.

GROWING MINDS IN MOTION: PRACTICAL CONSIDERATIONS FOR CONDUCTING FMRI WITH SCHOOL-AGE CHILDREN

Emilio Valadez[1], Nim Tottenham[2], Marta Korom[3], Alexandra Tabachnick[4], Daniel Pine[5], Mary Dozier[3]
[1]University of Maryland, [2]Columbia University, [3]University of Delaware, [4]Northwestern University, [5]National Institute of Mental Health

Brain functional magnetic resonance imaging (fMRI) research in children enhances our understanding of neural development and of factors that may influence neurodevelopmental trajectories. However, collecting high-quality fMRI data in younger populations raises unique challenges. Relative to adults, children are more likely to have difficulty avoiding motion artifacts, to experience scanner-related anxiety and scanner fatigue, and to misunderstand task instructions – often resulting in larger numbers of excluded participants than their older counterparts. In addition to these data collection challenges, analysis of children's fMRI data also requires special considerations. For example, reliance on adult brain templates and on the canonical hemodynamic response function used by most fMRI analysis software packages may bias developmental findings. This talk will present approaches to mitigate each of these challenges, using as an example a recent fMRI study examining the long-term neurodevelopmental effects of an infant parenting intervention.

FUNDING: This work was supported by the National Institute of Mental Health Award Numbers K23MH130751 (to E.A.V.), R01MH074374 (to M.D. and N.T.), R01MH091864 (to N.T.), and Intramural Research Program project ZIA MH002781 (to D.S.P.).

ADVANCING THE REPORTING OF DEVELOPMENTAL EEG DATA: TOOLS FOR ESTIMATING RELIABILITY, EFFECT SIZE, AND DATA QUALITY METRICS

Wenyi Xu[1], Alexa Monachino[1], Laurel Gabard-Durnam[2], Santiago Morales[1]
[1]University of Southern California, [2]Northeastern University

Children present unique challenges in EEG studies due to shorter recordings and increased artifacts. Therefore, it is crucial to develop tools that maximize data collection, improve reproducibility, and facilitate inclusion in large-scale longitudinal studies. Efforts have made strides in automating preprocessing, yet current developmental EEG studies often lack consistency in reporting reliability,

effect sizes, and data quality metrics. To address this gap, we developed a novel tool to estimate reliability, effect size, and data quality (e.g., standardized measurement error) in EEG data. The tool features user-friendly software along with bootstrapped estimates to guide decisions on trial numbers for the inclusion of participants and task optimization for future study designs. Our presentation will demonstrate this tool's utility for enhancing metric reporting in popular EEG pipelines. We will apply the tool to large, longitudinal datasets of infants and children, generating reliability, effect size, and data quality estimates in three commonly used paradigms: visual perception, face perception, and resting state. Overall, our efforts aim to improve the quantification and reporting of reliability, effect size, and data quality estimates to inform robust understanding of cognitive and affective processes in EEG studies, fostering higher standards of reliability and reproducibility in developmental neuroimaging research.
FUNDING: This work was supported, in whole or in part, by the Bill & Melinda Gates Foundation INV-047884 to LGD and SM.

SYMPOSIA III-3

FROM THE LAB TO THE REAL-WORLD: THE INTEGRATION OF EXPERIENCE SAMPLING IN AFFECTIVE PSYCHOPHYSIOLOGY

Chairs: Carola Dell'Acqua[1], Anna Weinberg[2]
[1]University of Padova; [2]McGill University

Laboratory studies have shown that neural measures of affective and reward processing, alterations in certain resting-state functional connectivity networks, and cardiovascular reactivity are linked with maladaptive social, affective, and cognitive functioning. However, the translation of these psychophysiological patterns into real-world affective experiences and behaviors is unexplored. This symposium addresses this gap by presenting studies that integrated laboratory-based psychophysiological measures with Ecological Momentary Assessment (EMA), a tool suitable for delving into the complexities of daily affective experiences and behaviors. First, C. Dell'Acqua will show that individuals with greater neural responses to social reward were more likely to experience positive affect when receiving social support. A. Heller will present data showing that individuals with higher hippocampal-NAc resting-state connectivity had greater positive affect on days characterized by increased experiential diversity. M. Schettino will present work demonstrating that specific patterns of network functionality predicted levels of daily anxiety and ruminative thinking. Finally, L. Bylsma will discuss a study aimed at linking laboratory parasympathetic activity (heart rate variability) and daily negative affect, negative emotional reactivity, and emotion regulation, highlighting the challenges of connecting lab and real-world data. Combined, we demonstrate that commonly used psychophysiological measures hold predictive value for real-world emotional states and behavior.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.12 Ecological Momentary Assessment (EMA), 3.6 Other (Laboratory experiments combined with Ecological Momentary Assessment (EMA) over several days), 4.7 Psychopathology, 4.23 Emotion/affect, 4.24 Social factors

LINKING SOCIAL REWARD RESPONSIVENESS AND AFFECTIVE RESPONSES TO THE SOCIAL ENVIRONMENT: AN ECOLOGICAL MOMENTARY ASSESSMENT STUDY

Carola Dell'Acqua[1], Grace Allison[2], Connie Yun[2], Anna Weinberg[2]
[1]University of Padova, [2]McGill University

Social support is a key predictor of well-being, but not everyone experiences mental health benefits from receiving it. However, given that a growing number of interventions are based on social support, it is crucial to identify features that make individuals more likely to benefit from social ties. Emerging evidence suggests that neural responses to positive social feedback (i.e., social reward) might relate to individual differences in social functioning, but potential mechanisms linking these neural responses to psychological outcomes are yet unclear. This study examined whether neural correlates of social reward processing, indexed by the reward positivity (RewP), relate to individuals' affective experience following self-reported real-world positive social support events. To this aim, 193 university students (71 % females) underwent an EEG assessment during the Island Getaway task and completed a 10-day ecological momentary assessment where participants reported their positive and negative affect (PA, NA) nine times a day and the count of daily positive and negative events. Experiencing a higher number of social support positive events was associated with higher PA. The RewP moderated this association, such that individuals with greater neural response to social feedback at baseline had a more positive association between social support positive events count and PA. Individual differences in the RewP to social feedback might be one indicator of the likelihood of experiencing positive affect when receiving social support.

FUNDING: C.D.A. was supported by a research training grant from the Society for Psychophysiological Research. A.W. was supported by the Research Chair (CRC) in Clinical Neuroscience and by the SSHRC Insight Development grant (430-2017-00386).

ASSOCIATION BETWEEN REAL-WORLD EXPERIENTIAL DIVERSITY AND POSITIVE AFFECT RELATES TO HIPPOCAMPAL-STRIATAL CONNECTIVITY

Aaron Heller
University of Miami

Preclinical work in rodents suggests that experiential diversity confers benefits for cognitive and affective function. Animals able to roam freely within "enriched" environments that offer diverse experiences exhibit greater affective well-being than those reared in standard laboratory environments. These enriched environments impact a network that includes the hippocampus and Nucleus Accumbens (NAc) – a circuit that assigns reward value to novelty. Yet, whether such associations are observed in humans is only beginning to be explored. Combining GPS tracking and EMA, we investigated the role that daily environmental exploration, operationalized as roaming entropy, has on positive and negative affect. We continuously tracked 132 people's GPS while assessing their positive affect. On days of heightened exploration, people reported increases in positive affect. We replicated this work in a separate developmental sample demonstrating that exploration is associated with positive affect across development. Moreover, using resting state fMRI, people for whom days of heightened exploration most benefited their emotion were those with the greatest hippocampal-NAc resting-state connectivity. Given the efficacy of behavioral activation as a treatment for depression, we have tested our work in individuals with depression. We find that depression linked to decreased levels of exploration but that people with depression experience affective benefits when they do explore. These findings suggest the possibility of optimizing behavioral treatments for internalizing disorders.

FUNDING: R21MH125311 R01MH133693.

THE ROLE OF LARGE-SCALE NETWORKS IN THE PREDICTION OF DAILY-LIFE OCCURRENCE OF REPETITIVE NEGATIVE THINKING SYMPTOMS

Martino Schettino[1,2,3], Rotem Dan[1], Chiara Parillo[4], Federico Giove[5], Antonio Napolitano[4], Cristina Ottaviani[2,6], Diego Pizzagalli[1]
[1]McLean Hospital & Harvard Medical School, [2]Sapienza University of Rome, [3]IRCCS Istituto delle Scienze Neurologiche di Bologna, [4]Bambino Gesù Children's Hospital, [5]IRCCS Santa Lucia Foundation, [6]IRCCS Santa Lucia Foundation

Abnormalities in the functioning of the default mode network (DMN), salience network, frontoparietal network and limbic network have been implicated in repetitive negative thinking (RNT), a symptom of persistent worry and rumination common to depression and anxiety disorders. However, the utility of these large-scale networks for predicting RNT symptoms during daily life has not yet been investigated. We applied graph-based predictive modeling (GPM), a novel data-driven machine learning approach using graph theory measures and cross-validation, to predict 2-day ecological momentary assessment (EMA) of RNT in a sample of 54 individuals with varying severity of generalized anxiety disorder (GAD) symptoms. Graph metrics were computed from two fMRI sessions: a resting-state and an RNT-induced state. We found that the GPM predicted EMA levels of anxiety from DMN's centrality (i.e., increased level of network information transfer) during resting and RNT states. Additionally, GPM predicted a composite score of EMA symptoms of RNT, namely levels of distraction, intrusiveness, repetitiveness and being stuck from limbic network's segregation (i.e., decreased level of network specialization) during RNT state. This study highlights the utility of using a brain-based graph approach to specifically predict the occurrence of RNT symptoms in daily life at the individual level. Current findings open the possibility of targeting functional network abnormalities emerging during states of RNT.

FUNDING: This work was supported by Sapienza University of Rome (AR223188B3133F0E; SIT-GLU: State-dependent effects of pathological Intrusive Thinking on GLUtamatergic neurometabolism within the ventral striatum: A proton magnetic spectroscopy study).

CHARACTERIZING ASSOCIATIONS BETWEEN LABORATORY AND DAILY LIFE EMOTIONAL REACTIVITY AND REGULATION WITH CARDIOVASCULAR PSYCHOPHYSIOLOGY AND SELF-REPORT IN A LARGE COMMUNITY SAMPLE

Lauren M. Bylsma[1], Xin Hu[1], David M. Fresco[2], Kristin Naragon-Gainey[3]
[1]University of Pittsburgh, [2]University of Michigan, [3]University of Western Australia

We examined emotional reactivity and regulation in the lab and in daily life with 10 days of ecological momentary assessment (EMA) and continuous monitoring of cardiovascular psychophysiology (using Movisens ECGMove4) in a community sample (N=264; aged 18-65 (74% female, Mage=37.2). In the laboratory, participants completed a 5-minute resting baseline followed by two 4-minute film conditions (a sad film and a neutral film) while cardiovascular psychophysiology was assessed using Mindware. For the EMA protocol, participants completed up to 4 daily event-triggered (triggered by physiological changes or self-initiated) and 4 random prompts rating their current negative affect. For event-triggered prompts, participants also reported self-reported distress of their most recent emotional episode and any emotion regulation strategies used. Multilevel models were used to examine associations between laboratory high frequency heart rate variability (HRV, an index of parasympathetic activity) and daily life negative affect and emotional reactivity (i.e., current negative affect controlling for negative affect at the prior timepoint). Contrary to expectations, neither baseline HRV or HRV reactivity (sad film vs. neutral) was significantly associated with daily life negative affect levels or negative reactivity (ts=.06-.85, ps=.33-.95), or use of specific emotion regulation strategies (ts=.06-1.63; ps=.10-.95). Results highlight the complexity and heterogeneity of associations between laboratory and daily life measures of affective processes.

FUNDING: NIMH (MH118218).

SYMPOSIA III-4

M/EEG CORRELATES OF EMOTIONAL RELEVANCE: PERCEPTUAL VERSUS PSYCHOLOGICAL CONTEXTUAL EFFECTS

Chairs: Sebastian Schindler[1], Roxane Itier[2]
[1]University of Münster; [2]University of Waterloo

Visual emotional stimuli, specifically emotionally expressive faces, are important communicative signals which processing seems prioritized, leading to distinct neural responses. However, factors that contextualize the relevance of emotional stimuli and impact their processing have been neglected. This symposium showcases findings from four Event-Related Potential (ERP) studies and one MEG study investigating multiple facets of context effects on visual emotion processing. These include stimulus presentation mode (size, duration, position), task type (goal relevant, distracting, dual-task), and participants' subjective relevance (arousal, valence). The first talk will present stimulus-duration effects in a concurrent target-distractor task, showing that stimulus offset after shorter durations leads to strong emotion differences. The second talk will address the effects of face size, a proxy for social distance, on expression differences, while the third will present the impact of face position and goal relevance on ERPs. The fourth talk will show the effects of concurrent load and dual tasks on face expression MEG activity and its underlying brain sources. Finally, we will close the symposium with a last talk highlighting the specific role of individual valence and arousal perception on emotion-related ERPs. Our syntheses will provide a comprehensive framework regarding how contextual relevance affects the neural processing of emotional stimuli and highlight the potential impact of different statistical tools like Mass Univariate and multivariate analyses.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.2 Myography (EMG etc.), 2.6 Eye Tracking (blink, movement, size), 3.3 Lab Based Experiment, 4.20 Attention, 4.23 Emotion/affect, 4.24 Social factors

ERPS EVOKED BY ABRUPT OFFSETS OF EMOTIONAL STIMULATION

Uxía Fernández-Folgueiras[1], Dominique Kessel[1], Fátima Álvarez[1], Germán Cipriani[2], Estrella Veiga-Zarza[1], Guzmán Alba[1], Luis Carretié[1]
[1]*Universidad Autonoma de Madrid,* [2]*University of Granada*

Previous data show an advantage of emotional visual stimuli to capture attention. Specifically, the abrupt *onset* of emotional visual stimuli evokes enhanced amplitudes of ERP components indexing exogenous attention and worse performance in concurrent but distinct target-distractor (CDTD) tasks. However, the potential effects elicited by the abrupt *offset* of emotional stimuli remain unexplored. Forty-four participants performed a CDTD task employing emotional (positive and negative) and neutral stimuli presented at three different presentation durations (125, 250, and 500 ms). A triphasic component consisting of positive-negative-positive polarity peaks appeared 60 ms after the stimulus offset in every duration and lasted for 200 ms. Mass Univariate Analysis revealed that this offset component was sensitive to emotional content in short and medium-duration exposures: its amplitude was greater for emotional than neutral stimuli in the former, and for positive than neutral stimuli in the latter. We hypothesize that this emotional effect on the offset potential of brief stimuli may reflect a reactivation of their sensory representation to complete their processing. Importantly, future studies should take into account that this emotion-sensitive offset component co-occurs and overlaps with other emotion-related components seen at similar latencies (P300 or LPP) for stimuli durations between 250 to 400 ms, potentially interfering with their characteristics and functional meaning.
FUNDING: MICINN/AEI (PID2021-124420NB-I00).

IMPACTS OF STIMULUS SIZE ON THE PERCEPTION OF ARTIFICIAL AND NATURAL EMOTIONAL EXPRESSIONS IN FACES: EVIDENCE FROM ERPS

Anne Schacht
University of Goettingen

Encountering an angry individual in close physical proximity can lead to a larger retinal representation of that individual, an enhanced resolution of emotional cues, and an increased motivation for rapid visual processing and action preparation. The study examined the impact of stimulus size on the perception of happy, angry, non-expressive, and scrambled faces. Event-related brain potentials (ERPs) and behavioural responses of 40 participants who performed a naturalness classification task on real and artificially created facial expressions, were analysed. The accuracy for recognizing authentic expressions was modulated by stimulus size, while ERPs showed only additive effects of stimulus size and emotional expression, with no significant interaction between the two. These findings contrast with previous research on emotional scenes and words. All ERPs included in the study showed effects of stimulus size, while emotional expressions affected the N170, EPN, and LPC, regardless of size. These findings imply that emotional valence can be decoded from faces even when presented in small size. Supra-additive effects in faces may necessitate larger size ranges or dynamic stimuli that increase arousal.
FUNDING: This research was supported by the Deutsche Forschungsgemeinschaft, Grant/Award Number: 254142454 /GRK 2070 and Project- ID 454648639/SFB 1528.

DISTINCT EFFECTS OF GOAL-RELEVANCE AND EMOTIONAL ATTENTION ON EARLY FACE PROCESSING

Gilles Pourtois, Xiaojuan Xue
Ghent University

Using 64-channel EEG in 40 healthy adult participants, we carefully analyzed the processing of peripheral fearful (vs. happy) faces used as cues in a dot probe task where they were either unattended or attended because of being directly task-relevant. The use of covert peripheral vision by the participants was confirmed using eye-tracking. Results showed that the structural encoding of the faces, as reflected by the N170 component, was stronger for fearful than happy faces, yet irrespective of task-relevance. Interestingly, following this early stage, a distinct ERP activity was identified by means of a multivariate analysis, which showed sustained emotional face processing when the face was task-relevant compared to when it was not, regardless of the valence of the face. These results suggest the existence of dissociable neurophysiological effects of emotional attention and goal relevance during face processing. Although the former one can influence early stages of face processing in an automatic manner, the latter one suggests that goal relevance can increase emotional processing generically during a later stage of processing. More generally, these results suggest that value (i.e. threat) and goal can influence face processing via different mechanisms and they are interpreted using the notion of an attentional priority map where these two components can each contribute to it.

SPATIOTEMPORAL AND OSCILLATORY SIGNATURES OF EMOTIONAL FACE PROCESSING AND WORKING MEMORY LOAD IN A DUAL TASK

Katharina Lingelbach[1,2], Jochem Rieger[1]
[1]*University Oldenburg,* [2]*Fraunhofer Institute for Industrial Engineering IAO*

Previous research has examined cognitive and affective processes separately, neglecting their potential interaction. Several recent studies have demonstrated the effects of working memory (WM) load on emotional face processing. However, simultaneous and sequential effects of different emotional expressions and load levels are still not fully understood. We conducted a MEG study (N=38) with a dual task alternating between facial emotion discrimination (happy, angry, neutral) and spatial n-back (1-, 2-back). We hypothesized that high load would reduce valence effects during face processing and angry faces would disrupt WM processes by occupying shared cognitive resources. We observed significant main effects of load and valence, but no interaction. Spatiotemporal clusters starting 190 ms after face onset revealed that angry faces elicited increased activation in prefrontal areas, the insula, the anterior cingulate cortex, and face-specific occipital regions during emotion discrimination. Insula activation was further correlated with later occipital reactivation, suggesting enhanced processing and salience for angry faces. Prefrontal control mechanisms were observed 400 ms after face onset, but only for angry compared to happy faces. During high load in the n-back task, alpha and beta power was reduced in parieto- and temporo-occipital brain regions and cingulate cortex, suggesting reduced WM processes but also reduced inhibition of distractors. Our findings revealed differences in processing modes but also available resources, when discriminating angry faces.
FUNDING: The research was supported by the Fraunhofer Gesellschaft with the scholarship »Fraunhofer TALENTA«, Ministry of Economic Affairs, Labour, and Tourism Baden-Wuerttemberg in the project »KI-Fortschrittszentrum Lernende Systeme und Kognitive Robotik«, and by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) under Germany's Excellence Strategy—EXC 2177/1—Project ID 390895286.

ARE ERP RESPONSES TO FACIAL EXPRESSION DRIVEN BY INDIVIDUAL PARTICIPANTS' PERCEIVED AROUSAL AND VALENCE?

Amie Durston, Roxane Itier
University of Waterloo

Decades of ERP research on the neural decoding of facial expressions have yielded inconsistent results. We investigated whether participants' perceived valence and arousal of facial expressions could drive ERP emotion differences and thus contribute to past inconsistencies. ERPs were recorded while 80 participants viewed faces expressing fear, anger, happiness, and no emotion, during a gender discrimination task. Participants then viewed each face again and rated them on arousal and valence using Likert scales. Ratings from each face were linked back to corresponding ERP data, trial by trial. ERPs were analyzed in a data-driven way (all time points, all electrodes) using mass univariate statistics. Paired contrasts between expressions were analyzed using three different hierarchical models: without (original) and with valence or arousal ratings. Results overlapped between models, although effects were more restricted in the models with ratings. Around the face-sensitive N170 component, Fear-Neutral differences related to valence, Happy-Angry differences related to arousal, and Fearful-Angry differences related to both ratings but at different time points. Around the EPN only Happy-Fearful differences related to valence and arousal. Overall, the extent to which participants' subjective perception of valence and arousal relates to their neural activity depends on the specific emotion contrast. We conclude that the subjective relevance (valence and arousal) of stimuli is a critical source of neural variability, likely contributing to inconsistent findings in the field.
FUNDING: Funding: This project is funded by a Discovery grant from the Canadian Natural Science and Engineering Research Council (NSERC) to RJI. AJD is supported by a CGS-M and an Ontario Graduate Scholarship (OGS).

Symposia III-5: SPECIAL SYMPOSIUM: IN YOUR SHOES: NEUROBIOLOGICAL MECHANISMS UNDERLYING BEHAVIORAL AND PHYSIOLOGICAL RESPONSES TO VICARIOUS STRESSFUL EXPERIENCES IN RODENTS

Chairs: Luca Carnevali[1], Susan Wood[2]
[1]*University of Parma;* [2]*University of South Carolina School of Medicine*

Stressful experiences can be transmitted among individuals through social interactions and affect the individual's

behavior and physiology beyond the daily stressors experienced firsthand. Like humans, rodents are social creatures whose behavior and physiology can be influenced by the emotional state of conspecifics. This symposium adopts a translational approach and leverages multidisciplinary techniques to uncover the neurobiological mechanisms underlying psychophysiological responses to vicarious stressful experiences in rodents. Dr. Barbetti will first present sex differences in the response to vicarious social stress, with females being more vulnerable to the development of anxiety-like behaviors and males being more vulnerable to cardiovascular impairment. Dr. Smiley will then illustrate that the emergence of an anxiety-like behavioral phenotype during vicarious social stress in females is driven by neuroinflammatory mechanisms within the LC-norepinephrine system. Dr. Michon will reveal specific hippocampal neuronal activation during the vicarious experience of distress in fellow rodents and its association with freezing responses in observers during context re-exposure. Dr. Ben-Ami Bartal will conclude that prosocial behaviors meant to help other rodents in distress have positive effects on the behavior and physiology of helpers. This symposium aims to deliver the message that studies in rodents can inform our translational understanding of the way different psychophysiological responses to vicarious emotional experiences may impact the well-being of observers.

Topics: 1.7 Animal Studies (e.g., rodent models), 2.3 Cardio (HR, HRV, LVET, PEP), 2.5 Hemodynamic (BP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.3 Sex differences, 4.10 Stress, 4.23 Emotion/affect

SEX DIFFERENCES IN THE BEHAVIORAL AND CARDIOVASCULAR CONSEQUENCES OF VICARIOUS SOCIAL STRESS IN RATS

Margherita Barbetti, Monia Savi, Andrea Sgoifo, Luca Carnevali
University of Parma

Social stress encompasses an interactive interpersonal process capable of impacting those nearby. The vicarious experience of stress can have detrimental effect both on cardiovascular and mental health. In this study, we employed a rodent model of "witness social stress" to explore potential sex disparities in the behavioral and cardiovascular consequences of vicarious social stress exposure. Adult male and female rats bore witness to the social defeat bout of a male conspecific from the safety of an adjacent compartment within the cage of an aggressive male rat for nine consecutive days. Behavioral and cardiovascular responses of witness rats were recorded during the first and last stress exposure, while arrhythmias susceptibility, cardiac contractile function and corticosterone levels were assessed at the conclusion of the stress protocol. Our findings reveal that the vicarious experience of social defeat stress induces greater amounts of anxiety-like behaviors (e.g., burying behavior) and higher corticosterone levels in females compared to males. Accordingly, when re-exposed to the stress-context alone, females exhibit greater anxiety-like behaviors than male counterparts. Conversely, male witnesses exhibit a larger susceptibility to pharmacologically induced arrhythmias and a more severe impairment in myocardial performance than female witnesses. This study unveils sex-specific behavioral and cardiovascular responses to vicarious social stress, which can inform our translational understanding of stress-related vulnerabilities in both sexes.

FUNDING: Work supported by #NEXTGENERATIONEU (NGEU) and funded by the Ministry of University and Research (MUR), National Recovery and Resilience Plan (NRRP), project MNESYS (PE0000006) – A Multiscale integrated approach to the study of the nervous system in health and disease (DN. 1553 11.10.2022)

NEUROIMMUNE TARGETS REGULATING A HYPERVIGILANT PHENOTYPE IN FEMALES

Cora Smiley, Susan Wood, Samantha Bouknight, Brittany Pate, Hunter Bielicki, Evelynn Harrington, Lawrence Reagan, Aaron Jasnow
University of South Carolina School of Medicine

Stress-related disorders such as post-traumatic stress disorder are prevalent and disproportionately affect females. Heightened neuroimmune signaling in response to stress may be a mechanistic factor underlying this behavioral dysfunction. Previous studies in our lab determined that vicarious witness stress (WS) led to a hypervigilant phenotype characterized by enhanced burying behaviors, and acoustic startle. Notably, WS resulted in accumulation of IL-1b in the LC-norepinephrine (NE) system of females, promoting LC-NE hyperactivity. The current studies determined if increased neuroimmune signaling elicited WS-evoked behavioral dysfunction. These studies tested two approaches, intra-LC administration of IL-1 receptor antagonist (IL-1ra), or a chemogenetic DREADDs techniques with a virus engineered to target microglia (AAV-CD68-Gi) to evaluate the functional and behavioral impact of neuroimmune activity within the LC during WS exposure on subsequent hypervigilance-related outcomes. These studies concluded that IL-1 receptor inhibition and microglial inhibition prevents the emergence

of the hypervigilant behaviors during stress, in response to the stress context and acoustic startle. Additionally, the DREADD-mediated inhibition of microglial cells was confirmed to suppress neuronal activity of NE cells in the LC. In all, these experiments identified that stress-evoked LC microglial activation is a key factor mediating hypervigilant behavior in females and may provide a novel treatment target for the prevention of stress-related pathologies.
FUNDING: MH113892, BX005661, BX002664.

HIPPOCAMPAL RESPONSES ASSOCIATED TO CONTEXTUAL FEAR LEARNING BY OBSERVATION

Frédéric Michon, Valeria Gazzola, Christian Keysers
Social Brain Lab, Netherlands Institute for Neuroscience

In the wild, learning to avoid dangerous situations by witnessing the misfortunes of others without first-hand harm increases chances of survival. Despite existing knowledge on the neuronal basis of memory for our own experiences and how our brain maps the emotions of others, the combination of these two fields –how observing what happens to others is integrated into our own memory system and changes our representations of the world- remains largely unexplored. The dorsoventral hippocampal network is critical for learning from our own experiences and their context and is ideally situated to support socially-acquired threat memory processes. To investigate the contribution of the dorsoventral hippocampal network to socially-acquired fear memory, we took advantage of the ~1mm long shaft of the Neuropixels probe to simultaneously record from both the dorsal and ventral hippocampus of rats while they learn and remember socially-acquired contextual fear. In this paradigm, an observer is exposed to two contexts. In one of them, it witnesses a demonstrator receive electrical shocks. After 1h, the observer is placed again in the two contexts to assess memory recall. Here, we will present data showing that observers animal freeze more in the shock than safe context during this memory test, suggesting they remember its association with threat. We will also present preliminary results for the hippocampal neuronal responses associated with footshock observation and memory processing in this paradigm.

NEUROBIOLOGICAL MECHANISMS UNDERLYING MODULATION OF HEALTH AND WELL-BEING BY PROSOCIAL BEHAVIOR

Inbal Ben-Ami Bartal
University of Tel-Aviv

The social environment has a pivotal role in maintaining well-being for humans as well as other social species where individuals rely on conspecifics for survival and thriving. Prosocial acts meant to improve the well-being of others in distress are an integral part of life in social groups and have been observed in many species. We aim to investigate how neural mechanisms that underlie prosocial behavior may explain its benefits to well-being, which have been reported in helpers as well as receivers of prosocial support. In a helping behavior test (HBT), rats may release a conspecific trapped inside a restrainer by opening the door from the outside. Using the immediate early gene c-Fos, we identified a "prosocial" neural network, which is active in response to a trapped conspecific and associated with helping. The prosocial network includes sensory regions, areas associated with empathy in humans (mPFC, anterior insula and cingulate cortices) and regions associated with reward and motivation. The effects of daily helping over a sustained period were examined in pair-housed and socially isolated rats and correlated with immune system indices. In line with existing literature, isolation had detrimental effects on health, as well as changes in oxytocin receptor expression in key regions of the prosocial network. Isolated rats showed increased motivation to release trapped conspecifics. We conclude that prosocial behavior should be investigated as a possible intervention to protect against social isolation impacts on health and well-being.

SYMPOSIA IV-1

EXPLORING INTEROCEPTION: MULTIFACETED INSIGHTS INTO EVERYDAY LIFE, STRESS, DISEASES AND INTERVENTIONS

Chair: Olga Pollatos
Ulm University

Interoception, the ability to process and integrate bodily signals, holds profound implications for emotional experience, physiological processes, and mental health. As interoception continues to gain significance across various fields of research, our symposium serves as a nexus for a diverse array of perspectives. We embark on a comprehensive exploration of interoception, traversing from

controlled and experimental laboratory settings to the assessment of interoceptive experiences in everyday life. Our symposium transcends disciplinary boundaries, encompassing investigations across diverse populations, investigating interoceptive processes in both healthy individuals and those with clinical conditions. Delving into the interconnected nature of interoception, we unveil cutting-edge research on predictors of and metacognitive insights into interoceptive abilities. Moreover, we present empirical data on the link of interoception with emotional experience and dysfunctional breathing, as well as its implications for chronic pain, and for stress-related psychological disorders. Furthermore, this symposium examines the efficacy of interoception-based clinical interventions, alongside interventions aimed at enhancing interoceptive abilities. With this broad presentation of findings regarding predictors, links and aspects influenced by interoception, spanning self-reported, behavioral, physiological and neurological domains, we offer a multfaceted approach to current advances in interoception research. Implications and future research avenues will be discussed.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.12 Ecological Momentary Assessment (EMA), 3.3 Lab Based Experiment, 4.9 Pain, 4.10 Stress, 4.23 Emotion/affect

PREDICTING FLUCTUATIONS IN CARDIAC INTEROCEPTIVE ACCURACY AND SENSIBILITY THROUGH ADDITIONAL HEART RATE VARIABILITY REDUCTIONS (ADDHRVR) IN EVERYDAY LIFE

Christian Rominger, Andreas Schwerdtfeger
University of Graz

Cardiac interoception, assessed in terms of accuracy (IAcc) and sensibility (IS; beside others), is important for health and wellbeing. Situations with reduced interoceptive abilities might indicate increased vulnerability (i.e., impaired self-regulatory skills), asking for just-in-time adaptive interventions (JITAIs). Ecological momentary assessment studies exploring the dynamics of cardiac interoception showed substantial fluctuations of IAcc and IS in everyday life. This research indicated that states of increased (physiological) stress, such as decreased heart rate variability (HRV), might hamper interoceptive skills, while more relaxed states might increase interoception. We built on this and investigated if HRV reductions independent from metabolic needs (i.e., additional HRV reduction, AddHRVr) and therefore, most likely linked to (physiological) stress, can predict IAcc and IS. In a sample of more than 120 participants, with data of three consecutive days, we simulated the predictive value of different AddHRVr algorithm settings. Poor IAcc and IS could be predicted by specific algorithm settings. This finding suggests a link between physiological markers of psychological states and interoceptive abilities, which awaits replication. Nevertheless, this study provides first insights how to predict episodes of compromised interoception using physiologically well-informed algorithms, which can easily run on widely used wearables. This is a fundament to develop JITAIs advancing personalized health interventions to support people in states of high vulnerability.

INTEROCEPTION IN ACUTE STRESS AND STRESS-ASSOCIATED DISEASES

André Schulz
University of Luxembourg

The interaction between interoception and stress can be construed as bi-directional communication between the brain and the body. The current study set aimed to: 1) Understand the bi-directional communication between the brain and the body in a healthy state and 2) reveal the potential role of dysregulated brain-body communication in stress-associated diseases. To address these aims, different stages of interoceptive signal processing, as well as their interpretation, were studied. Specific attention is paid to the activity of both physiological stress axes, the hypothalamic-pituitary-adrenocortical (HPA) and the sympatho-adreno-medullary (SAM) axis. First, a number of studies applying laboratory stress tests and pharmacological designs showed that an activation of the SAM axis stimulates the cardiovascular system and affects attentional resources for interoceptive signals. Second, cortisol amplifies brain-body communication on the stage of cortical CNS representation of interoceptive signals. A number of mental disorders are characterized by a specific pattern of dysregulation with regard to interoception and physiological stress axes, which may account for the heterogeneity of somatic symptoms associated with these diseases. Third, the course of chronic diseases can be predicted by indicators of interoception. These findings, as well as studies showing a reduction of somatic symptom distress after an interoceptive training, suggest that normalizing bi-directional brain-body communication may help to improve mental and physical health in stress-associated diseases.

INTERRELATIONSHIPS BETWEEN EMOTIONS, INTEROCEPTION, DYSFUNCTIONAL BREATHING AND SYMPTOMS IN CHRONIC PAIN

Elke Vlemincx[1,2], Raymond Ostelo[1,2]
[1]*Vrije Universiteit Amsterdam,* [2]*Amsterdam University Medical Center*

Research has established important relationships between emotions, interoception and symptoms in chronic disease. However, it is not clear what the role of dysfunctional breathing is these relationships. Dysfunctional breathing is both cause and consequence of emotions, related to interoception, and symptoms of dysfunctional breathing often largely overlap with disease-specific symptoms in chronic disease. This way, emotions, possibly via increased interoception, may increase dysfunctional breathing, and via dysfunctional breathing enhance perception of symptoms. The goal of the current study is to study the role of interoception and dysfunctional breathing symptoms as mediators in the associations between emotions and symptoms in chronic pain. In a cross-sectional study, stress, anxiety, depression, interoception, dysfunctional breathing symptoms and pain were measured by means of self-report measures via a crowdsourcing platform in 80 participants reporting chronic pain. Mediation analyses supported indirect relationships of stress and depression predicting pain via increased perception of bodily signals predicting more dysfunctional breathing symptoms. The current results demonstrate significant relationships between emotions, interoception, dysfunctional breathing and symptoms in chronic pain. The present findings are merely cross-sectional, and based on self-report in small samples, but warrant further research investigating the role of dysfunctional breathing in chronic disease.

EMBODIED EMOTIONS: ON THE EMPIRICAL AND NEURAL CONNECTION OF INTEROCEPTIVE ABILITIES AND EMOTIONAL PROCESSING

Jasmin Schultze, Miriam Kipping, Thomas Kammer, Georg Grön, Olga Pollatos
Ulm University

Interoception, or the ability to process and integrate bodily signals, plays a pivotal role in both psychological and physiological domains, including mental health. Emotion theories and empirical findings alike support a close link with emotion processing, emphasized by hypothesized underlying neural networks responsible for both. We engaged 55 healthy adults in a battery of behavioral tasks targeting interoceptive abilities (i.e. Heartbeat Detection Task) and emotional perception (rating of emotional pictures) with $n = 55$ healthy adults. $n = 36$ undervent an anodal HD-tDCS paradigm aiming to enhance interoceptive and emotional processing. Further, fMRI data during interoceptive and emotional tasks was collected in part of the study population to explore potential network structures for interoceptive and emotional processes. Preliminary results regarding behavioral tasks indicate no strong correlations between interoceptive abilities and emotional perception in our sample. However, a connection of HD-tDCS-induced changes in cardiac interoceptive accuracy and in valence rating of neutral pictures ($r = .40$, $p = .02$) was observed. This talk on our range of empirical work provides insights into the multifaceted link between interoception and emotion. Implications of these results regarding further neuromodulation research and clinical interventions will be discussed.

INTEROCEPTIVE TRAINING: THE PATH FROM PROOF-OF-CONCEPT STUDIES, VIA CLINICAL TRIALS, TOWARD CLINICAL IMPLEMENTATION

Hugo Critchley[1], Jessica Exxles[1], Sarah Garfinkel[2], Lisa Quadt[1]
[1]*University of Sussex,* [2]*University College London*

The timing and strength of each heartbeat is presented in the brain, influencing emotional states via interoceptive representations. Here, anxiety is related to "unexpected" physiological arousal. Interoceptive surprise, measured by subjective-objective discrepancy in an interoceptive accuracy measure, predicts anxiety symptoms and is thus targeted by "Align Dimensions of Interoceptive Experience" (ADIE) therapy, aimed to mitigate anxiety. A developmental study in a nonclinical group validated ADIE therapy. A subsequent randomised controlled clinical trial of ADIE therapy was conducted in a population of autistic adults at greater vulnerability to anxiety (N=120). This led to a feasibility trial in a different clinical group (ADAPT) of ADIE therapy delivered on a digital platform with remote therapist guidance. The proof of concept study confirmed efficacy of ADIE. The ADIE trial in autistic adults showed clinical superiority of ADIE therapy to an active 'exteroceptive' emotional therapy, improving trait anxiety. In ADAPT, the digital delivery of ADIE therapy at home in anxious people with physical health issues confirmed feasibility and efficacy equivalent to Emotion-focused Supportive Therapy, and informed further development of the digital platform for ADIE delivery

to increase accessibility and inclusivity. The further application of this new interoceptive therapy and the development of the digital platform (HeartRater:Clinical) as an accessible clinical tool for the treatment of anxiety symptoms in vulnerable groups is discussed.

SYMPOSIA IV-2

MEASURE FOR MEASURE: COMPARATIVE UTILITY OF HEART RATE VARIABILITY INDICES OF CARDIAC VAGAL CONTROL

Chairs: Bruce Friedman[1], Jared McGinley[2]
[1]*Virginia Tech;* [2]*Towson University*

Discussant: Mustafa al'Absi, University of Minnesota

Heart rate variability (HRV) analysis, used as an index of cardiac vagal control, has been an important topic of investigation in psychophysiology for over four decades. In particular, HRV quantification issues as well as the use of HRV as a clinical biomarker have been prominent subjects in the HRV literature. In this symposium, we present four studies that, collectively, compared common HRV indices in the contexts of quantification procedures and their relative value as predictive biomarkers of psychological and physiological health. Jarczok et al. report on the beneficial effects of a slow-paced breathing, an intervention known to stimulate vagal fibers, on various HRV indices in a sample of pneumonia patients. Moretta & Buodo describe a study which indicates that among different HRV measures, root mean square of successive beat-to-beat interval differences (rMSSD) showed the most diagnostic utility for alcohol use disorder in a young adult sample. Watanabe et al identify rMSSD cutpoints for increased clinical and subclinical depression risk in a large sample, supporting the utility of rMSSD for early detection of depression risk. Finally, Schmausser & Koenig compare the preprocessing effects of two common automated toolboxes (Python & MATLAB) for HRV extraction from raw ECG data on high frequency HRV and rMSSD, two widely used HRV indices of cardiac vagal control. Together, these studies indicate that the various common HRV indices show differential sensitivity to quantification protocols as well as in their predictive validity for psychophysiological health outcomes.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 3.6 Other (Multiple methods across the studies), 4.5 Population-specific health, 4.7 Psychopathology, 4.26 Other

EXAMINATION OF THE EFFECT OF A SLOW-PACED BREATHING INTERVENTION IN HOSPITALIZED COVID-19-PNEUMONIA PATIENTS - SECONDARY RESULTS FROM A CLINICAL RANDOMIZED CONTROLLED TRIAL

Marc Jarczok[1], Beate Grüner[1], Sophia Haase[1], Mandakini Kaw-Geppert[1], Julian Thayer[2], Harald Gündel[1], Elisabeth Balint[3]
[1]*Ulm University,* [2]*University of Califonia Irvine,* [3]*Privatklinik Meiringen*

Slow-paced breathing (SPB) is a long-known, noninvasive, and inexpensive method to stimulate vagal fibers known to directly decrease heart rate (HR) and increase indicators of HR variability (HRV). The aim of the present analysis is to investigate the direct effects of SPB in C19-pneumonia patients on commonly used HRV. Patients from the BeatCOVID RCT intervention group (DRKS00023971) wore bidaily holter monitors (Faros 180) during 5min-rest, 4x5min SPB, and 5min recovery, processed in Kubios for HRV calculation. SPB effect on HRV-parameters were analyzed using multilevel fixed-effect linear regression models. N=22 patients (age 58±12; 59% male) with n=361 recordings (mean= 16, range 4-32) were available. Compared to rest, Total Power, LF, and SDNN increased significantly, but not HF and RMSSD. Recovery did not differ from rest. HRV-indicators increased over time (reflecting convalescence) but phase difference was unchanged, indicating immediate effects of SPB on HRV independent of course of disease (all LR-chi^2 (df2) ≤0.46; all p≥0.8). SPB effects on HRV remained independent of relevant comorbidities (no vs. yes; all LR-chi^2 (df2) ≤1.73; all p≥0.42), C-19 medication (count; all LR-chi^2 (df2) ≤5.35; all p≥0.07), sex (all LR-chi^2 (df2) ≤3.74; all p≥0.16), and ECG-derived breathing frequency (all LR-chi^2 (df2) ≤4.13; all p≥0.13). SPB is feasible and safe in patients with bilateral C19 pneumonia and appears to be an effective self-performed intervention to immediately increase HRV measures, independent of course of disease, comorbidities, comedication and breathing rate at rest.

A BAYESIAN APPROACH FOR ANALYZING THE RELATIONSHIP BETWEEN ALCOHOL USE DISORDER, HEART RATE VARIABILITY, AND IMPULSIVITY IN YOUNG ADULTS

Tania Moretta, Giulia Buodo
University of Padova

Executive impairment in Alcohol Use Disorder (AUD) reflects dysfunctional fronto-striatal connectivity

underlying inhibitory control and goal-directed behavior. Given its association with these processes, Heart Rate Variability (HRV) has been proposed as a candidate diagnostic biomarker of AUD. However, despite findings on reduced HRV in AUD, the adopted HRV indices are heterogeneous among studies, and the overall results are inconsistent. Given its clinical relevance, especially for the early identification of AUD in youth, the current study assessed the association between AUD severity and time- and frequency-domain indices of HRV. Moreover, given the importance of impulsivity as a significant risk factor for AUD and a potential confound in the HRV-AUD association, its role was also assessed. AUD severity and impulsivity were assessed in 82 Italian young adults. The electrocardiogram was recorded for 5 minutes in resting state and time- and frequency domain indices of HRV were computed. Bayesian analyses revealed that only the root mean square of successive beat-to-beat interval differences (rMSSD) and the High-Frequency Power HRV (HF-HRV) showed marginal posterior inclusion probabilities > 0.5. More severe AUD was inversely associated with rMSSD and HF-HRV, with the rMSSD effect showing less uncertainty. Moreover, motor impulsivity was positively associated with AUD severity. Overall, our results support reduced vagal activity, as indexed by rMSSD, and motor impulsivity to be risk and maintaining factors of AUD. Clinical implications will be discussed.

EVALUATION OF AUTOMATED TOOLBOXES FOR HRV EXTRACTION FROM RAW ECG DATA: A COMPARATIVE ANALYSIS

Maximilian Schmausser, Julian Koenig
University Hospital Cologne

In mental health and psychophysiological research, the prevailing approach to extract HRV measures from far ECG data is the application of a file-by-file approach using commercial processing software (e.g., Kubios). Since this approach is relatively time consuming, especially when applied to large datasets, recent advancements in code-based analysis tools for bio-signals have gained increasing importance as they enable the fully automated processing of large raw ECG datasets. However, since processing steps such as peak detection and artifact removal within such fully automated processing pipelines partly employ varying mathematical algorithms and do not allow manual corrections, the question arises whether they produce reliable, valid, and comparable results. In this study, we extracted two measures for vagally mediated HRV (RMSSD & HF-HRV) from raw ECG data from a subset of the UK Biobank (n = 7908) using different code based (Python & MATLAB) toolboxes. To analyze the effect of the different toolboxes on both HRV measures, we employed multiple linear mixed models, correlational analyses, and frequency analyses of non-physiological and statistical outliers produced by the respective toolboxes. Preliminary findings indicate that: 1) different toolboxes produce significantly different HRV values when applied on the same raw ECG data and 2) that these differences seem to be more pronounced in HF-HRV compared to RMSSD. Our results underscore the need for careful consideration when selecting automated processing tools for HRV analysis in research and clinical settings.

EVALUATION OF LOW VAGALLY-MEDIATED HEART RATE VARIABILITY AS AN EARLY MARKER OF DEPRESSION RISK

Darcianne Watanabe[1], Marc Jarczok[2], DeWayne Williams[1], Julian Koenig[3], Julian Thayer[1]
[1]*University of Califonia Irvine,* [2]*Ulm University,* [3]*University Hospital Cologne*

Cross-sectional and prospective studies have shown depression is associated with low vagally-mediated heart rate variability (HRV); both are risk factors for cardiovascular disease (CVD). We recently identified an HRV cutpoint below which persons have an increased risk for several cardiometabolic disorders. However, no cutpoint exists to identify those at risk for depression. This study examines the association between HRV and the clinically valid five-item World Health Organization Well-being Index (WHO-5), which has been validated against other widely used depression scales. It identifies an HRV cutpoint for individuals at greater risk for depression (n = 9973, M_{age} = 41.9(10.9), 19.39% females). Multiple regression adjusting for age, sex, and linear trend showed a significant quadratic association between depression, indexed by WHO-5 scores and HRV, indexed by the root mean square successive differences (RMSSD) in milliseconds (ms), which filters out low-frequency variability (primarily sympathetic influences). Logistic regression models were calculated to compare the clinically (WHO-5 ≤ 28) and subclinically (WHO-5 ≤ 50) depressed to the rest of the population. Odds ratios suggested two RMSSD values (±2ms) that may be used to identify those with an elevated risk for clinical (OR = 1.39, 95%CI [1.17, 1.64] and subclinical depression (OR = 1.17, 95%CI [1.02, 1.34]. As HRV is a brief measure that can be used in clinical settings, our results have implications for the early detection of those at risk for psychological and cardiometabolic disorders.

SYMPOSIA IV-3

PHYSIOLOGICAL COMMUNICATION DURING SOCIAL INTERACTIONS

Chair: Chen Erez
Bar-Ilan University

Physiological processes related to, and resulting from emotional experiences are at the core of human interactions. When we see others sigh, watch their chest rise, this provides information regarding their emotional and mental state. Moreover, people's sensitivity to such information sets the stage for interpersonal synchronization of physiological activities, an evolutionary-based, alignment mechanism facilitating bonding. While an established field, we are constantly learning about the role of synchrony, especially in group interactions. In this symposium, we present studies examining our sensitivity to others' physiological operations, their relevance to central emotional states, and the antecedents and effects of physiological synchrony. Lomoriello reveals who can discern others' heartbeat from observation and under what conditions. Ravreby shows that machine learning tools can differentiate between specific emotions and between sympathetic and parasympathetic functions by analyzing breathing patterns. Erez discusses the importance of linear and nonlinear team heartrate synchrony to the functioning of groups with emotionally regulated and dysregulated members. Massaro shows team HRV synchrony's role in the functioning of varsity teams as a mediating factor between need-supportive leadership and athlete engagement. Goldstein shows that people's neurological alignment recorded via MEG while listening to a speech is affected by their induced preconceptions about the speaker. We provide new techniques and a nuanced understanding of psychophysiological social exchanges.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 3.3 Lab Based Experiment, 4.14 Unconscious processes, 4.23 Emotion/affect, 4.24 Social factors

THE ROLE OF INTEROCEPTION IN INFERRING OTHERS' PHYSIOLOGICAL STATES FROM VISUAL CUES

Arianna Lomoriello, Ivana Konvalinka
Denmark Technical University

Since emotional experiences are intertwined with visceral or interoceptive bodily states, accurate inference of others' physiological states can provide insight into their emotional state. Yet, the degree to which people can infer these from visual cues remains uncertain. Evidence suggests people can identify the likely owner of a sequence of heartbeats better than chance based on visual cues, raising questions about the underlying self-other mechanisms. We explored if the ability depends on one's own interoceptive abilities, assessed using two interoception tasks. We designed a two-alternative forced-choice task in which people had to guess the owner of a set of heartbeats by watching videos showing people side-by-side in from a frontal or back perspective, and visual feedback of the heartbeats of one of the person in the center. Results supported earlier findings, indicating that the likely owner of the heartbeats was identified above chance. Accuracy was higher in the back condition, suggesting a potential information overload from facial cues in the frontal condition and indicating that lower-level physical features, such as body movements, may drive the success rate in the back condition. Higher interoceptive abilities were correlated with better performance, but only in the frontal condition, when more complex information was available from the other person. These results suggest that one's interoceptive skills influence the inference of others' states in situations with potential confounding signals, which are presumably integrated with the information about others.
FUNDING: Carlsberg Semper Ardens Accelerate Grant.

INTERNAL EMOTIONAL EXPERIENCES READOUT FROM RESPIRATORY TRACE

Inbal Ravreby[1,2], Meyrav Weiss[3], Hila Man[4], Yaara Yeshurun[4], Noam Sobel[2]
[1]Cornell University, [2]Weizmann Institute of Science, [3]Mansfield College University of Oxford, [4]Tel-Aviv University

Breathing patterns carry rich emotional information. For example, when someone is under threat or stress, it manifests through fast breathing and when someone is relaxed it manifests through deep slow breathing. Previous studies were able to classify different externally induced emotions through individual breathing patterns. However, it remains unknown whether self-generated emotional experiences, which are purely intrinsic, are reflected in breathing patterns. To test this, using a spirometer, we recorded airflow from each nostril of 61 participants. Each participant was instructed to self-generate one of six emotions in each trial: calmness, empathy, safety, anger, fear, and pleasure. This was done across three rounds of emotion-evoking prompts. We chose these six emotions to have three SNS and three PNS emotional states, in order to

also address the role of autonomic tone. Multiple breathing parameters demonstrated significant differences between SNS and PNS emotions as well as between the six tested emotions. Using machine learning tools, we could successfully classify emotions as either associated with the SNS or the PNS. We also successfully classified the six specific emotions, demonstrating a robust connection between self-generated emotions and breathing patterns. The results indicate that even internally generated emotions, without external stimuli, are manifested through distinct respiratory patterns.
FUNDING: This research was supported by the Israel Science Foundation (Grant No. 2434/19) and the Ariane de Rothschild Women's Doctoral Program.

IS TEAM SYCHRONY IMPORTANT TO TEAM OUTCOMES? DEPENDS ON WHICH, FOR WHOM, AND FOR WHAT PURPOSE

Chen Erez[1], Ilanit Gordon[1,2]
[1]*Bar-Ilan University,* [2]*Yale University*

Physiological interpersonal synchrony, the temporal coupling of physiological time-series between partners, is considered essential for bonding. While extensively studied in dyads, the role of team physiological synchrony (TPS) in social and goal-oriented team outcomes, particularly while managing negative affect, remains underexplored. Heart rate synchrony is particularly relevant for its key role in stress regulation and affiliation. We examined the impact of TPS on team cohesion and performance in adult triads completing a high-interdependence word assembly task before and after watching an emotionally evoking scene. We employed a multiverse approach to explore TPS assessment via a linear dyad-centered method and a nonlinear systems approach. Comparing triads comprising 2 members with low emotional regulation (ER) (n=27) to triads with no low ER members (n=29), we hypothesized that the latter group would show higher TPS, cohesion, and performance improvements, with TPS mediating this relationship. We also explored the outcomes of TPS calculated in different methods. Lastly, we assessed how team composition moderated our results. We provide initial results indicating mainly that Linear TPS was crucial for low ER teams' cohesion, while nonlinear TPS was central only for high ER teams' performances. Also, increases in linear and nonlinear TPS during later courses of the interaction predicted high ER teams' performance. We discuss the complex interactions between individual differences and physiological coordination in shaping team outcomes.
FUNDING: Israel Science Foundation.

LEADING THE RHYTHM: INVESTIGATING NEED SUPPORTIVE LEADERSHIP

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Research has increasingly focused on Heart Rate Variability (HRV) to explore the link between the autonomic nervous system and organizational behavior. This study extends this by examining HRV's role in understanding team dynamics, particularly team synchrony and its connection to need-supportive leadership. Need-supportive leadership, grounded in self-determination theory, fosters intrinsic motivation and interpersonal security. This research investigates whether such leadership promotes team engagement by influencing synchrony, measured via HRV entropy. Using a sample of varsity athletes from a Canadian university, data was collected during training sessions with HRV monitoring. Team synchrony was assessed using HRV entropy, and need-supportive leadership and engagement were measured through surveys. Results indicate that need-supportive leadership negatively predicts HRV entropy and engagement, with synchrony mediating this relationship. This suggests that synchrony partly explains the link between need-supportive leadership and engagement. Thus, HRV entropy emerges as a useful variable for capturing team synchrony in newly formed teams. This study contributes to theory by highlighting the role of synchrony in the leadership-engagement relationship and offers practical insights for interventions in competitive environments.
FUNDING: Fonds de recherche du Québec – Société Culture and the Fonds National du Luxembourg.

FACTORS AFFECTING AUDIENCE ALIGNMENT IN MEDIATED COMMUNICATION

Avi Goldstein, Barak Atia
Bar-Ilan University

Good communicators are able to align the audience to their behavior and thoughts, increasing the synchrony in behavior and brain activity between the members of the audience. Speaker charisma and delivery style are key to alignment, but factors outside the speaker, such as prior attitudes of the audience or the feeling of being in a crowd may also affect alignment. The effects of these factors were tested in a series of experiments measuring inter-subject correlations (ISC) in MEG recordings while participants watched video clips of professional actors delivering a speech. Audience attitude was manipulated by providing negative or positive information about the

speaker prior to viewing a video clip of a speech. A positive attitude towards the speaker resulted in greater ISC in several brain regions, mainly superior temporal and inferior frontal, as well as parietal regions. Effects were greatest in beta-band frequencies in the right hemisphere, but also appeared in alpha and theta bilaterally. Areas showing higher ISC in participants with a positive attitude included regions of the alignment and persuasion networks. Visual cues of audience presence also increased inter-brain synchrony but only in the beta band and were confined to left-hemisphere inferior frontal and anterior insula, indicating more engagement with the linguistic aspects of the speech. Our findings show that M/EEG ISC is a valuable tool to investigate how audience characteristics can help or hinder the alignment towards a charismatic speaker.

SYMPOSIA IV-4

FOUR ATTEMPTS TO OVERCOME THE CHASM BETWEEN SELF-REPORT MEASURES OF NEGATIVE AFFECT AND NEUROSCIENCE

Chair: Annmarie MacNamara
Texas A&M University

Knowing the brain basis of individual differences in negative-affect related traits (NARTs) could help reduce human suffering. Yet despite this laudable aim, it is difficult to find associations that account for substantial variance in NARTs or are replicable. Here, we discuss reasons and paths forward, in the context of four studies that have assessed these associations. Claudia Becker will present work in an internalizing sample showing that individuals with greater elaborated error-processing (Pe) at baseline were more likely to show increased avoidance one year later, particularly if they also had reductions in early error-processing (ERN) over this time. Kaylin Hill will report on k-cluster means analysis in a sample of depressed/at-risk adolescents, showing that individuals with both blunted reward (RewPs) and reduced emotional (LPP) processing were characterized by greater depression. Stewart Shankman will report on how increased synchrony between siblings' loss-related theta is associated with greater depression and reports of worse childhood sibling relationships. Julia Klawohn will describe data showing that females with blunted emotion-processing (LPP) at baseline benefit less from cognitive behavioral treatment of obsessive-compulsive disorder. Finally, Philipp Bierwirth will highlight two challenges in identifying meaningful associations between neurobiological measures and NARTs: inadequate knowledge of psychometric properties and over-reliance on univariate brain measures that may insufficiently capture cognitive processes of interest.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

PROSPECTIVE ASSOCIATIONS BETWEEN ERP MEASURES OF ENDOGENOUS THREAT PROCESSING AND AVOIDANCE IN AN INTERNALIZING SAMPLE

Claudia Becker, Annmarie MacNamara
Texas A&M University

The error positivity (Pe) and error related negativity (ERN) can be used to measure individual differences in sensitivity to endogenous threat (errors). Avoidance, a negative affect related trait (NART), is a response to threat that is associated with the development and maintenance of anxiety. Here, we investigated if escalations in avoidance over a year could be predicted by baseline sensitivity to endogenous threats in a mixed internalizing sample. Participants (N=36; all female) performed a flanker task with EEG at baseline (Time 1) and 1 year later (Time 2). Principal component analysis yielded a single, transdiagnostic avoidance factor from items on the Panic Disorder Severity Scale and the Contrast Avoidance Worry Questionnaire. Time 1 Pe and Time 1 ERN were assessed as predictors of Time 2 avoidance with Time 1 avoidance controlled. Moderation analyses were also conducted. Individuals with increased Time 1 elaborative error processing (Pe) showed larger increases in Time 2 avoidance (β=.412, p=.009) – in particular, for individuals displaying reduced early error processing (ERN) from Time 1 to Time 2 (β=.371, p=.016; t=3.70, p<.001). Greater Time 2 avoidance was also associated with smaller Time 2 ERNs (r=.379, p=.023). Heightened endogenous threat processing (Pe) at baseline may lead to increased avoidance for individuals showing blunted early threat processing (ERN) over time. The Pe and ERN may have unique predictive and cross-sectional associations with a specific, maladaptive NART that cuts across various internalizing psychopathologies.

FUNDING: This work was supported by: National Institute of Mental Health grant R01MH125083 (MacNamara).

CHARACTERIZING EMOTIONALITY IN ADOLESCENT DEPRESSION: THE UTILITY OF INTEGRATING MULTIPLE NEURAL MEASURES

Kaylin Hill, Sam Pegg, Anh Dao, Emma Boldwyn, Lindsay Dickey, Lisa Venanzi, Alexandra Argiros, Christian Bean, George Abitante, Autumn Kujawa
Vanderbilt University

Positive and negative affect have both been implicated in depression symptomatology and vulnerability, and we can measure related processes at the neural level using event-related potentials (ERPs). However, associations between single ERPs and symptoms are often small and few studies have investigated alterations in positive and negative affective processing in conjunction. We will present a study advancing the characterization of depression in adolescence via a data-driven approach integrating multiple ERPs. We worked with a sample of adolescents oversampled for clinical depression and depression risk based on maternal history (N=129; 14-17 years old) to examine the reward positivity (RewP) to monetary and social stimuli and the late positive potential (LPP) to affiliative and socially threatening stimuli. Results of the k-means cluster analysis supported a two-cluster solution wherein one cluster was characterized by relatively attenuated responsiveness across valences and the other by relatively intact responsiveness. Youth in the attenuated cluster reported significantly greater depressive symptoms and were more likely to have current major depressive disorder diagnoses. In contrast, associations of single ERPs with depression were non-significant. This study highlights the importance of moving beyond single measures to characterize valence systems functioning in depression. Implications for future work, including leveraging longitudinal ERP assessments, will also be discussed to characterize affective processes in depression symptomatology and vulnerability.

SIMILARITY IN NEURAL RESPONSES TO LOSS REFLECTS MECHANISMS OF FAMILIAL TRANSMISSION FOR DEPRESSION

Stewart Shankman[1], Lilian Li[1], Lauren Grzelak[1], Randy Auerbach[2,3]
[1]*Northwestern University,* [2]*Columbia University,* [3]*New York State Psychiatric Institute*

Having a depressed 1st-degree relative is a robust risk factor for depression. Research on the familial transmission of depression, however, has largely ignored siblings, even though sibling relationships are common and characterized by frequent and intense emotions. Studies suggest that those in close relationship may exhibit similarities in emotions and cognitions over time, a process underpinned by biobehavioral synchrony. To elucidate neural mechanisms underlying familial transmission of depression, this study tested whether neural similarity in sibling pairs in response to reward and loss, indexed by inter-subject correlation (ISC) in EEG, was associated with each individual's depression risk and relationship quality. One-hundred eight same-sex, adult, full-sibling pairs with a range of depression severity separately completed a monetary reward task during EEG acquisition. ISCs to reward and loss feedback were calculated using circular correlation between siblings' phase angles in delta and theta frequency bands, respectively. Significant sibling ISC to reward and loss was observed, with activity maximal at frontocentral sites. ISC for loss-related theta, but not reward-related delta, was associated with: (a) greater depression risk (both MD diagnosis and depression symptom severity), but not anxiety, and (b) worse sibling relationship quality during childhood in each sibling. Findings provide initial evidence that sibling similarities in neural responses to loss may reflect disturbed childhood sibling relationships, and increase risk for depression during adulthood.

EMPLOYING PSYCHOPHYSIOLOGICAL MARKERS TO PREDICT TREATMENT EFFECTS IN OCD

Julia Klawohn[1,2], Anja Riesel[1,3], Rosa Grützmann[1,4], Franziska Jüres[1], Benedikt Reuter[1,4], Norbert Kathmann[1]
[1]*Humboldt-Universität zu Berlin,* [2]*University of Hamburg,* [3]*University of Hamburg,* [4]*MSB Medical School Berlin*

Obsessive-Compulsive Disorder (OCD) is a severe mental disorder that tends to persist without treatment. Cognitive-behavioral therapy (CBT) has been established as an effective treatment for OCD, yet a significant number of patients do not sufficiently respond to intervention. In line with recent advances in individualized medicine approaches, neurocognitive biomarkers could help identify individuals at risk for non-response and provide insight into underlying mechanisms. Here, we examined whether the late positive potential (LPP), a neural correlate of emotional reactivity, could serve as a prospective predictor of therapy response in patients with OCD (n = 100). Results indicated gender-moderated prediction of therapy response by LPP to unpleasant and pleasant emotional pictures. That is, female patients with relatively higher reactivity to pleasant and unpleasant stimuli were more likely to benefit from CBT, possibly through lower emotional avoidance. Moreover, findings from the same sample suggest that higher resting heart-rate-variability

(HRV) also is a predictor of greater symptom reduction through CBT, particularly in female patients with OCD. As HRV has been discussed as a marker of flexible implicit emotion regulation, these findings align to indicate that both biological measures of emotional responsivity can serve as clinical prognostic markers in OCD, with blunting in responsivity being predictive of higher risk for non-response to CBT. Implications of these findings with respect to the clinical utility of such markers and further directions will be discussed.

THE CHASM BETWEEN SELF-REPORTED NEGATIVE AFFECT AND NEUROSCIENCE: TEN REASONS AND POTENTIAL SOLUTIONS

Philipp Bierwirth[1], Erik Mueller[2]
[1]*University Marburg,* [2]*University Marburg*

A basic assumption of psychophysiological research on negative affect related traits (NARTs) is that interindividual differences in experiencing negative affect are reflected in systematic interindividual differences in brain structure and function. However, despite years of ongoing research, there are only a few, if any, replicable findings that seem to link neurobiological variables and NARTs. Based on our own work and by referencing to the psychophysiological questions addressed by other talks of this symposium, we outline a number of important issues that occur when linking NARTs and pathology to psychophysiological variables. Among these issues, we will focus on two measurement-related problems: (A) the often-neglected role of the psychometric properties of neurobiological variables and (B) the reliance on univariate brain measures that might not sufficiently capture the actual cognitive processes of interest. Both problems will be discussed, and potential solutions will be provided by presenting empirical work from our lab, that focuses on the neuropsychometric properties of classical psychophysiological measures like theta oscillations and on the multivariate assessment of functional brain-heart coupling. In sum, we believe that the described issues may transfer to neurobiological research on other traits and pathology and that addressing them in future studies could contribute to increased replicability of results.

SYMPOSIA V-1

AFFECTIVE STATES AND BRAIN-BODY COUPLING - INTRA- AND INTER-INDIVIDUAL VARIABILITY

Chairs: Michael Gaebler[1], Tahnée Engelen[2]
[1]*Max Planck Institute for Human Cognitive and Brain Sciences;* [2]*Ecole Normale Supérieure*

Affective states, like emotions, are adaptive responses to external stimuli, such as challenging situations or pleasant social interactions. Affective states involve subjective experiences, behavioural-expressive reactions, and physiological processes in the brain and - importantly - the rest of the body: Psychophysiological research on interoception, the processing of internal bodily signals in the brain, has been increasingly showing that brain-body coupling not only maintains life but also shapes our mental and particularly affective states. In this symposium, we'll present complementary approaches to linking affective states and brain-body coupling: Tahnée Engelen and Michael Gaebler will focus on *intra*-individual variability by dissociating pre- and post-stimulus brain-heart interactions (Tahnée Engelen) and by relating feelings to brain-heart dynamics in immersive virtual reality (Michael Gaebler). Heini Saarimäki and Vincenzo Catrambone will focus on *inter*-individual variability in the link between subjective experience and brain-body coupling by investigating its alterations in at-risk children (Heini Saarimäki) and in adults with depressive symptoms (Vincenzo Catrambone). Taken together, the symposium will present pioneering research on mind-brain-body states and their variability both within and between individuals for a comprehensive investigation of the link between emotions and brain-body coupling.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 3.3 Lab Based Experiment, 4.10 Stress, 4.20 Attention, 4.23 Emotion/affect

THE RELATIVE CONTRIBUTIONS OF INTEROCEPTIVE AND PHYSIOLOGICAL MARKERS TO THE SUBJECTIVE EXPERIENCE OF EMOTION

Tahnée Engelen
Ecole Normale Supérieure

Two core components of emotions, the subjective experience and the physiological changes associated with it, are often found to be strongly correlated, yet they do not

always do so in a perfect manner. This suggests we might draw upon other sources of information, besides valence and arousal based bodily changes, to construct our subjective emotional experience. One potential candidate could relate to interoceptive rhythms, and in particular the moment-to-moment changes in coupling between the heart and the brain. These changes can be quantified through heartbeat evoked responses (HERs), which have previously been found to index self-related processing. Here I will present work that aims to dissociate the relative contributions of each of the potential sources, namely heartbeat evoked responses and classical markers of valence and arousal such as facial and skin conductance responses, to the subjective experience of an emotion. Findings indicate that fluctuations in brain-heart coupling, specifically those related to self-relevance, can predict how participants will feel in response to social affective images. Moreover, they do so independently from the participant's physiological response to the images. Ongoing work is extending these findings in more naturalistic settings.

BRAIN-HEART DYNAMICS AND THEIR LINK TO NATURALISTIC AFFECTIVE EXPERIENCE

Michael Gaebler
Max Planck Institute for Human Cognitive and Brain Sciences

Psychophysiological research has traditionally relied on simplified stimuli, such as static images, which lack the complexity and context of real-life - particularly affective - experiences. In three studies, we used naturalistic (i.e., dynamic and interactive) stimuli in immersive virtual reality (iVR) to capture the physiology of human emotions. In study 1, 29 healthy adults completed an iVR experience that included rollercoasters while their EEG and ECG were recorded. Higher self-reported emotional arousal was linked to lower parasympathetic cardioregulation and changes in heartbeat-evoked responses as well as in the bidirectional information flow between brain and heart. In study 2 (n = 41), we found no significant difference in perceived distance to threatening versus non-threatening animals across cardiac phases (systole, diastole), suggesting that cardiac phase biases for threatening stimuli may not generalize from classical lab to more naturalistic iVR settings. Lastly, we're currently developing a method to collect continuous ratings of affective experience for 360° movies. In an evaluation study (n = 51), we found no evidence that the real-time ratings were distracting they correlated with standard summary ratings at the end of the movie, indicating the method's viability for capturing dynamic feelings. Together, these studies highlight iVR's potential for increased naturalism in studies that link brain-body physiology to affective processing and subjective experience.

INDIVIDUAL DIFFERENCES IN GAZE, PHYSIOLOGY, AND NEURAL RESPONSES DURING EMOTIONAL AND SOCIAL EXPERIENCES

Heini Saarimäki
Tampere University

While there is increasing understanding of the behavioral, physiological, and neural changes to different emotional and social experiences, less is known about how individual differences in social perception and functioning affect these in our everyday social life. In a series of studies, we employed movies with varying emotional and social content and measured behavioral, physiological, and neural responses with eye movements, ECG and EDA, and fMRI, respectively. We identified how gaze patterns, physiological changes, and neural activity are differently associated with different emotional and social experiences. Furthermore, we applied these methods in specific populations with altered social perception and functioning, including toddlers at risk of autism, and lonely children and adolescents. The results indicate that social perception and functioning alter the behavioral and physiological responses to social and emotional movies. Finally, based on our previous findings, we developed a two-person interaction paradigm to study behavioral and physiological changes during real-life emotional encounters. I will highlight both the paradigm and the preliminary results related to how emotions modulate behavioral and physiological synchrony and mutual understanding.

IMPAIRED FUNCTIONAL BRAIN-HEART INTERPLAY SUSTAINS EMOTION DYSREGULATION IN DEPRESSED INDIVIDUALS

Vincenzo Catrambone
University of Pisa

The continuous bidirectional functional interplay between the Central Nervous System and the Autonomic Nervous System, also known as Brain-Heart Interplay (BHI), plays a key role in emotional processing and regulation. While dysfunctional emotional processing is considered a psycho-physiological manifestation of depression, the specific role of BHI dynamics in emotional

processing of depressive subjects is not fully understood yet. To this end, in the present study, we leverage a specific methodological framework of BHI analysis to investigate psychophysiological responses to emotional stimuli in adult subjects with and without depressive symptoms. Experimental results from combined EEG-ECG analysis show higher efferent brain-to-heart interplay and lower afferent heart-to-brain information transfer in depressive individuals compared to healthy controls.

SYMPOSIA V-2

THREAT RELEVANCE OF FACES BASED ON INSTRUCTION, LEARNING, OR EXPRESSION - NEW FINDINGS FROM PSYCHOPHYSIOLOGY

Chair: Sebastian Schindler
University of Münster

Viewing others as threatening can be based on experience but also arise from verbal instructions about the threat relevance of others. Faces convey this meaning by their expression and/or through acquired relevant information. This symposium illustrates how threat information associated with faces influences central and peripheral responses. Firstly, we present findings on the role that attentional factors play in fear generalization when faces are used as naturalistically valid stimuli. Secondly, the allegedly intrinsic safety value of loved familiar faces is examined within three experimental paradigms (free viewing, classical conditioning, and instructional learning) using peripheral physiology. The third talk catches up on the threat-of-shock paradigm using ERPs, showing specific effects for threats associated with outgroup faces. The fourth talk focuses on how threat information related to faces can modulate ERP responses along the processing stream as a function of the learning setting. Finally, the fifth talk discusses the underlying brain mechanisms based on large lesion samples with left and right medial temporal lobe resection and measured EEG responses towards fearful and neutral faces. Our syntheses, therefore, will shed light on the multiple facets of faces with acquired or inherent threat relevance that affect early and late central and peripheral psychophysiological responses. This symposium will allow us to draw a comprehensive framework on how threat information affects the processing of facial stimuli and the workings of the brain mechanisms involved.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.2 Myography (EMG etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 3.3 Lab Based Experiment, 4.6 Racism/prejudice, 4.20 Attention, 4.23 Emotion/affect

GENERALIZATION OF FEAR TO (OTHER) FACES: THE INTERPLAY OF ANXIETY, EYE MOVEMENTS, AND PHYSIOLOGY

Mario Reutter, Matthias Gamer
University of Würzburg

Fear generalization has been identified as an important mechanism to investigate the etiology and maintenance of anxiety disorders. However, using ecologically valid stimuli in fear generalization paradigms is necessary to translate these findings to people's everyday life. We thus developed a set of facial photographs that were meticulously manipulated such that pairs of faces could be distinguished either by looking into the eyes or into the region around the mouth and nose, respectively. These pairs were then employed as CS+ and CS− in a differential fear conditioning paradigm followed by a generalization test with morphs in steps of 20%. In a sample with diverse levels of anxiety ($N = 87$), we replicated previous results, supporting the notion that the amount of fear generalization depends on trait anxiety and attentional deployment to diagnostic facial features. Furthermore, *social* anxiety was associated with different visual exploration strategies and altered temporal dynamics of cardiac patterns. In summary, fear generalization depends on attentional deployment. We conclude that pathological generalization of adverse situations may be ameliorated by attentional or perceptual training. Repository: https://osf.io/4gz7f/

EMOTIONAL PROCESSING OF LOVED FAMILIAR FACES: FROM BASIC RESEARCH TO THEIR ROLE IN THE ACQUISITION AND EXTINCTION OF FEAR RESPONSES

Pedro Muñoz
University of Granada

The visualization of pictures of loved, highly supportive individuals, has been associated with beneficial effects in threatening contexts, leading to the reduction of the subjective experience of pain or the inhibition of certain defensive reactions (i.e. startle reflex). In addition, findings from several studies on the acquisition/extinction of fear responses have shown that these stimuli cannot be aversively conditioned and have the capability to enhance inhibitory learning in classical conditioning protocols. However, it seems that these effects cannot be extended to other learning modalities. In threat-of-shock studies, pictures of loved familiar people easily become threat cues, being associated with a pattern of psychophysiological changes that is distinctive of a pronounced defense

reaction (sustained heart rate deceleration, increases in skin conductance and corrugator EMG activity, and startle potentiation). On the other hand, more recent studies suggest that pictures of loved ones have no positive effects as regards the extinction of fear responses, irrespective of the learning modality. Here, we will review currently available evidence as to the role of loved familiar faces as buffering stimuli in three experimental settings (passive viewing, classical conditioning, and instructional learning) in order to determine under which conditions they could act as safety signals and whether they constitute or not a promising approach to improving inhibitory learning in clinical contexts.

FUNDING: This research has been possible thanks to a Research Grant awarded to the author by the Spanish Ministry of Science and Innovation (ref. PID2020-119549GB-I00).

VISUAL CATEGORIZATION AND THREAT GENERALIZATION ACROSS RACIAL OUTGROUP INDIVIDUALS

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[2]*Heidelberg University,* [3]*Central Institute of Mental Health Mannheim*

Individuals who look different from oneself but share similarities with one another are often perceived as homogenous members of a different 'racial' group. This study examined whether this tendency is related to associative overgeneralizations across visual outgroup individuals. While recording event-related electrocortical activity, 40 White participants observed sequences of White and Black faces. Faces were presented in pairs, consisting of two ingroup or two outgroup faces, depicting the same or two different individuals. Before each sequence, participants received instructions designating a specific ingroup or outgroup face as a cue for the possibility of an unpleasant electric shock (threat-of-shock). The results show that outgroup faces were less individuated during early face processing, as indicated by identity-sensitive N170 repetition suppression, observed only for ingroup faces. A similar modulation of the Late Positive Potential (LPP) was observed for all outgroup faces, indicating a stronger generalization of threat across outgroup compared to ingroup faces. These findings suggest that outgroup homogeneity misperception may promote associative outgroup generalizations, underscoring the significance of perceptual learning experiences. In a follow-up study, we replicated these results and examined the impact of interindividual differences in anxiety. Misperceptions of outgroup homogeneity and the threat of overgeneralization may be important mechanisms contributing to stereotyping and prejudices.

BEYOND EXPRESSIONS: EARLY AND LATE NEURONAL PROCESSING OF INHERENTLY NEUTRAL FACES WITH ASSOCIATED THREAT-RELEVANCE

Sebastian Schindler, Maximilian Bruchmann, Thomas Straube
University of Münster

Threat-related facial expressions reliably modulate specific Event-Related Potentials (ERPs) from the EEG. However, faces can acquire threat relevance based on one's own experiences or learned knowledge related to topics such as immediate physical danger, reported criminal behavior, or association of identities with potentially threatening information. While a recent review showed that the majority of studies reported significantly increased N170 amplitudes depending on the threat relevance of faces, little is known about the impact of threat information along the processing stream. Here, we report on three studies using fear conditioning, instructed threat relevance, and negative social experiences to measure the differential processing of faces on early (P1, N170), mid-latency (EPN), and late (LPP) ERPs. These studies highlight that suited tasks can dissociate different processing stages, aligning with the suggested functions of early, mid-latency, and late processing stages. However, differences exist between the different types of acquired threat relevance. The detection of robust early (P1) differential responding seems to depend on the direct experience of the association, while subsequent EPN and LPP responses depend on increased attention to the threat-related information. Potentiated processing of neutral faces associated with threats can be observed across different attention conditions, studies, and types of learning, highlighting the importance of the threat relevance of faces and informing theories of emotional information processing.

DIFFERENTIAL CONTRIBUTIONS OF LEFT AND RIGHT TEMPORAL LOBE RESECTIONS TO EMOTIONAL FACE PERCEPTION: EVIDENCE FROM EVENT-RELATED POTENTIALS AND STIMULUS-INDUCED GAMMA-BAND ACTIVITY

Enya Weidner[1], Malena Mielke[1], Lea Reisch[1], Sebastian Schindler[2], Christian Bien[1], Johanna Kissler[1]
[1]Bielefeld University, [2]University of Münster

Although it is widely believed that medial temporal lobe (mTL) structures, predominantly the amygdala, drive visual processing biases for emotional faces in scalp EEG signals, systematic research on the temporal dynamics of mTL contributions to emotional face processing is still sparse. By comparing a sample of 36 epilepsy patients with left- or right-hemispheric temporal lobe resections (lTLR/rTLR) to a matched healthy control group (HC), this study aimed to uncover possible influences of such resections on event-related potentials and gamma-band activity (GBA) that typically differentiate emotional from neutral faces in healthy participants. ERP data demonstrated reduced early attentional selection of fearful over neutral faces in rTLR patients compared to HC, as indicated by reduced P1 difference amplitudes (fearful – neutral). Likewise, emotion differentiation in occipital GBA was ipsi-resectionally reduced in rTLR compared to HC from about 30-360 ms and 550-700 ms. By contrast, lTLR patients presented with stronger emotion differentiation than HC in the N1. These results suggest an involvement of the right mTL, perhaps particularly the amygdala, in rapid attentional selection of emotionally relevant faces but also in sustained gamma-band synchronization. Also, present data imply a role of the left mTL in attentional disengagement from emotion that diminished in lTLR patients.

FUNDING: This work was partly funded by grants from the German Research Foundation: Deutsche Forschungsgemeinschaft, Grant/Award Numbers BI1254/8-1 and KI1286/6-1.

SYMPOSIA V-3

AGENCY IN ACTION: NEUROPHYSIOLOGICAL AND COMPUTATIONAL INSIGHTS INTO THE RELATIONSHIP BETWEEN SENSE OF AGENCY AND GOAL-DIRECTED TASK PERFORMANCE

Chairs: André Forster[1], Stefan Arnau[2]
[1]University of Würzburg; [2]Leibniz Research Centre for Working Environment and Human Factors

Understanding the degree to which control can be exerted over internal and environmental states is crucial for allocating cognitive resources effectively, providing insight into how effortful behavior or cognition influences the likelihood of achieving a goal. Sense of agency is the subjective feeling of being in control of one's actions and the environment. It is assumed to play a significant role in moderating various phenomena related to goal-directed task execution observed in cognitive and psychophysiological research, such as fatigue, task engagement, and fluctuations in performance over time. Against this background, this symposium focuses on three primary aspects of a potentially recursive relationship between sense of agency, the processing of performance feedback and task behavior:

1. The computational aspects of inferring agency from feedback.
2. The influence of the inferred agency expectation on the processing of task-related reinforcement learning processes.
3. The consequences of inferred agency beliefs on task performance and its implications for psychopathology.

To address these objectives, the symposium will feature four presentations utilizing computational modeling approaches in conjunction with fMRI and EEG measures. These presentations will explore topics including credit assignment, attentional deployment, effortful control, and reinforcement learning.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.15 Computational / Simulation, 3.3 Lab Based Experiment, 4.19 Motivation, 4.25 Cognitive control/executive functions

COGNITIVE AND NEURAL MECHANISMS OF CREDIT ASSIGNMENT AND CONTROL INFERENCE DURING SOCIAL INTERACTIONS

Lisa Spiering[1], Hailey Trier[1], Jill O'Reilly[1], Nils Kolling[2], Matthew Rushworth[1], Jaqueline Scholl[3]
[1]University of Oxford, [2]SBRI Stem-cell & Brain Research Institute, [3]Centre de Recherche en Neurosciences de Lyon

A key human ability is to learn from outcomes by identifying their cause ("assigning credit"), and to figure out whether one's actions have any influence on our environment. Here, we examined how participants assign credit to themselves versus others and estimate their control over the environment. For this, we developed a novel behavioural paradigm, in which participants inferred from feedback how well they and another player perform, and how much control they exert. We employed this paradigm in a 3T fMRI study (n=34) and an online study (n=60). We found that participants assigned credit by splitting up outcomes according to their control. To better disambiguate feedback, people engaged in exploratory behaviour ("active disambiguation", AD). During AD, people changed their performance to test the effect of their behaviour on the feedback, thereby inferring their control. This behaviour is consistent with that of an optimal Bayesian learning model. Activity in the dorsolateral prefrontal cortex dissociated between whether participants assigned more of the prediction error (difference between expected and actual feedback) to themselves versus others, depending on their control. We found widespread activation related to AD, including the dorsal anterior cingulate cortex. These results illuminate how people assign credit and learn about control by engaging in different action types and which neural mechanisms underly these behaviours. In the future, these results will be compared to a depressed sample to examine different cognitive biases in outcome attributions.
FUNDING: This work is supported by the Medical Research Council (awards MR/N013468/1 to Lisa Spiering; MR/N014448/1, Skills Development Fellowship to Jacqueline Scholl) and Wellcome Trust (221794/Z/20/Z to Matthew Rushworth).

THE INFLUENCE OF SUBJECTIVE CONTROL EXPERIENCE ON EVALUATIVE FEEDBACK PROCESSING DURING LEARNING

Jakob Kaiser, Maren Giersiepen, Simone Schütz-Bosbach
Ludwig-Maximilians University München

Goal-directed adaptation of our behavior is only possible if we learn from our past mistakes and successes. Several psychological theories suggest that humans' learning performance increases when they feel responsible for their actions. However, the neurophysiological mechanisms for this phenomenon are still unclear. In two studies (N = 30, N = 40), we employed a reinforcement learning task where participants had to select one of two items, resulting in either positive or negative feedback. Importantly, participants could either freely choose an item or were forced to select an item chosen by the computer. Using EEG, we measured midfrontal theta power during feedback presentation, which has been shown to be a reliable indicator of cognitive control engagement. As expected, participants reported a higher sense of agency during free choice versus forced choice trials. Importantly, free compared to forced choice trials led to significantly higher midfrontal theta power during feedback presentation. Even when participants were explicitly informed that learning from the feedback during the forced-choice trials would be relevant for their future actions, free-choice compared to forced-choice trials still elicited stronger theta reactivity. Thus, feeling agency over one's current decision boosts the neural processing of performance feedback, independent of its expected relevancy for future actions. Based on this data, we propose a model which explains how subjective sense of agency can support learning, by enhancing the neural processing to self-relevant performance feedback.
FUNDING: This work was supported by a grant to J. K. by the German Research Foundation (DFG), grant number: 446432554.

EXPLORING ELECTROPHYSIOLOGICAL CORRELATES OF HELPLESSNESS ACROSS MULTIPLE MEASUREMENT OCCASIONS. A REGISTERED REPORT

André Forster, Johannes Rodrigues, Billy Sperlich, Johannes Hewig
University of Würzburg

The belief in one's ability to produce positive outcomes and prevent negative ones is a crucial resilience factor across various forms of psychopathology. When this belief is impaired, the learned helplessness (LH) model of depression suggests that passivity, anxiety, and disengagement from tasks but also anhedonia and tiredness may follow. While numerous studies have explored LH in terms of functional neuroanatomy in rodents and other non-human species, there is limited data available on the human electrophysiological correlates associated with the formation of prolonged states of hopelessness/helplessness. This talk thus focuses on electrophysiological markers of helplessness recorded in 60 healthy participants undergoing a modified

unsolvable anagram task. Additionally, interventions were administered to investigate their impact on helplessness, including extinction and reconsolidation-based approaches on the following day. Subsequently, all participants faced a helplessness task again on a third occasion, allowing for the examination of both stable interindividual differences and within-person changes accompanying the process of losing and regaining agency over the outcome of a cognitive task. The results concentrate on feedback-related ERPs, frontal and posterior midline theta power, following a double-blind randomized controlled trial procedure, submitted (and accepted at stage 1) as a registered report in Psychophysiology.

THE SENSE OF AGENCY AFFECTS COGNITIVE EFFORT: INVESTIGATING THE EXPENDITURE OF PROACTIVE CONTROL USING THE EEG

Stefan Arnau, Nathalie Liegel, Edmund Wascher, Daniel Schneider
Leibniz Research Centre for Working Environments and Human Factors

Cognitive performance largely depends on the degree to which an individual is engaged in a task. According to the Expected Value of Control framework, cognitive effort is adjusted to the expected benefit of successful task-performance. To obtain an expected benefit reliably, the consequence of an action needs to be controllable. The subjective sense of agency should therefore be a relevant factor for the expenditure of effort. We present research investigating effects of experimental manipulations of the sense of agency on task-engagement using the EEG. The participants performed in a color-discrimination task where the difficulty of each trial varied on a trial-to-trial basis and was cued before target onset. The subjective reliability of the response detection was manipulated in a block wise manner. In high sense of agency blocks, the feedback regarding the response always corresponded to the given response. In low sense of agency blocks the feedback regarding the given response was flipped in 30% of the trials. Performance significantly decreased in the flip-blocks compared to blocks with response-consistent feedback. The EEG analysis of low compared to high sense of agency blocks showed a diminished CNV amplitude during the cue-target interval. This was not found when analyzing sequential effects in trials after flipped versus non-flipped responses. These results indicate that the loss of the sense of agency resulting from a reduced controllability of the outcome of an action resembles a cognitive state rather than a transient decrease of motivation.

SYMPOSIA V-4

RHYTHMS OF RESILIENCE: UNVEILING THE ROLE OF HEART RATE IN UNDERSTANDING THE RISK AND RESILIENCE FOR STRESS-RELATED PSYCHOPATHOLOGY

Chairs: Alainna Wen[1], Matthias Sperl[2]
[1]University of California, Los Angeles; [2]University of Siegen

Discussant: Julian Thayer, University of California, Irvine

Autonomic control of the heart plays a critical role in the risk and resilience of stress-related psychopathology. While increased autonomic control can be adaptive in some situations, it may lead to maladaptive outcomes in others. This symposium aims to elucidate these mechanisms of risk and resilience through applying innovative techniques involving electrocardiogram data, including stimulus-evoked changes in heart rate, variability in heart rate (HRV), and virtual reality biofeedback. Matthias Sperl (University of Siegen, Germany) will illustrate how heart rate is modulated by imagery-based fear conditioning, an experimental model for anxiety disorders. Alina Koppold (University Medical Center Hamburg-Eppendorf, Germany) will then link heart rate deceleration in the context of action preparation with postural freezing, a correlate of anxiety and trauma-related disorders. Next, Alainna Wen (University of California, Los Angeles, USA) will delineate the link between HRV and transdiagnostic internalizing symptom trajectory using a longitudinal design. Maria Meier (University of Konstanz, Germany) will then present findings on the links between autonomic reactivity to relaxation interventions and psychopathology risk. Lastly, Floris Klumpers (Radboud University, Netherlands) will highlight the role of virtual reality biofeedback in increasing HRV and its utility in stress regulation training for individuals in high-stress professions. Julian Thayer (University of California, Irvine, USA) will serve as the discussant, integrating and synthesizing the presentations.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.15 Biofeedback, 4.23 Emotion/affect

IMAGERY-BASED FEAR CONDITIONING EVOKES HEART RATE DECELERATION

Matthias Sperl[1,2,3], Lena Moench[4], Erik Mueller[5], Michelle Craske[2], Christiane Hermann[6]
[1]University of Siegen, [2]University of California, Los Angeles, [3]University of Giessen, [4]University of Giessen, [5]University of Marburg, [6]University of Giessen

Aversive learning experiences are important in the etiology of social anxiety disorder. A central mechanism is classical conditioning, whereby a conditioned stimulus (CS) becomes paired with an unpleasant unconditioned stimulus (US). However, many patients cannot recall a specific unpleasant learning experience. The question arises whether aversive imagery can also be associated with specific environmental stimuli. Conditioning studies with physically presented US (e.g., electric shock) have shown that fear acquisition leads to heart rate deceleration in response to the CS (conditioned bradycardia) and heart rate acceleration in response to the US. We developed a novel, imagery-based paradigm, and in N = 140 healthy participants, tested whether imagined socially relevant US also leads to a modulation of heart rate as a conditioned response. During acquisition, two neutral faces (CS+) were paired with an aversive or neutral socially relevant imagery. Another CS was paired with no imagery (CS-). Heart rate was recorded with EKG. We showed successful conditioning with imagined social stimuli, which was accompanied by a cardiac defensive response. As expected, the presentation of the CS+aversive (compared with the CS+neutral and the CS-) led to heart rate deceleration (conditioned response). In contrast, aversive imagery (compared with neutral imagery and no imagery) led to heart rate acceleration (unconditioned response). Our findings suggest that social anxiety can be learned through imagination, opening perspectives for innovative, imagery-based therapeutic approaches.
FUNDING: Justus Liebig University Postdoctoral Fund.

DYNAMIC MODULATION OF DEFENSIVE BEHAVIOR AND FREEZING RESPONSE IN RELATION TO THREAT AND UNCERTAINTY

Alina Koppold[1], Tina Lonsdorf[1,2]
[1]University Medical Center Hamburg-Eppendorf, [2]Bielefeld University

When faced with threat, defensive circuits are activated to ensure survival. In the context of survival, reduced physiological response is linked to action preparation, but little is known about human preparatory responding to certain threat versus uncertain threat. We present a paradigm that aims to capture defensive psychophysiological response and action preparation under threat certainty, uncertainty, and safety. In a multimethod approach, we combine the human postural sway and cardiac responding as proxies for freezing-like behavior in humans, skin conductance levels, fear potentiated startle (EMG), behavioral task performance, and subjective ratings as outcome measures. Results (N = 250) replicated postural and cardiac freezing-like behavior but also increased skin conductance levels in the experimental conditions of threat certainty and uncertainty as compared to safety. This suggests that threat uncertainty prompts an earlier onset of postural freezing as compared to certain threats. Moreover, we observed EMG inhibition during action preparation under threat as compared to EMG responses in the inter-trial interval. High threat conditions resulted in faster reaction tendencies at the expense of accuracy as compared to low threat. The findings align with animal models on the defensive mechanism of shifting from freezing to action under threat, unveiling a valence-specific response pattern. Finally, the results highlight postural freezing as a measure that distinguishes defensive responding between certain versus uncertain threats in the context of action preparation.
FUNDING: Deutsche Forschungsgemeinschaft (DFG, German Research Foundation).

HEART RATE VARIABILITY AS A BIOMARKER OF TRANSDIAGNOSTIC INTERNALIZING SYMPTOMS: A LONGITUDINAL INVESTIGATION

Alainna Wen[1], Tomislav Zbozinek[1,2], Julian Ruiz[1], Richard Zinbarg[3], Robin Nusslock[3], Michelle Craske[1]
[1]University of California, Los Angeles, [2]California Institute of Technology, [3]Northwestern University

Internalizing psychopathology is associated with abnormalities in heart rate variability (HRV). Lower HRV that reflects reduced parasympathetic nervous system activity has been observed in depressive and anxiety disorders. Existing studies predominantly used categorical rather than dimensional approaches, the latter of which better addresses clinical comorbidity and heterogeneity. Moreover, there is little evidence on the role of HRV in longitudinal symptom trajectory. The current study examined the association between HRV and internalizing symptom trajectory using a dimensional approach – the tri-level model of depression and anxiety. Young adults (N = 362) participated in a 4-year longitudinal study, where they completed electrocardiogram recordings and self-report symptom questionnaires. Multilevel modeling

was conducted with root mean square of successive differences (RMSSD) between heart beats as the predictor and tri-level dimensional symptom factors over 4 years as the outcome. HRV significantly predicted the slope of the broad General Distress symptom factor, but not the intermediate Fears or Anhedonia-Apprehension symptom factors. Higher HRV was associated with a decline in General Distress over time. That is, greater parasympathetic nervous system activity at baseline was associated with a greater decline in the broad internalizing symptom factor, but not symptom factors that are more specific to depressive or anxiety disorders. Higher parasympathetic activity, therefore, may be a transdiagnostic biomarker for internalizing symptoms in young adults.
FUNDING: National Institute of Mental Health.

EXPLORING LINKS BETWEEN AUTONOMIC REACTIVITY TO RELAXATION AND RISK FACTORS FOR PSYCHOPATHOLOGY

Maria Meier[1,2], Raphaela Gaertner[1], Elea Klink[1], Stella Wienhold[1], Bernadette Denk[1], Stephanie Dimitroff[3], Jens Pruessner[1,4]
[1]University of Konstanz, [2]University of Basel, [3]University of Montana, [4]McGill University

Early life adversity (ELA), or chronic stress (CS) increases the risk for disorders, including anxiety disorders. The mechanisms behind this are not fully understood. Initiating psychophysiological relaxation responses (i.e., increasing vagal tone and positive mood) is as important for survival as is displaying an adequate stress response. However, ELA and CS have rarely been linked to relaxation. Hence, we examined the association between ELA, CS and cardiac reactivity to relaxation in two experiments. Healthy adults were invited to the laboratory and equipped with electrocardiography (ECG) devices before recording a baseline and executing a relaxation intervention. Participants performed a paced breathing exercise (study 1) and either received a soft-shoulder massage or rested (study 2). In both experiments, participants completed questionnaires on ELA (e.g. Childhood Trauma Questionnaire) and CS (e.g. Perceived Stress Scale). The Root Mean Square of Successive Differences (RMSSD) was calculated as an index of vagal tone. Multilevel models showed a significant increase in RMSSD in response to paced breathing, massage and rest, confirming a successful induction of relaxation. Results show a negative correlation between RMSSD and CS ($r = -.2$, $p = .05$), suggesting a link between chronic stress and lower basal vagal tone. Problematic patterns of physiological response to relaxation may increase the risk for psychopathology, including anxiety disorders, and may be a suitable target for prevention and intervention.

VIRTUAL REALITY BIOFEEDBACK IN AN AROUSING ACTION GAME IMPROVES IN-ACTION VOLUNTARY HEART RATE VARIABILITY CONTROL IN EXPERIENCED POLICE

Floris Klumpers[1], Abele Michela[1], Jacobien van Peer[1], Robert Oostenveld[1,2], Wendy Dorrestijn[1], Annika Smit[3,4], Isabela Granic[1,5], Karin Roelofs[1]
[1]Radboud University, [2]Karolinska Institute, [3]Police Academy of the Netherlands, [4]University of Humanistic Studies, [5]McMaster University

Adequate control over evolutionarily engrained bodily stress reactions is essential to avoid disproportionate responses during highly arousing situations that are frequently experienced by the police. This regulation can be trained via heart rate variability (HRV)-biofeedback, a widely used intervention intended to improve stress regulation, but typically has been conducted under passive, low arousing conditions. We integrated closed-loop HRV-biofeedback in a newly designed, engaging Virtual Reality (VR) action game containing the behavioral elements typically compromised under stress. Specifically, we aimed to train in-action physiological self-control under high arousal to allow improved transfer to real-life situations. A pre-registered quasi-randomized controlled trial in 109 Dutch police trainers demonstrated highly significant increases in HRV (32% average), through the engaging and gamified closed loop biofeedback. This ability to voluntarily upregulate in-action HRV transferred to game sessions without biofeedback (near transfer). Critically, we could additionally demonstrate transfer to a professional shooting performance assessment outside VR (far transfer). These results suggest that real time-biofeedback in stressful and active action contexts can help train professionals in high-stress careers, such as the police, in real-life stress regulation.
FUNDING: NWO Creative Industry grant.

SYMPOSIA V-5: SPR SPECIAL SYMPOSIUM ON 100 YEARS OF EEG RESEARCH (1): BIG TEAM SCIENCE IN EEG RESEARCH

EEG IN THREE DIMENSIONS: NEURAL CORRELATES OF COGNITIVE-AFFECTIVE PROCESSES UNDER IMMERSIVE VIRTUAL REALITY AND REAL-LIFE CONDITIONS

Chairs: Leon Lange[1], Joanna Kisker[2]
[1]*University of California, San Diego;* [2]*Osnabrück University*

EEG as a powerful tool for studying human cognition has traditionally been limited to two-dimensional, screen-based experiments. Yet more sophisticated experimental designs increasingly gain importance. This symposium aims to showcase the wide range of possibilities and challenges of, as well as to provide insights into EEG under three-dimensional experimental conditions in virtual reality (VR) and in real life. Joanna Kisker presents results from joint VR-EEG studies focusing on oscillatory responses mirroring cognitive-affective processes, revealing modulations and disparate responses in both, the low-frequency range and the gamma-band range. Merle Sagehorn presents how attentional demands and cognitive load differ between VR and standard 2D settings on the example of face perception, offering a middle course between real-life and in-lab settings. Shedding light on discrepancies between controlled and real-life attention measures, Agatha Lenartowicz presents EEG data from elementary school children that reveal distinct patterns of alpha power modulation during lab tasks and natural learning activities. Leon Lange unveils findings on stress detection in surgical contexts using mobile EEG, with a focus on achieving real-time stress detection during laparoscopic training tasks. Nadine Jacobsen will highlight how artifact assessment may be used to optimize preprocessing of real-life EEG data and present results on the impact of terrain and dual-tasking as well as cortical correlates of gait in participants with Parkinson's disease.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.10 Stress, 4.18 Memory, 4.20 Attention

MODULATIONS OF THE HIGH- AND LOW-FREQUENCY RANGES UNDER VIRTUAL REALITY CONDITIONS

Joanna Kisker[1], Marike Johnsdorf[1], Merle Sagehorn[1], Benjamin Schöne[2], Thomas Gruber[1]
[1]*Osnabrück University,* [2]*Norwegian University of Science and Technology*

Virtual reality (VR) is increasingly crucial to investigate human cognition under ecological valid settings. To examine the cortical mechanisms underlying cognition, the electrophysiological activities in specific frequency bands serve as well-established indices. Combining both techniques, we addressed perks and pitfalls of acquiring EEG oscillations in a series of joint VR-EEG studies. We explored the modulation of brain oscillations directly after, or in immediate response to VR experiences. In the low-frequency theta- and alpha-band range, our studies reveal both modulations and disparate responses under VR conditions compared to conventional desktop settings. For example, theta-band responses reflecting mnemonic processing indicate divergent recognition mechanisms. Moreover, the low-frequency responses indicate that the perception of virtual 3D objects equals real 3D objects more strongly than 2D objects. Furthermore, to complement the low-frequency range, we demonstrate the feasibility of capturing oscillations in the high-frequency gamma-band range (30-100Hz) in VR. These oscillatory responses are even more prone to electrical and extracerebral artefacts as opposed to the low-frequency range. Our results reveal that gamma-band responses can be accessed during the use of a VR headset if certain requirements are met, and that the observed responses are in line with previous findings. We conclude that the acquisition of oscillatory electrophysiological markers in immersive VR offers a promising approach to extend findings to more ecologically valid settings.

ANALYZING INDUCED OSCILLATORY RESPONSES IN A 2D LABORATORY AND VIRTUAL REALITY SETTING: FACE AND OBJECT PERCEPTION

Merle Sagehorn[1], Marike Johnsdorf[1], Joanna Kisker[1], Benjamin Schöne[2], Thomas Gruber[1]
[1]*Osnabrück University,* [2]*Norwegian University of Science and Technology*

In perception research, induced oscillations in different frequency bands provide important insights into the neural processing of external information. The cognitive

domains of attention, cognitive load and working memory are particularly relevant, each of which is reflected in characteristic oscillatory response patterns. However, perception research is mainly conducted in conventional laboratories, where stimuli are presented as 2D images on monitors in rather distanced settings. As a complementary method in the lab, virtual reality (VR) enables the presentation of life-size 3D stimuli, creating an experience with self-referential and immersive value close to real life. In a standard perception paradigm with two object categories differences in the induced alpha and theta band responses are compared between a standard 2D monitor and a realistic VR setting. No evidence was found for differences in general attention between the 2D conditions and the realistic virtual conditions in electrode space, as posterior alpha suppression did not differ between conditions. However, source analysis suggests differences in the engaged attention networks for 2D and 3D perception. Midfrontal theta was significantly stronger in laboratory conditions, indicating higher cognitive load than in the VR environment. Exploratory analysis of posterior theta showed stronger responses in VR, possibly reflecting the processing of depth information provided only by the 3D material. In addition, the theta response under realistic conditions seems to be based on more distributed sources.

QUANTIFYING ATTENTION IN THE LAB VERSUS NATURAL ENVIRONMENT: CHALLENGES AND OPPORTUNITIES

Fang Chang, Agatha Lenartowicz, Zoe Mao, Jennie Grammer
University of California, Los Angeles

Nearly a century of laboratory electroencephalography (EEG) studies on attention control and selective attention have identified candidate oscillatory and event-related potential indicators of visual attention processing. However, the utility of such indicators for prediction or tracking in natural environments has not been as successful. In this presentation I will describe a study in which we collected EEG from elementary school children (n = 60, 7-9 yo) while they engaged in lab-based attention working-memory tasks and in naturalistic learning activities (movie, zoom lesson, in-person lesson, individual work). We quantified oscillatory alpha (8-12Hz) power during both testing contexts, with the goal of using alpha power as an objective index of visuospatial cortex engagement across learning contexts. The results indicated significant modulation of alpha power during visual encoding in the laboratory task with load and performance, consistent with prior findings. We also observed significant modulation of alpha power during naturalistic learning activities, with greater alpha power and poorer behavioral attention during teacher-interactive activities than independent work. However, the neural measures between naturalistic and in-laboratory assessments did not correlate with one another, with between-subject variability during natural activities consistent with influences from non-attentional factors. The results provide insight into root causes of (and potential solutions to) weak associations between in-lab and naturalistic measures of attention states.

FUNDING: National Institutes of Health, US: R21MH119448 (PI: Lenartowicz) R01MH128475 (PI: Lenartowicz) R01MH130731 (PI: Lenartowicz).

DECODING STRESS WAVES: EEG INSIGHTS IN LAPAROSCOPIC TRAINING

Leon Lange[1], Greg Appelbaum[1], Ryan Broderick[1], Yang Cai[1], Tzyy-Ping Jung[1,2], Ying Wu[1]
[1]University of California San Diego, [2]National Taiwan University

In the dynamic realm of surgical training, effective stress management significantly impacts performance and overall well-being. This study aims to monitor stress response during surgical training tasks by utilizing mobile wireless electroencephalographic (EEG) technology. Our goal is to build robust physiological models by uncovering EEG correlates that distinguish elevated stress from normal stress during laparoscopic training tasks. Our results show a negative correlation between stress level and alpha band power, showcasing the feasibility of stress monitoring in the context of real-world surgical training. Further data will be presented, focusing on spectral band power and pairwise channel coherence for training of machine-learning classifiers to accurately classify stress levels based on neural responses. It will be discussed how the derived physiological models can be leveraged for a real-time stress response detection algorithm, contributing to the broader mission of improving surgical training by integrating real-time stress monitoring using personalized interventions and adaptive learning systems.

FUNDING: Wellcome Leap Foundation.

NEURAL SIGNATURES OF NATURAL GAIT

Nadine Jacobsen, Lara Papin, Karsten Witt, Stefan Debener
University Oldenburg

Understanding cortical activations during natural walking, especially in dual-task scenarios and varied terrain, is crucial for deciphering the cognitive demands of natural walking. We use mobile electroencephalography (EEG) to record brain activity during free walking conditions. We will present results from three studies. In the first study, we developed a new procedure, the multidimensional footprint of gait-related artifacts, to identify suitable gait artifact reduction pipelines. This framework can also be used to compare mobile EEG systems and individuals. We also present the results of a dual-tasking mobile EEG study recordings of 19 healthy participants walking on even and uneven terrain, with and without a concurrent button-pressing task. Gait pattern analysis revealed prolonged stride times on uneven terrain and during dual-tasking, validating the task conditions. We analyzed gait-phase related power modulations (GPM) of sensorimotor rhythms. GPMs showed significant changes with terrain variation, indicating distinct cortical processes associated with cortical demands of gait control. We will also present GPM results from a new dual-tasking mobile EEG pilot study in patients diagnosed with Parkinson's disease. We conclude that GPMs recorded with mobile EEG can provide valuable insights into the motor-cognitive demands of natural gait. These findings provide a basis for protocols to assess cognitive demands on the motor system during real-world walking conditions, with potential applications in areas such as rehabilitation.

SYMPOSIA VI-1

CONTEXT CONSIDERED: EXPERIMENTAL AND INTRAPERSONAL FACTORS IMPACTING OUR UNDERSTANDING OF THE PSYCHOPHYSIOLOGY OF REINFORCEMENT

Chair: Marlen Gonzalez
Cornell University

The goal of psychophysiology is to understand the relationships between physiological signals and psychological experiences like feeling rewarded. Encouragingly, the field has grown to create more layered studies with greater participation from people outside of the university. However, these changes have also created a fair bit of contextual complexity and unreliable findings. Context, it seems, reveals moderators of cognitive tasks, the inadequacy of our tools, and hidden complexities in the relationship between psychological states and physiological signals. This symposium will engage with experimental and intrapersonal contextual factors that can change how we think about reinforcement processes. In the first talk, Skye Napolitano examines how changing participants' sense of the time burden can abolish the canonical decrease in error-related negativity seen in the latter half of executive tasks. Then, Marlen Gonzalez shares a cautionary tale of how increasing the number of tasks in an fMRI study can result in poor task reliability for a widely used monetary reward paradigm. In the third talk, Wendy D'Andrea showcases how individual differences in autonomic arousal can yield surprisingly different response patterns for pain. Finally, Ellen Yates examines how individual differences in sub-threshold dissociative experiences captures elegant differences in gain and loss processing. Taken together, the symposium encourages us center people's actual psychological experiences in psychophysiology through greater examination of contextual factors.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 3.3 Lab Based Experiment, 4.9 Pain, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

THE EFFECT OF MANIPULATED TIME PERCEPTION ON THE MAINTENANCE OF COGNITIVE CONTROL

Sky Napolitano, Roslyn Harold, Kimberly Galvez-Ortega, Wei Siong Neo, Lisa Brown, Dan Foti
Purdue University

Cognitive control (CC) regulates behavior during fluctuating external conditions (e.g., task changes) and internal conditions (e.g., changes in affect and motivation). Past work shows that CC becomes more effortful with time, highlighting the role of participant fatigue in study design. Extending this work, we tested how the experimental manipulation of time perception may alter the trajectory of CC over the course of a protocol. We present findings from a study in which participants completed repeated blocks of a traditional arrow Flanker task while also repeatedly reporting the current time from a digital clock on display. Participants were randomly assigned to either a "normal" time condition (i.e., standard clock) or a "fast" time condition (i.e., 2x standard clock speed). All other experimental parameters were equivalent across groups, including the length of the task. Analyses focused on the amplitude

of error-related negativity (ERN), a neurophysiological indicator of automatic error detection in the service of CC. Participants in the "normal" condition exhibited the expected effect of participant fatigue, whereby ERN amplitude was reduced for the final Flanker run compared to the first Flanker run. By contrast, participants in the "fast" condition exhibited maintained CC, whereby ERN amplitude was unchanged from the first run to the final run; participants were generally unaware of the time manipulation at debrief. These effects have practical implications for task design, as well as broader implications for the interplay between cognitive control and motivation.

LESS IS MORE: EXPERIMENTAL BURDEN DIMINISHES BOLD RESPONSE TO COMMON MONETARY REWARD TASK

Marlen Gonzalez[1], Meghan Puglia[2]
[1]*Cornell University,* [2]*University of Virginia*

Any fMRI biomarker must first be reliable to be useful. However, a meta-analysis showed that widely used paradigms like the monetary incentive delay (MID) task showed poor test-retest reliability. One unexplored reason for this may be practical changes to protocols which change the broader context across a study's lifespan. We conducted a secondary analysis of a larger study to illustrate how a change in study length changed BOLD outcomes. 112 participants had useable MID fMRI data collected in the same session with several other tasks. 28 of these participants completed 6 to 7 other tasks before the MID (High Burden) while the rest completed 2 or 3 tasks before (Low Burden). 28 Low Burden participants were randomly chosen to balance the groups. Using FSL's standard pipeline at the individual level and permutation-based testing (5000 permutations) at the group level, we found that the Low Burden group had greater BOLD in lateral occipital cortex and parietal regions compared to the High Burden Group for monetary Gain conditions ($p < .05$). However, groups did not differ on loss trials. Further, the High Burden Group produced no main effects. Importantly, the inclusion of the High Burden group in full analyses diminished previous findings for the full sample. These data warn that as studies have gotten longer, attempting to make the most out of participant presence, neuroimagers may have inadvertently created a context of participant fatigue through time and cognitive burden.

FUNDING: National Science Foundation [1228522].

WHEN I GET LOW, I GET HIGH: DIVERGENCE BETWEEN AFFECTIVE AND AUTONOMIC RESPONSES TO AVERSIVE STIMULI

Wendy D'Andrea[1], Ashley Doukas[1], Greg Seigle[2]
[1]*The New School for Social Research,* [2]*University of Pittsburgh*

Psychology has generally taken the view that, when it comes to arousal, less is more. But for some participants, having more emotion and increasing autonomic activity may instead represent target states, suggesting a contextual difference in the valence coding of affect and arousal. The present study tested if trait subjective and baseline physiological arousal showed compensatory reactions to an aversive stimulus (shock) in an emotion regulation paradigm. 80 people engaged in two tasks: one where they were asked regulate high-threshold stimuli through reappraisal or shock; and one where they were asked to tolerate low-threshold stimuli. They were stratified on subjective trait hyper-arousal (exaggerated emotional reactivity and startle) or hypo-arousal (emotional numbing, difficulty experiencing pleasure, and difficulty describing states); concurrent autonomic activity and emotional response to the two tasks were recorded. Hyper-aroused people experienced a reduction in subjective arousal during low-intensity tasks, which corresponded to lower SCR and HR (p's $< .05$), whereas hypoaroused people had an increase in subjective and autonomic arousal during high-intensity tasks, which corresponded to lower negative affect. We situate these results within life history and social context. These findings show that an internal context of arousal overrides whether a painful stimulus is experienced as aversive, and have implications for a) parsing the confluence of subjective and objective arousal and b) contextualizing emotion regulation goals within divergent internal landscapes.

HIDDEN PATIENTS: USING PSYCHOPHYSIOLOGICAL RESPONSES TO REWARD AND LOSS TO IDENTIFY SUB-THRESHOLD INDIVIDUALS ON A CLINICAL MEASURE

Ellen Yates[1], Wendy D'Andrea[1], Greg Seigle[2]
[1]*The New School for Social Research,* [2]*University of Pittsburgh*

Much previous work has demonstrated links between dissociation and measures of neurobiological functioning. Yet, the nature of the relationship between dissociation and reward processing remains elusive. Moreover,

psychometrics of the self-report measures needed to begin to examine this relationship have historically relied almost exclusively on diagnostic or behavioral data. Thus, we conducted a taxometric analysis the Dissociative Experiences Scale (DES), comparing the diagnostically established threshold (30) against BOLD reactivity to a reward receipt and loss task in an archival community sample of adults (N=169), recruited between 2012 and 2017 in Pittsburgh and New York City. Findings show evidence of taxonicity in the reactivity across 18 regions or canonical brain networks; such taxonicity was indicated in 15 regions or networks under loss conditions, but in only three of these regions under win conditions. As a group, reactivity in these regions and networks indicated brain-based thresholds (M=20.17, Mode=23, SD=10.43) lower than the established one. Taken together, these results suggest that reliance in research or clinical practice on self-report measures may allow apparently subthreshold individuals who are experiencing measurable physiological changes to go unnoticed. Even further, the practice of including physiology in psychometric analysis allows for better characterization of the relationship between constructs involved, such as the difference in relationship type between dissociation and reward versus loss uncovered here.

SYMPOSIA VI-2

LOOKING BEYOND THE AMYGDALA: THE NEURAL MECHANISMS OF VISUAL EMOTION PROCESSING

Chairs: Johanna Kissler[1], Andreas Keil[2]
[1]*Bielefeld University;* [2]*University of Florida, Gainesville*

Processing of emotionally relevant cues is a vital task for living organisms. A dominant view has been that emotion processing relies on dedicated circuits in the brain, with the amygdala as a key hub. This view has been recently revised in favor of flexible and distributed neural mechanisms for visual emotion processing. This symposium provides an overview of this work. Kissler and colleagues discuss findings from lesion studies indicating a selective reduction of early emotion enhancements following loss of right but not left amygdala but no effect on hemodynamic responses. Carretie et al. present stimuli varying in threat-relevance, finding support for emotional evaluation of non-face stimuli already in the early afferents of the visual system. Schindler and colleagues use masking and selective attention tasks to characterize the chronometry and functional neuroanatomy of emotional face perception in combined EEG-fMRI recordings which suggest task independence of the N170 ERP and correlated amygdala activity. By contrast, Pourtois et al. demonstrate context dependence of early physiological responses in a switching attention task involving aversive contexts. Finally, Keil et al. report on a series of studies examining how lower-level visual processes change during emotional learning suggesting that the configuration of structures involved in emotional evaluation changes with experience. The talks show how emotional stimulus evaluation is accomplished by various neural mechanisms, leveraging information about context, past experience, and statistical regularity.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.7 Skin responses, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.22 Learning/conditioning, 4.23 Emotion/affect

TIME- AND HEMISPHERE-SPECIFIC CONTRIBUTIONS OF MEDIAL TEMPORAL LOBES TO VISUAL EMOTION PROCESSING: INSIGHTS FROM UNILATERAL ANTEROMEDIAL TEMPORAL LOBE RESECTIONS.

Johanna Kissler, Enya Weidner, Malena Mielke, Lea-Marie Reisch, Christian Bien
Bielefeld University

Emotionally salient stimuli enjoy privileged processing compared to neutral ones. This is typically reflected in larger visually evoked brain potentials (ERPs) and stronger hemodynamic responses in the extended visual cortex. The medial temporal lobes and primarily the amygdalae are thought to drive such enhancements but the dynamics of this putative influence remain underspecified. Here, we present data from patients after unilateral resection of left- (N=18) or right-hemisphere (N=20) anteromedial temporal lobes, including the amygdala, and healthy controls who participated in EEG and fMRI experiments encompassing free viewing of negative or neutral faces, scenes, and words. Across all stimuli a consistent pattern emerged: In the EEG, right hemisphere resection resulted in loss of early (P1, N1) emotion enhancements with subsequent recovery to normal levels at later processing stages (P3, LPP). Following left hemisphere resections, emotion enhancements were preserved or even enhanced for mid-latency (EPN) and late components (LPP). By contrast, fMRI data revealed intact emotion enhancements in visual cortices with little evidence of emotion-specific reductions in BOLD response following the resections.

This suggests that recruitment of distributed visual networks during sustained processing masks specific contributions of medial temporal lobes that occur primarily in early processing. These data specify the contributions of left and right medial temporal lobes to distinct stages of visual emotion processing and thereby constrain theories of visual emotion processing.
FUNDING: German Research Foundation (DFG).

ULTRA-FAST BRAIN RESPONSE TO EMOTIONAL VISUAL STIMULI: A DOUBLE EXPERIMENT APPROACH

Luis Carretie, Uxia Fernandez-Folgueiras, Dominique Kessel, Guzman Alba, Estrella Veiga-Zarza, Manuel Tapia, Fatima Alvarez
Universidad Autonoma de Madrid

Initial evaluation structures (IESs), those first detecting emotional visual stimuli, remain undefined. Latency is a key clue that may support some traditional hypotheses (amygdala as IES, its first detection of non-facial emotional visual stimuli occurring beyond 200 ms) or others, more recent ones (structures in the ascending visual route itself as IESs, potentially faster). Greater amplitudes in the fastest visual ERP components (N40, C1, P1) to emotional than to neutral non-facial stimuli would support the latter. Negative (spiders) and neutral (wheels) silhouettes (sharing their low-level visual parameters) were presented in two experiments (n=36 and 35). In both we employed i) a high number of trials to increase the signal-to-noise ratio, ii) stimuli with gestalt characteristics to enhance the response of contour-sensitive neurons in V1/V2, and iii) a high-pass filter at 0.01Hz, convenient for early ERPs. Experiment 2 introduced additional implementations. Both N40 (39 ms) and C1 (80 ms) in Experiment 1, as well as N40 (45 ms) and P1 (105 ms) in Experiment 2, were elicited by stimuli presented at fixation. Significantly greater N40-C1/P1 peak-to-peak amplitudes to spiders were found in both experiments. These effects were not explained by C1/P1 alone, N40 contributing significantly in both experiments. Source analyses pointed to V1 as a N40 focus. Main sources for C1 were V1 and V2/LOC, and V2/LOC in the case of P1. These results and their timing tip de balance to hypotheses proposing the ascending visual route itself as the IES.
FUNDING: Ministerio de Ciencia e Innovación, Spain (MICINN).

DISSOCIATING EARLY AND LATE DIFFERENTIAL EMOTIONAL FACE PROCESSING BY ATTENTION TASKS AND MASKING PROCEDURES: COMBINED EEG-FMRI FINDINGS

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University of Münster

There is an ongoing interest in understanding how limited attentional conditions affect the differential processing of emotional visual information across the processing stream. For decades, the role of the amygdala has been debated, while recent findings also propose other mechanisms for how the brain enables differential responses to emotional information under limited attention. Here, specific task conditions allow the study of the chronometry of differential processing and the differentiation of early and late modulations of event-related potentials (ERPs). In contrast to later ERPs, early differential amplitude increases for emotional visual stimuli remain intact under various distraction tasks, including perceptual distraction, load, or efficient masking procedures. Specifically, we show that the differential N170 amplitude towards emotional information is invariant to various tasks, including efficient masking procedures. We present combined EEG-fMRI results from a study using efficient masking of fearful and neutral faces. ERP results show a shared differential N170 response to fearful faces irrespective of stimulus visibility. The shared increases in hemodynamic responses to fearful faces can be mapped to related visual areas. In contrast, differential responses to fearful faces are observed in the amygdala, where only visible fearful faces elicit stronger activations than neutral ones. The findings inform different theories of visual-emotional information processing in the brain, and we provide an outlook on remaining important questions and conflicting findings.

ON THE LOOKOUT FOR A THREAT: NEUROPHYSIOLOGICAL EFFECTS OF HYPERVIGILANCE ON ATTENTIONAL FLEXIBILITY BETWEEN EXTERNAL AND INTERNAL SOURCES OF INFORMATION

Gilles Pourtois, Nan Wang, Sam Verschooren
Ghent University

Hypervigilance produces an increased scanning of the external environment, potentially at the cost of attention to internal information. Using EEG, psychophysiological and behavioral data, we assessed effects of hypervigilance on attentional flexibility between external and

internal sources of information. Fifty participants performed the switching attention task (SAT) while either a safe or an aversive sound was played at unpredictable times. 64-channel EEG was recorded continuously. Using the SAT, participants had to process either external information or internal information held in memory, and these two trial types were shown in a random order to yield either repetitions or switches of external and internal attention. At the psychophysiological level, participants showed a larger skin conductance response in the threatening than the safe condition. Behaviorally, hypervigilance interfered with attentional flexibility, as revealed by a symmetrical cost when switching between external and internal attention compared to the safe condition where it was asymmetrical. Moreover, at the EEG level, internal attention led to a perceptual decoupling early on following stimulus onset, as shown by the P1 and N1 components; and this neurophysiological effect was influenced by hypervigilance. These results suggest that the increased scanning of the environment, which is typically associated with hypervigilance, could result in impaired attentional flexibility, and more specifically an inability to maintain internal attention.

REGION-SPECIFIC TRIAL-BY-TRIAL DYNAMICS OF FEAR ACQUISITION AND EXTINCTION - TESTING AN ADAPTIVE POPULATION TUNING MODEL USING EEG-FMRI

Andreas Keil, Andrew Farkas, Jurdan Pouliot
University of Florida

Classical aversive conditioning is a well-established laboratory model for studying acquisition and extinction of defensive responses. In experimental animals as well as in humans, research to date has been mainly focused on the role of mid-temporal structures (e.g., the amygdala) in these responses. Recent evidence has begun to stress the role of the brain's sensory and attention control systems in maintaining, elaborating, and curating the neural representations of conditioned responses. The present talk discusses findings from several studies using aversive generalization conditioning, using EEG data as well as concurrent EEG-fMRI recordings. The data are conceptually and computationally modeled through an adaptive population tuning framework, in which brain responses evolve to optimize efficiency and fidelity of threat representations as learning progresses. Across studies, trial-by-trial analyses showed that: 1) BOLD signals in the amygdala tended to vary as a function of prediction errors; 2) visuocortical signals displayed sharpening, with tuning to the conditioned feature becoming more narrow over time. 3) attention signals increasing and changing throughout acquisition and extinction.
FUNDING: NIMH R01MH125615.

SYMPOSIA VI-3

WHAT IS THE CATCH WITH NEW ANALYSES METHODS IN PSYCHOPHYSIOLOGY?

Chairs: Daniela Pfabigan, Lin Sørensen
University of Bergen

Discussant: Daniela Pfabigan, University of Bergen

Innovative and advanced analyses are often suggested to improve the understanding of the complex, biological systems underlying body-mind interactions. The reason for this is that established psychophysiological analyses methods are often a useful simplification, but almost always fail to fully capture signal complexities inherent to biological systems. This symposium will provide the latest trends of advanced signal processing and computational modeling approaches in psychophysiology. Lin Sørensen (University of Bergen) presents a graph theory approach to disentangle subtle sex differences in spontaneous fluctuations in heart inter-beat intervals. Jakub S. Gąsior (Medical University of Warsaw) shows the benefits of taking different breathing patterns into account when modeling nonlinear heartrate variability measures in children. Subsequently, Cameron Hassal (MacEwan University) presents a deconvolution approach to successfully unmix rapidly occurring reward-related activity in a naturalistic EEG paradigm. Lastly, Franz Wurm (Leiden University) demonstrates how model-based trial-level analyses of EEG data can inform our understanding of decision-making stages. The symposium will be concluded by Daniela M. Pfabigan (University of Bergen), discussing the advantages and pitfalls of the presented analyses approaches and implications for the presented results. The aim of this symposium is to provide a balanced view on recent analytical advances by bringing together a varied group of researchers from different academic backgrounds, career stages, and scientific interests.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.15 Computational / Simulation, 3.3 Lab Based Experiment, 4.3 Sex differences, 4.19 Motivation, 4.26 Other

USING AN INNOVATIVE, NON-LINEAR GRAPH THEORETICAL METHOD IN DETECTING SUBLTE SEX DIFFERENCES IN INTER-BEAT INTERVALS OF THE HEART AMONG YOUNG HEALTHY ADULTS

Lin Sørensen[1], Elisabet Kvadsheim[1], Julian Thayer[2,3], DeWayne Williams[2], Ole Fasmer[1], Berge Osnes[1]
[1]University of Bergen, [2]University of California, Irvine, [3]Ohio State University

Inter-beat intervals (IBIs) of the heart are regulated by complex biological systems causing frequent spontaneous fluctuations in heart rate. These spontaneous fluctuations may not be reflected in traditional measures of variability in IBIs. Due to different lifespan trajectories of IBIs between the sexes, more subtle sex differences are expected to be found in young adulthood. Males tend to have a higher IBI variability than females during adolescence, whereas this changes during adulthood with females showing higher IBI variability. We therefore investigated sex differences in a large sample of young healthy adults between 18 to 30 years old (N = 273) using a non-linear, similarity graph algorithm. The algorithm allows for calculating different segments of IBIs in 2+2 neighbors providing smaller time windows of 2-5 s and 10+10 neighbors providing longer time windows of 12-25 s. In comparison, the traditional measures of IBIs variability are linear with time windows of 1-5 min. The results showed that males had higher inter-relatedness in IBIs than females with the graph algorithm, but the differences were only significant using the smaller time windows of 2+2 neighbors (p=.008). Traditional measures of IBIs variability (RMSSD, high/low frequency) did not show significant differences. These results indicate that non-linear methods allowing for studying IBIs in smaller time windows can be more sensitive for measuring rapid, spontaneous effects on IBIs, and thereby complement the traditional measures of IBIs in understanding the relation between the body and mind.

"BREATHE NATURALLY, SPONTANEOUSLY" COMMAND ALTERS BREATHING RATE AND LINEAR AND NON-LINEAR HEART RATE VARIABILITY IN HEALTHY ADOLESCENT BOYS

Jakub Gąsior, Bożena Werner
Medical University of Warsaw

As there is no optimal solution on how to control respiratory rate (RespRate) in studies on heart rate variability (HRV), participants have commonly been asked/instructed to breath naturally or spontaneously. We observed that the command "breath naturally, spontaneously" alters RespRate pattern during short-term electrocardiographic recordings (ECGs) in healthy children. The aim of this pilot study was to assess changes in RespRate after the mentioned command and to verify whether these changes influence linear and nonlinear HRV in healthy boys. A total of 14 boys (11 ± 1 years) participated in the study. Linear (frequency-domain parameters) and non-linear (symbolic dynamics measures) HRV analyses were performed based on two consecutive 5 min ECGs (1000 Hz): first without any command/instructions (Rest) followed by HR and RespRate stabilization (10 min), and second preceded by the command "breath naturally, spontaneously" (Breath). RespRate (abdomen and thorax video recorded; breaths per min) during stabilization, Rest and Breath were: 17 ± 3, 17 ± 3 and 16 ± 3, respectively. There was a significant increase in high-frequency power and the rate of patterns with two unlike variations from symbolic analysis (vagal modulation), and a decrease in low-frequency power and the rate of patterns with no variations (sympathetic modulation) during Breath compared to Rest. The simple command "breath naturally, spontaneously" altered RespRate and significantly changed linear and non-linear HRV in healthy adolescent boys. Symbolic analysis may be used to detect sympathovagal shift.

REGRESSION-BASED EEG ANALYSIS APPROACHES FOR RAPID AND CONTINUOUS COGNITION

Cameron Hassall[1], Yan Yan[2], Laurence Hunt[3]
[1]MacEwan University, [2]Stanford University, [3]University of Oxford

Electrophysiological responses are traditionally isolated by spacing experimental events in time. This approach may not be possible in naturalistic tasks, which can involve rapidly occurring or continuous stimuli. The problem is that a traditional averaging procedure such as the method of event-related potentials (ERPs) will produce a signal that reflects an overlap of brain responses. However, these overlapping responses can be unmixed using a regression-based approach called deconvolution. We will begin by describing deconvolution in general, then show how we have used it to unmix rapidly occurring reward-related activity during naturalistic tasks such as drumming. Several advantages of the deconvolution approach will be discussed. We will conclude by describing how in addition to rapidly occurring stimuli, deconvolution can be used to measure the brain's response to continuous stimuli (the temporal response function or TRF). We will illustrate

how this approach can reveal cognitively relevant signals during continuous decision-making and continuous feedback processing.

MODEL-BASED TRIAL-LEVEL ANALYSIS AS A WINDOW INTO THE NEURAL MECHANISMS OF VALUE AND STRUCTURE LEARNING

Franz Wurm[1], Benjamin Ernst[2], Marco Steinhauser[2]
[1]University of Leiden, [2]Catholic University of Eichstätt-Ingolstadt

EEG research on reward processing has traditionally relied on aggregate-level analyses. This "ANOVA" approach is limited by its necessity to group trials into separate conditions, putting strong constraints on the choice of paradigms and experimental manipulations. To unravel the dynamics of reward-related decision-making and neural activity, we need methods that are sensitive to the nuanced trial-by-trial variations in human behavior and EEG. Recent advancements advocate for the adoption of model-based trial-level analyses. In a multi-decision bandit paradigm in which the mapping between decisions and outcomes is hidden from direct observation, we demonstrate the added value of computational modelling. First, we use model selection to identify the most plausible cognitive mechanism to describe human behavior. Second, we use posterior predictive checks to show the dynamics of learning and explain how such a mechanism solves the task by inferring the hidden decision-outcome mapping. Finally, we search for correlates of the central model variables in the human EEG. The neural patterns clearly support quantitative predictions of our reinforcement learning model. Besides low-level predictions errors for candidate mappings, we also found higher-level signals reflecting credit assignment and arbitration of control towards the correct decision-outcome mappings. In summary, when behavior and EEG data are analyzed using model-derived trial-level estimations of latent cognitive variables, we can gain unparalleled insights into the mechanisms underlying reward processing and learning.

SYMPOSIA VI-4

REVISITING THE RELATIONSHIP BETWEEN AUTONOMIC REACTIVITY AND AFFECTIVE AND THREAT-RELATED PROCESSES

Chair: Carlos Ventura-Bort
University of Potsdam

It is well accepted that feelings of excitement or threat co-occur with physiological changes. However, the complexities surrounding affect-related physiological responses, including their connection to emotional experiences, temporal consistency, and relationship to learning processes, remain topics of ongoing debate. Showcasing a wide range of multivariate methodologies, including machine learning and representational similarity analysis on autonomic (SCR, HR, startle) and BOLD fMRI data, this symposium will provide novel insights into the dynamics of physiological reactions within affect-inducing contexts. First, *Hedwig Eisenbarth* will present data about the contribution of SCR and HR for determining emotional states in both natural and controlled settings. Next, *Alina Koppold* will explore the relationship between valence, arousal, and SCR and startle, to clarify whether events eliciting similar affective experiences produce comparable physiological reactions. While the autonomic reactivity pattern elicited by established paradigms such as fear conditioning is well-documented, the question remains as to whether these patterns exhibit temporal stability. To address this, *Maren Klingelhoefer-Jens* will present findings on the temporal robustness of SCR and BOLD fMRI evoked by a fear conditioning paradigm. Lastly, *Carlos Ventura-Bort* will explore the relationship between autonomic reactivity and learning processes, investigating the correspondence between SCR and startle, and measures of associative learning change and uncertainty across a series of fear conditioning studies. *Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 2.17 Machine Learning/ Deep Learning, 3.1 Observational Study: Cross-Sectional, 4.23 Emotion/affect*

LINKING AUTONOMIC NERVOUS SYSTEM ACTIVITY TO BODY MOVEMENT AND SUBJECTIVE EXPERIENCES.

Hedwig Eisenbarth, Roydon Goldsack, Areito Echevarria, Nicola Hyland, Bastiaan Kleijn
Victoria University of Wellington

When we move in our world and encounter emotional stimuli, both internal or external, our body is ideally

smoothly adjusting to those situations, for a concerted physiological, behavioral and emotional response. Therefore, we think that body movement not only impacts the way we feel but also in turn reflects our feelings, that body movement evokes physiological reactions and can be a result of those. Across two datasets with individuals moving in space, one in a more or less natural conversation with another person (dyadic data), once in with single individuals performing a variety of emotional states and intensities (performance data), we investigated the contribution of physiological activity (HR and SCR) for determining emotional states in comparison to body movement information, using machine learning models that account for time course data. For the dyadic data, the physiological activity data contributed significantly more to explain the emotional state of the individuals in those dyads, compared to the body movements. We compare those to the performance data derived models and in addition compare the models for different emotional states and intensity levels. Results from these comparisons allow us to understand the body - physiology connection in varying emotional states.

FUNDING: Victoria University Research Trust and Ministry of Business, Innovation and Employment.

PHYSIOLOGICAL HARMONY OR DISCORD? UNVEILING THE CORRESPONDENCE BETWEEN SUBJECTIVE AROUSAL AND VALENCE AND PHYSIOLOGICAL RESPONSES

Alina Koppold[1], Manuel Kuhn[2], Tina Lonsdorf[1,3], Mathias Weymar[4], Carlos Ventura-Bort[4]
[1]*University Medical Center Hamburg-Eppendorf,* [2]*Harvard Medical School,* [3]*University of Bielefeld,* [4]*University of Potsdam*

Subjective affective experiences - characterized by valence and arousal- often coincide with physiological changes. Despite this, the correspondence between affective experiences and physiological responses is still unclear. Earlier studies suggest that similar affective experiences may evoke specific physiological responses, but recent studies point to physiological variation among events evoking similar affective experiences. To unravel this relationship, we investigated the correspondence between physiological reactions and subjective arousal and valence, using representational similarity analysis. In two independent samples (discovery, N=483, replication, N=64) and three affect-inducing tasks, SCR and startle responses were compared to models of subjective affect that either assume similar or dissimilar physiological responding among trials evoking comparable affective experiences. In the discovery sample, decisive evidence for a correspondence between SCR and models of arousal that assume variation (particularly between high arousing events) was found. Similar results were observed in the replication sample. For startle responses, decisive evidence for a relationship with models of valence that assume variation (particularly between unpleasant events) was also found. These findings were, however, not found in the replication sample. Overall, these results indicate that physiological variation may be the norm between trials evoking similar affective experiences and invite to reconsider the relationship between affective experience and physiological reactivity.

FUNDING: This research was supported by a grant from the Federal Ministry for Economic Affairs and Climate Action (EXIST program; number: 03EGSSI013) as well as an individual grant awarded by the German Research Foundation (DFG LO1980/4–1) and a grant awarded by the German Research Foundation in the context of the Transregional Collaborative Research Center CRC 58 with projects Z02 (INST 211/438–4) and B07 (INST 211/633–2 and INST 211/633–1).

USING REPRESENTATIONAL SIMILARITY ANALYSIS TO ASSESS THE TEMPORAL STABILITY OF SCR AND BOLD FMRI IN A FEAR CONDITIONING PARADIGM

Maren Klingelhoefer-Jens[1], Manuel Kuhn[2], Vincent Keyaniyan[1], Tina Lonsdorf[1,3]
[1]*University Medical Center Hamburg-Eppendorf,* [2]*Harvard Medical School,* [3]*University of Bielefeld*

Fear conditioning tasks are widely used to shed light on physiological changes during threat-related contexts. Specifically, they aim to investigate mechanisms underlying fear- and anxiety-related processes in the lab. However, little is known about the temporal stability of these physiological changes across repeated measurements which is crucial for making (long-term) individual-level predictions. 120 participants underwent a differential fear conditioning paradigm, repeating fear acquisition and extinction within a 6-month period. Temporal stability of SCR and BOLD fMRI conditioned responses was assessed using a representational similarity analysis (RSA)-related approach. We investigated whether an individual's baseline responses were more similar to their own (within-subject similarity) or to those of others (between-subject similarity) at the 6-month follow-up. Mostly, SCRs of one individual at baseline were not more similar to responses of the same individual compared to others at follow-up indicating limited temporal stability. However, for BOLD fMRI, within-subject similarity was significantly higher

compared to between-subject similarity during acquisition, but not extinction. These results raise the question whether BOLD fMRI may be more stable over time than SCRs at an individual level or if RSA-inspired approaches might be more sensitive to detecting BOLD fMRI than SCR individual-level similarity. These findings emphasize the importance of establishing the assessment of the temporal stability of physiological measures as a standard practice in the field.

FUNDING: Emmy Noether Project of the DFG (Project ID: LO1980/6-1).

BURNED IN THE SKIN, STORED IN AN EYE BLINK: THE CORRESPONDENCE BETWEEN SCR, STARTLE, ASSOCIATIVE LEARNING AND UNCERTAINTY IN THE CONTEXT OF AN AVERSIVE LEARNING TASK

Carlos Ventura-Bort[1], Christoph Szeska[1,2], Mathias Weymar[1], Julia Wendt[1]
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In aversive learning tasks, there is little evidence about the correspondence between physiological reactivity and the different features involved in reinforcement learning. This talk will present new findings on the relationship between startle and SCR, and indexes of associative learning and uncertainty (i.e., CS predictiveness), using representational similarity analysis (RSA). In study 1, participants underwent a differential aversive conditioning in which geometrical forms were paired (CS+) or not (CS-) with an electric shock (UCS) at different contingency rates (60%, 100%). We observed that both SCR and startle were strongly related to uncertainty, but not to associative learning models. These results could be replicated in five other studies. Considering the implications of aversive learning research for the understanding of anxiety-related tendencies, we collapsed the data from the six studies to test the association between the physiology-uncertainty similarity and anxiety scores. For the SCR, but not for the startle, we observed a negative association between the physiology-uncertainty similarity and anxiety. Inter-subject RSA further revealed that participants scoring high in trait anxiety showed a more homogeneous pattern than participants with lower anxiety scores. These findings indicate that in the context of a differential aversive conditioning, both SCR and startle responses may be indexing similar processes related to CS uncertainty and also highlight the potential of the physiology-predictiveness correspondence as a correlate of anxiety tendencies.

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SYMPOSIA VII-1

MODULATION OF CARDIAC AUTONOMIC ACTIVITY USING NON-INVASIVE BRAIN STIMULATION

Chair: Maximilian Schmausser
University Hospital Cologne, Department of Child and Adolescent Psychiatry

A well-functioning autonomic nervous system (ANS) is fundamental to effectively adapt to environmental demands and engage in goal-directed behavior. Extensive evidence indicates that activity of the ANS significantly interacts with cognitive and emotional processes. Consequently, various theoretical approaches have proposed that overlapping cortico-subcortical networks promote a synchronized regulation of cognitive, emotional, and autonomic processes. Supporting these assumptions, findings from neuroimaging studies have identified cortical and subcortical nodes involved in cognitive, emotional, and autonomic regulation alike. The exact mechanisms underlying this synchronization, however, remain to be clarified. Given the well-known shortcomings of neuroimaging, new investigative methods are warranted in this regard. The use of non-invasive brain stimulation (NIBS) has not only proved a viable tool to investigate causal contributions of specific cortical regions to various cognitive and emotional but has also recently been shown to be effective in altering cardiac markers of ANS activity. In this symposium, we present four trials using magnetic (TMS) as well as electronical stimulation with either constant (tDCS) or alternating current (tACS) to study the cortical regulation of cardiac markers of ANS functioning and its connection to cognition and emotion. In doing so, all studies combined the respective NIBS methods used with cognitive or behavioral tasks and/or further behavioral or neuroimaging outcome measures.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions, 4.26 Other

THE DYNAMIC ROLE OF THE LEFT DLPFC IN NEUROVISCERAL INTEGRATION: DIFFERENTIAL EFFECTS OF THETA BURST STIMULATION ON VAGALLY-MEDIATED HEART RATE VARIABILITY AND COGNITIVE-AFFECTIVE PROCESSING

Maximilian Schmausser[1], Sylvain Laborde[2], Markus Raab[2]
[1]University Hospital Cologne, [2]German Sport University Cologne

Adapting to the ever-changing demands of the environment requires a complex interplay between cognitive-affective, neuronal, and autonomic processes. Vagally-mediated heart rate variability (vmHRV) is positively associated with both cognitive-affective functioning and prefrontal cortex (PFC) activity. The PFC is suggested to play a shared role in the regulation of cognitive-affective processes and autonomic nervous system (ANS) activity. While there are numerous correlational findings in this regard, no study so far has investigated whether the manipulation of PFC activity induces changes in vmHRV and cognitive-affective processing in an inter-dependent manner. In this study, we examined the effects of continuous (cTBS) and intermittent theta-burst stimulation (iTBS) over the left dorsolateral PFC (dlPFC) on vmHRV and cognitive-affective processing within an emotional stop-signal task (ESST) in 66 participants. Our results revealed that both resting vmHRV and reactivity predicted cognitive-affective processing. Furthermore, we found a dampening effect of cTBS on resting vmHRV, as well as an enhancing effect of iTBS on ESST performance. Our results show no direct association between vmHRV changes and ESST performance alterations following stimulation. We interpret our results in the light of a hierarchical model of neurovisceral integration, suggesting a dynamical situation-dependent recruitment of higher-order cortical areas like the dlPFC in the regulation of the ANS.

EXPLORING THE RELATIONSHIP BETWEEN MIDFRONTAL THETA OSCILLATIONS AND AUTONOMIC RESPONSES TO ERRORS. A HIGH-DEFINITION TRANSCRANIAL ALTERNATING CURRENT STIMULATION (HD-TACS) STUDY

Sarah Boukarras[1,2], Valerio Placidi[3,4], Salvatore Aglioti[5,6], Gabriele Fusco[7,8]
[1]Sapienza University, [2]Santa Lucia Foundation (IRCCS), [3]Sapienza University, [4]University of Camerino, [5]Sapienza University, [6]Santa Lucia Foundation (IRCCS), [7]Sapienza University, [8]Santa Lucia Foundation (IRCCS)

The ability to monitor one's own performance is crucial for driving successful goal-directed behaviours. During cognitive and motor tasks, errors elicit midfrontal theta oscillations (i.e. MFΘ) and transient autonomic changes (e.g. cardiac deceleration). Interestingly, both MFΘ and autonomic changes are linked to the activity of the anterior cingulate cortex (ACC), a medial frontal area in the central autonomic network (CAN) responsible for the regulation of behavioural and visceral responses. However, the strength and type of any causal link between midfrontal theta and autonomic responses during error processing is underexplored. In the present study, we tested the hypothesis that boosting MFΘ oscillations would hyperactivate the performance monitoring system and consequently increase autonomic responses to errors during a cognitive task. To test this hypothesis, we delivered theta (6 Hz), gamma (30 Hz, as a control frequency) or sham high-definition transcranial Alternating Current Stimulation (HD-tACS) over the ACC of healthy participants performing the Letter-Flanker task. Cardiac responses were quantified as changes in inter-beat intervals (IBIs) following correct or erroneous trials. Preliminary results (N = 10) revealed that IBI length increased following erroneous compared to correct trials, confirming the error-related cardiac deceleration. Unexpectedly, both theta and gamma HD-tACS, compared to sham, reduced the amplitude of cardiac deceleration, suggesting a possible nonspecific effect of tACS-related frequencies.

FUNDING: Sapienza grant "Avvio alla Ricerca 2023" number AR223188B425756F.

DOSE-DEPENDENT RESPONSE OF PREFRONTAL TRANSCRANIAL DIRECT CURRENT STIMULATION ON HEART RATE VARIABILITY: AN ELECTRIC FIELD MODELING STUDY

Laís Razza[1], Stefanie De Smet[1], Stevan Nikolin[2], Xander Cornelis[1], Matias Pulopulos[3], Andre Brunoni[4], Rudi De Raedt[3], Marie-Anne Vanderhasselt[1]
[1]Ghent University Hospital, [2]University of New South Wales, [3]Ghent University, [4]Universidade de Sao Paulo

Transcranial direct current stimulation (tDCS) of the prefrontal cortex (PFC) modulates the autonomic nervous system by activating deeper brain areas via top-down pathway. However, effects on the nervous system are heterogeneous and may depend on the amount of current that penetrates into the brain. Therefore, we aimed to investigate the variable effects of tDCS on heart rate variability (HRV), a measure of the functional state of the autonomic nervous system. Using three prefrontal tDCS protocols (1.5mA, 3mA and sham), we associated the simulated individual electric field (E-field) magnitude in brain regions of interest with the HRV effects in a randomized, double-blinded, sham-controlled and within-subject trial, in which healthy volunteers received tDCS sessions separated by two weeks. Brain regions of interest were the dorsolateral PFC (DLPFC), anterior cingulate cortex, insula and amygdala. Overall, 37 participants were included, corresponding to a total of 111 tDCS sessions. The findings suggested that HRV, measured by Root Mean Squared of Successive Differences and high-frequency HRV, were significantly increased by the 3.0mA tDCS when compared to sham and 1.5mA. No other significant difference was found. E-field analysis showed that brain regions of interest were associated with HRV. However, this significance was associated with the protocol intensity, rather than inter-individual anatomical variability. To conclude, our results suggest a dose-dependent effect of tDCS for HRV and further research is warranted to investigate the optimal current dose to modulate HRV.
FUNDING: Research Foundation Flanders (FWO) grant (G0F4619N) postdoc FWO grant (Grant number: 12AZO24N)

COMBINING SLOW-PACED BREATHING AND PREFRONTAL TRANSCRANIAL DIRECT CURRENT STIMULATION: UNRAVELING THE TEMPORAL INTERPLAY ON CARDIAC INDICES OF AUTONOMIC ACTIVITY

Marie-Anne Vanderhasselt[1], Zefeng Li[1], Emmanuelle Schoonjans[2], Jens Allaert[1], Stefanie De Smet[1], Mitchel Kappen[3], Matias Pulopulos[3], Rudi De Raedt[3]
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Voluntary reduction of breathing rate (slow-paced breathing, SPB) can enhance cardiac vagal control, indexed by Heart Rate Variability (HRV), heart rate (HR), and blood pressure (BP). Furthermore, skin conductance can index sympathetic nervous system activity during breathing. Additionally, transcranial direct current stimulation (tDCS) can modulate the excitability of the prefrontal region and exert an impact on vagal nerve tone. However, fundamental research on the combination of SPB and prefrontal tDCS to enhance physiological indices of autonomic nervous system functioning is scarce. 200 participants were randomized into 4 sham-controlled groups. Each group received either 20 min of active or sham tDCS combined with a SPB or 15 BPM breathing intervention. Regardless of tDCS condition, the SPB group showed (vs. 15 BPM breathing group) a significant increase in HRV. Regardless of breathing condition, the active (compared to sham) tDCS group exhibited higher HR in the second half of the intervention, suggesting more sympathetic arousal. There was no combined effect on HRV, HR, skin conductance levels, systolic and diastolic BP. These results demonstrate the effectiveness of SPB in promoting the influence indices of ANS that are associated with a more relaxed mental and physical state. However, in contrast to our hypotheses, prefrontal tDCS may produce effects that counteract those of SPB. Furthermore, the combination of SPB and prefrontal tDCS did not have the amplifying effects that we expected. Lessons learned and future research directions will be discussed.
FUNDING: FWO-Flanders for research projects for fundamental research (Grant Numbers: G044222N; G044019N) FWO-Flanders for research projects for fundamental research (Grant Number 12C9923N) grant for a Concerted Research Action of the Special Research Fund of Ghent University (01G00623).

SYMPOSIA VII-2

NEUROPHYSIOLOGICAL CORRELATES OF SOCIO-EMOTIONAL COMMUNICATION

Chairs: Florian Bublatzky[1], Stefan Schweinberger[2]
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The exchange of emotional and social information is integral to human relationships and interactions. However, the brain processes involved are manifold and have far-reaching implications for navigating social life. This symposium spans a broad range of current socio-emotional research from voice to touch, children to adults, healthy and pathological mechanisms using various psychophysiological methods. Uta Sailer provides a review on recent research on social touch and interpersonal relationships, addressing afferent peripheral and central nervous measures. Markus Tünte then takes a developmental perspective on affective touch, addressing interoception (respiration, heartbeat detection) and dyadic relationships between 3–18–month old infants and primary care givers. Christine Nussbaum presents ERP data on vocal emotion perception based on acoustic cues via parameter-specific voice morphs (pitch vs. timbre) in musicians and non-musicians. Florian Bublatzky examines interindividual differences in defensive reflex activity and trust behavior in a transdiagnostic clinical sample using an instructed learning paradigm. Finally, Karl-Philipp Flösch concludes on oscillatory brain activity in role taking and socially cooperative and competitive behavior in a dyadic game with human and computer partners. Overall, this symposium takes an integrative perspective from basic sensory parameters in touch and voice perception to psychophysiological responding, social learning to attachment, relevant psychopathology, and ultimately to multimodal socio-emotional communication.

FUNDING: This work was supported in part by the German Research Foundation (BU 3255/1-1 and /1-2).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.13 Speech/language, 4.23 Emotion/affect

FROM SKIN TO BRAIN: TRACING THE PATHWAYS OF SOCIAL TOUCH

Uta Sailer
University of Oslo

Interest in the role of touch in interpersonal relationships has grown considerably over the last two decades. This interest has been fueled in part by research on C-tactile afferents (CTs), which has led to a view of "skin as a social organ". However, we still know little about the neural mechanisms underlying touch in social interaction. The talk takes its starting point at the functions of touch in social interactions, focusing on emotion and stress regulation, bonding, and communication. I will summarise neuroscientific studies that have used a range of different methods to investigate these different functions in non-human animals and humans. The talk will also explain the role of CTs as reinforcers of slow caress-like touch rather than mediators of pleasant sensations. This view is based in part on the fact that a caress can be both pleasant and unpleasant. I will suggest that rather than assuming that a particular type of touch (e.g. caress or hug) is conducive to bonding, it is the message conveyed by the touch that is crucial to bonding and social relationships.

THE RELATIONSHIP BETWEEN INFANT INTEROCEPTIVE SENSITIVITY WITH MATERNAL INTEROCEPTION AND AFFECTIONATE TOUCH

Markus Tünte[1], Stefanie Höhl[1], Trinh Nguyen[2], Nadine Pointner[1], Nina Maier[1], Manos Tsakiris[3], Ezgi Kayhan[4]
[1]University of Vienna, [2]Italian Institute of Technology, [3]Royal Holloway University of London, [4]University of Potsdam

Interoception, the perception of internal physiological processes, is crucial for early development as infants depend on their primary caregiver for their regulation. However, we are lacking empirical research on interoception in infancy. Here, we investigate infants' sensitivity to their interoceptive signals, and their link to maternal interoception and affectionate touch. We use a MEGA-analytic approach pooling together data spanning

3-18-month-old infants and their primary caregiver. In two preferential looking paradigms that couple infants' cardiac or respiratory signals with stimuli presentation we find evidence for an increase of respiratory interoceptive sensitivity towards 18 months ($N = 100$, $p = .004$), but not cardiac interoceptive sensitivity ($N = 103$). Further, we find that 9-month-old infants' cardiac, but not respiratory, interoceptive sensitivity scores are related to their mother's performance on a heartbeat detection task ($N = 33$, $b = 3.86$, 95% CI [0.24, 7.57]). Lastly, in 4-6 ($N = 46$) and 9-month-old infants ($N = 32$) we measured maternal affectionate touch by rating videos of a free-play interaction and maternal interoception using a heartbeat counting task. We find exploratory evidence that affectionate touch is negatively related to maternal interoception at 9 months ($p = .04$), but not at 4 months. We do not find that affectionate touch is related to infant interoceptive sensitivity. In sum, our findings provide an important empirical basis on interoception in infancy while highlighting the complex role of maternal interoception and affectionate touch.

ELECTROPHYSIOLOGICAL INSIGHTS INTO THE ROLE OF MUSICALITY FOR VOCAL EMOTION PERCEPTION

Christine Nussbaum[1], Annett Schirmer[1,2], Johannes Lehnen[1], Stefan Schweinberger[1,3]
[1]Friedrich Schiller University Jena, [2]University of Innsbruck, [3]University of Geneva

Musicians outperform non-musicians in vocal emotion recognition, presumably due to their enhanced sensitivity towards emotional voice cues, especially pitch contour. However, it is unclear whether this is due to early, automatic representations of auditory information or due to later, more controlled aspects of voice processing. To address this question, we compared the electrophysiological response to acoustically manipulated voices between musicians (n = 39) and non-musicians (n = 39). We employed parameter-specific voice morphing to create voices that express emotions selectively through pitch contour (F0), timbre, or both. Differences in event-related potentials (ERPs) between musicians and non-musicians appeared only for a centro-parietal late positive potential (500–1000 ms). A similar pattern of late but not early group differences in neuronal processing was corroborated by a re-analysis of the data using a timeseries multivariate decoding approach, which is assumed to have increased sensitivity towards small effects. Thus, musicality seems to affect later more controlled aspects of emotional processing. In line with previous behavioral evidence, the specific ERP and neural decoding patterns imply a special reliance on pitch contour in musicians, while at the same time suggesting their general flexibility and sensitivity towards emotional voice cues.

A FACE TO BE LOVED OR FEARED? PSYCHOPHYSIOLOGICAL RESPONDING TO INSTRUCTED AND REVERSED THREAT PERSONS

Florian Bublatzky, Niclas Willscheid, Miriam Pelz, Inga Niedtfeld, Christian Schmahl
Central Institute of Mental Health

Verbal communication offers an efficient way to discern trustworthiness or potential danger in others. Intriguingly, such verbal threat and safety information can be easily changed by reversal instructions. This reversal from threat to safety (and vice versa) is important for both appropriate social interactions and therapeutic interventions. Here, we explore verbal learning of threat or safety across a transdiagnostic sample encompassing individuals from healthy to highly anxious participants or severely traumatized patients (PTSD, BPD). To date, 105 participants have completed a combined threat-of-shock and reversal paradigm utilizing four neutral faces as conditioned stimuli (CS+/CS-), while measuring psychophysiological responses (startle reflex, SCR), interpersonal mistrust, and ratings. Findings confirm pronounced effects of instructed and reversed threat/safety learning. CS+ faces were consistently perceived as more unpleasant, arousing, threatening, and distrustful compared to CS- faces. Moreover, a heightened defense reflex activity was evident at the physiological level. Interindividual differences in trait anxiety levels were associated with pronounced defensive reactions for repeated reversal instructions. However, at the group level, no differences were found between healthy controls and the patient sample. In summary, socially acquired threat and safety associations can be flexibly changed and updated by new information about other people. Such reversal processes may vary among individuals, especially in those with severe anxiety and stress-related symptoms.
FUNDING: This work was supported by the German Research Foundation (BU 3255/1-2)

SOCIAL COOPERATION: DYNAMIC ROLE TAKING DURING A DYADIC GAME CAN BE TRACED BY EEG OSCILLATIONS

Karl-Philipp Flösch, Tobias Flaisch, Harald Schupp
University of Konstanz

Humans are motivationally and cognitively tuned to engage in cooperation to achieve shared goals. Brain oscillations allow for an on-line measure of how individual role taking drives stimulus relevance during collaborative tasks. Providing simplified structures of social cooperation, experimental games enable to investigate how processes of coordination unfold over time. Here, we devised a "Pacman Game" requiring players to navigate a Pacman through a maze. Varying the game rules within this social context allows to study effects of competition/cooperation, reward value, self-interest, and task difficulty. The findings show that cooperative role taking is reflected by significant changes in oscillatory activity. Specifically, induced changes in alpha/beta power revealed asymmetries in cognitive task demands, affective stimulus significance, and distinct requirements on semantic processing depending on the players' role. In addition, effects were similar when participants played the Pacman Game with human or computer partners. Findings are discussed from the perspective of the information-via-desynchronization hypothesis proposing that alpha power decreases reflect states of enhanced cortical information representation. Our data show that experimental games are a useful tool for extending basic research on brain oscillations to the domain of naturalistic social interaction as emphasized by the second-person neuroscience perspective.

FUNDING: German Research Foundation (DFG) under Germany's Excellence Strategy (EXC2117-422037984 granted to Harald Schupp)

SYMPOSIA VII-3

EXTERNAL AND INTERNAL INFLUENCES ON THREAT PROCESSING AT THE AUTONOMOUS AND CENTRAL NERVOUS SYSTEMS LEVELS

Chairs: Matthias Wieser[1], Stephan Moratti[2]
[1]Erasmus University Rotterdam; [2]Universidad Complutense de Madrid

Detecting a potential threat in the environment and organizing the individual's responses requires a flexible response repertoire that adapts strategically depending on the situation. Threat can occur in different contexts and psychological and physiological states of the individual that determine objective and perceived threat imminence. In this symposium, we will discuss how such external and internal factors can explain the variability of threat processing at the autonomous and central nervous system levels. Szeska will present data on how the manipulation of the possibility to avoid threat cues and its imminence organize threat processing and defense responses as indexed by heart rate (HR) deceleration and acceleration. In this line, Moratti will demonstrate how inter-participant variability of HR deceleration or acceleration during viewing of threat cues modulate ssVEPs as an index of electrocortical cue processing, and beta band desynchronization to avoidance responses as a proxy of response preparation. Wieser will show how external factors such as threatening vs. safe contexts and unpredictability affect the generalization of ssVEP and SCR responses for threat cues. Andreatta will show using VR how sense of presence in interaction with trait anxiety boosts conditioned fear responses. Finally, Van Diest will extend our perspective by revealing that successful interoceptive fear learning does not necessarily affect habituation processes as indexed by central and autonomous response measures, thus demonstrating flexible strategic organization of response systems.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.23 Emotion/affect

THE DYNAMIC ADAPTATION OF THE AUTONOMIC SYSTEM TO SOCIAL THREAT

Christoph Szeska[1], Wendt Julia[1], Alfons Hamm[2], Matthias Wieser[3], Mathias Weymar[1]
[1]University of Potsdam, [2]University of Greifswald, [3]Erasmus University Rotterdam

The autonomic system adapts to external threat based on its imminence and the availability of escape options: Approaching inevitable threat (e.g., electric shock), as commonly used in fear conditioning research, elicits increasing cardiac deceleration and skin conductance reflecting attentive threat processing. However, approaching threat that can be actively avoided evokes cardiac acceleration and stronger skin conductance increases, supporting defensive action mobilization. In two ongoing studies we tested whether similar autonomic changes also occur to social threats. (1) Participants underwent social fear conditioning, in which two neutral faces either signaled an angry face accompanied by auditory negative devaluations (CS+), or not (CS-). (2) Participants underwent a social defense cascade paradigm, in which increasing threat

imminence was operationalized by neutral faces *gradually* changing to angry expressions accompanied by auditory negative devaluations, which could be actively avoided in half of the trials. Cardiac deceleration was dominant when participants were exposed to approaching inevitable social threat, signaled by conditioned or growingly angry social cues. This pattern switched to acceleration if threat was avoidable and most imminent. Contrasting previous research, skin conductance decreased when approaching social threat was inevitable and only increased upon avoidance options. Results suggest that the autonomic system dynamically adapts to approaching social threat similarly as to other external threats, but also point to specific response patterns.

FUNDING: DFG WE 4801/6-1.

ORIENTING AND DEFENSE RESPONSES TO POTENTIAL THREAT MODULATE SSVEP AMPLITUDES IN VISUAL CORTEX AND BETA BAND DESYNCHRONIZATION IN MOTOR AREAS.

Stephan Moratti[1], Carlota Gil Martin[2], Silvia Molina Blanco[1], Miriam Díaz Sánchez[1], Sara Pampín del Río[1], Gabriel Sánchez de Coral[1], Sergio Calvo García[1]
[1]*Complutense University of Madrid,* [2]*Universidad Autonoma de Madrid*

We present EEG data (N = 60) replicating and extending previous results (Echegaray & Moratti, 2021) about orienting and defense responses (OR and DR) as indicated by HR changes and its association with electrocortical processing of threat pictures. In this study, participants viewed threat related pictures for 4 s. Afterwards picture size increased (approaching) until participants "clicked" off the images, thus avoiding them. Multivariate kmeans grouping of HR data resulted in HR accelerators and decelerators. During the 4 s fixed picture presentations HR deceleration was associated with increased electrocortical processing as indexed by greater ssVEP amplitudes (Bayes Factor BF_{10} = 14). HR acceleration resulted in increased beta band desynchronization (BD) at frontal electrode sites during the 4 s fixed picture presentations (BF_{10} = 72). After approach onset unpleasant pictures were avoided faster than neutral ones (shorter response latencies, BF_{10} = 6.6). However, HR accelerators avoided unpleasant pictures faster than HR decelerators (BF_{10} = 3.3). Avoidance responses triggered BD that was also related with increased HR acceleration at frontal electrode sites (BF_{10} = 199). Our results suggest that HR responses indicating OR or DR correlate with distinct processing and excitation patterns in visual and motor cortices, respectively. Further, our data supports the concepts of increased sensory processing coupled with motor inhibition during ORs. In contrasts, DRs result in less activity in sensory cortex but enhanced excitability of motor circuits.

FUNDING: This work was supported by a National Grand from the Ministry of Science, Innovation and Universities (PID2021-126074NB-I00).

THREAT CONTEXTS AND THEIR INFLUENCE ON GENERALIZED FEAR

Matthias Wieser[1], Asimina Aslanidou[1], Alex Wong[1], Marta Andreatta[2]
[1]*Erasmus University Rotterdam,* [2]*University of Tuebingen*

Fear learning and fear extinction are modulated by threatening contexts, but much less is known about how contexts influence fear generalization. In this study we explored whether people generalize their fear responses to a wider range of stimuli in a threatening compared to a safe context. Forty-eight participants underwent differential cue-in-context conditioning with a generalization test while we recorded electrocortical (ssVEPs), SCR, and affective ratings. Two female faces appeared on a computer screen in two contexts consisting of different arrays of geometrical shapes (triangles or circles) presented in the corners and lasting for two minutes. One of the faces (CS+) in the threat context (CTX+) was followed by a female scream (US) 80% of the time, while the other face (CS-) and both faces presented in the other context (CTX-) were never reinforced. In the generalization test, the CSs along with four morphs (GS) that varied in similarity with the CS+ in steps of 20% were presented in both contexts again. Successful acquisition of the conditioned responses to the cues was registered for all measures. US-expectancy ratings and skin conductance responses were heightened in CTX+ while the affective ratings and ssVEPs were not sensitive to the contextual information. During test, adaptive generalized responses were evident for all measures. Despite increased overall US-expectancy ratings in CTX+, participants exhibited cue overgeneralization in both contexts, which suggests that threatening contextual information did not influence the degree of generalization.

SENSE OF PRESENCE IN A VIRTUAL ENVIRONMENT AND INDIVIDUAL TRAIT ANXIETY MAY BOOST DISCRIMINATIVE CONDITIONED ANXIETY RESPONSES

Marta Andreatta[1], Paul Pauli[2], Hannah Genheimer[2]
[1]*University of Tuebingen,* [2]*University of Würzburg*

Anxious individuals are sensitive to unpredictable threats demonstrating more pronounced defensive responses to a threatening virtual context (CTX+) vs. a safety virtual context (CTX-). On the one hand, the sense of presence within a virtual environment can boost emotional responses in low but not in high anxious individuals. On the other hand, a context can be conceptualized as a stable arrangement of elements or as the sum of single elements and both representations play a role in associative processes. Here, we investigated the interaction between sense of presence, trait anxiety and context representations during the acquisition and expression of conditioned anxiety responses. Forty-eight healthy individuals participated in a VR-based context conditioning wherein electric shocks (unconditioned stimulus, US) were unpredictably delivered in one virtual office (CTX+), but not in the other (CTX-). During the test phase, nine elements from each context were presented singularly. We found a cluster of participants, who exhibited heightened anticipation of the US for anxiety-related elements as compared to the other group. In contrast to their clear elemental representation, these individuals showed diminished discriminative responses between the two context's configurations. Verbal but not their physiological conditioned responses were boosted by the sense of presence, especially among highly anxious individuals. These findings align with the dual-representation view of context and provide insights into the role of presence in eliciting (conditioned) anxiety responses.

DOES INTEROCEPTIVE FEAR LEARNING AFFECT HABITUATION TO AN INTEROCEPTIVE STIMULUS?

Ilse Van Diest, Lauren Pattyn, Iris Van de Pavert, Valentina Jelinčić, Andreas von Leupoldt, Lukas Van Oudenhove, Jonas Zaman
KU Leuven

Both fear learning and impaired habituation to bodily sensations have been hypothesized to contribute to symptom burden in persons with functional symptoms. The present study sought to test whether fear learning towards a non-painful sensation in the esophagus hinders habituation to this sensation. In a homoreflexive, single cue, interoceptive fear conditioning paradigm, a non-painful electrical stimulation in the esophagus served as the conditioned stimulus (CS). Participants received this CS 42 times in each of the three phases of the experiment: prior, during, and following fear learning. In the fear learning group (n = 41), the CS was paired with a painful electrical sensation in the esophagus (US) during the learning phase. The control group (n = 41) received the CS and US in an unpaired fashion. Fear learning outcomes included startle blink EMG, skin conductance responses (SCR) and US-expectancy ratings. For each phase, habituation slopes of the perceived intensity of the CS were modeled; changes across time in P1, N2 and P2 amplitudes of the event-related potential (ERP) to the visceral CS were explored. Compared to the control group, the fear learning group showed a potentiated startle responses to the CS, higher US expectancy ratings, but a similar SCR to the CS. For both groups, habituation in intensity ratings occurred only during the fear learning phase. Habituation of P1, N2, and P2 amplitudes was present prior to fear learning, but not in subsequent phases. Thus, despite successful interoceptive fear conditioning, learned fear did not impact on habituation.

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SYMPOSIA VII-4

AUDITORY COGNITION: FROM PERCEPTION TO ACTION

Chair: Claude Alain
Rotman Research Institute at Baycrest

Sounds are omnipresent. Sometimes, they remind us to do something (e.g., mobile phone alarm) or inform us of someone approaching (e.g., footsteps). Sometimes, we generate the sounds ourselves and they inform us about success or failure of our actions. In all cases, the sounds are segregated from other co-occurring sounds and prioritized in such a way that we can adjust our behaviour accordingly (e.g., getting ready for the next meeting, looking to see who's coming, or adapting the sound level of their speech to the surroundings). These examples highlight

the intrinsic link between low-level perceptual organization, prior knowledge, and action. This symposium will present theoretical and empirical work exploring how we form sound objects and how these representations capture attention and guide behaviour.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.19 Other, 3.3 Lab Based Experiment, 4.18 Memory, 4.20 Attention, 4.25 Cognitive control/executive functions

THE ROLE OF LONG-TERM MEMORY IN AUDITORY PERCEPTION AND GOAL-DIRECTED ACTION

Claude Alain, Manda Fischer, Morris Moscovitch
Rotman Research Institute at Baycrest Centre

Auditory scene analysis (ASA) is an area of study in cognitive neuroscience that seeks to understand how we perceive and identify sound objects in the environment from the soundscape (i.e., a mixture of sound waveforms) that reaches our ears. To date, ASA research has primarily focused on low-level feature-driven processes using a wide range of pure tone configurations. In comparison, the influence of prior knowledge or experience on ASA has received relatively little attention. In a series of studies, we measure neuroelectric brain activity to examine the interplay between attention and memory during ASA. We use a novel auditory paradigm to assess how long-term contextual memory acquired explicitly or implicitly facilitates signal detection. These studies' findings reveal benefits from explicit and implicit auditory memory on task performance, which was associated with specific neural signatures. Evidence also suggests that this benefit of associative memory on task performance was related to motor preparation. Memory-guided auditory attention may be supported by enhanced top-down attention employed by the superior parietal lobe. These studies advance attention and ASA theories by comprehensively examining the mnemonic source of attentional bias and the mechanisms that optimize auditory attention and performance.

FUNDING: Natural Sciences and Engineering Research Council of Canada.

FROM PERCEPTION TO COGNITION: THE ROLE OF AUDITORY SOURCE AND ACTION REPRESENTATIONS

István Winkler[1], Susan Denham[2]
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One major goal of describing the processes of auditory perception is to explain how the brain parses the acoustic input arriving at the ears into constituents that have been likely emitted by different real-world objects during their behaviors (Auditory Scene Analysis [ASA]). Staged models of auditory perception posit the existence of some representation of these constituents, termed "auditory perceptual objects" allowing the outputs of parsing to enter cognitive operations. However, in contrast to ASA, cognitive operations, such as recalling a past scene, rely on representations allowing to address the question of "who did what". Thus, in terms of sound processing, the sound source(s) and the sound-generating behavior (action) are separately represented, whether one or both can be identified or not. Here we propose a framework allowing to separate auditory source and action representations by how they are perceived, their formation and the role of prediction in it, their stability, and the brain response associated with them. We then link auditory source and action representations to a general framework of processing real-world scenes, the Event Segmentation Theory. This helps to align perception across different modalities, specify the source of prior knowledge affecting sound perception, and point towards improved computational models of sound processing.

FUNDING: Hungarian National Research, Development and Innovation Office grant K132642 to IW.

FROM ACTION TO AUDITORY COGNITION: THE IMPACT OF ACTION ON AUDITORY PREDICTION ERROR SIGNALS

Erich Schröger, Andreas Widmann
Wilhelm Wundt Institute of Psychology, Leipzig University

We are not only passive recipients of sounds, but we also produce sounds with our own actions. While research about the brain's prediction error signals elicited by deviant sounds (e.g. MMN, P3a) and research about the attenuated neural processing of self-generated sounds (e.g. N1 suppression) is very popular, the impact of action on auditory error processing is largely unknown. Here, we present a series of studies investigating whether and how the

processing of deviant sounds is altered when the sounds are generated by the active listener as compared to when the same sounds are presented to the passive listener. We found that: (1) Sounds that do not violate an acoustic regularity (standards), but deviate from the expected outcome of an action DO elicit auditory error signals in the N1/MMN time window. (2) Sounds that violate an acoustic regularity (deviants), but conform to the effect associated with the action DO NOT elicit corresponding prediction error signals. (3) Early prediction error signals (ΔN1/MMN) are only elicited when the sounds are intentionally generated (as compared with when the intended action effects are visual stimuli with the sounds being accessory only), whereas later auditory error signals (N2b, P3a) are elicited whenever the action-sound association is violated. These results reveal that action-effect-associations are integrated in our predictive models underlying auditory error processing at several levels. Importantly, at an early, sensorial level prediction errors are confined to situations when the sounds violate an intended action-effect.
FUNDING: German Research Foundation.

FROM PERCEPTION TO ACTION FEEDBACK: USING AUDITORY PREDICTION TO EVALUATE MOTOR-AUDITORY LATENCIES

Alexandra Bendixen, Steffen Maihöfer, Sascha Feder, Jochen Miksch, Sabine Grimm
Institute of Physics, Chemnitz University of Technology

Basic research on the interplay of auditory perception and action has revealed that the degree to which a sensory event is perceived as an expected consequence of an own action (self-generation effect) is reflected in the agent's brain responses measured by electroencephalography (EEG). Specifically, the amplitude of the event-related potential (ERP) components N1 and P2 is modulated by the sensory event's predictability and origin (self- vs. other-generated). Here we use this ERP effect for inferring whether the sensory consequence of an own action is perceived as adequate by the agent. We manipulate the latency (delay) between user actions and system responses in a virtual reality (VR) environment. Replicating own prior work, we find that the amplitude of the P2 component progressively increases with the introduction of successively higher motor-auditory latencies. To test whether ERPs can be used as a read-out measure to assess VR immersiveness with respect to system latency, we applied a regularized linear-discriminant analysis (LDA) classifier. Such a classifier discriminates between low-latency (50 ms and below) and high-latency (150 ms and above) trials with an accuracy that is well above chance level, with the most informative features being identified in the P2 time window. We will discuss these results in terms of how basic auditory prediction effects can contribute to unobtrusive quality measurements in VR, potentially circumventing the need to interfere with the digital experience by repeatedly asking the user.
FUNDING: German Research Foundation.

SYMPOSIA VII-5

FROM TINNITUS TO MISOPHONIA: WHAT WE KNOW, WHAT WE DON'T KNOW, AND WHAT WE SHOULD KNOW

Chairs: Christian Dobel[1], Andreas Keil[2]
[1]University Hospital Jena; [2]University of Florida

Discussant: Nathan Weisz, Paris Lodron University Salzburg

Tinnitus is defined as the perception of a sound without the presence of an external source, also referred to as a phantom sound. It is currently classified as a symptom and not a disorder in itself. Worldwide, around 740 million people experience tinnitus and around 120 million people are affected to an extent that interferes with their mental health. The socioeconomic costs are significant. While there is no cure for the symptom in itself, medical guidelines give several recommendations for treatment. From a neurophysiological viewpoint, different methodological approaches have converged to suggest that the neural correlates are not restricted to auditory pathways, but encompass a distributed network spanning cortical and subcortical regions, most notably the limbic system. In recent years, the frontal cortex and its regulatory functions have attracted increasing interest as well. From a clinical viewpoint, tinnitus is characterized by high comorbidity, especially in severe states. The most frequently associated disorders are affective disorders and chronic pain. Within the auditory domain, hyperacusis (an oversensitivity to sound) and misophonia (a decreased tolerance to specific sounds) are related symptoms. In this this symposium, we ask if these phenomena share a common origin. We showcase different examples of how psychophysiological methods and paradigms may further our understanding of these auditory symptoms and, ultimately, lead to the development of novel therapeutic approaches.
FUNDING: The Misophonia Research Fund.
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.6 Eye Tracking (blink, movement, size), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.12 Sensation/perception/interoception, 4.23 Emotion/affect

MEG MODELING ON (DYS-)FUNCTIONAL CONNECTIVITY OF BRAIN NETWORKS RELATED TO TINNITUS: CHARACTERISTICS AND SUSCEPTIBILITY TO NEUROMODULATORY INTERVENTIONS

Evangelos Paraskevopoulos
University of Cyprus

Tinnitus pathophysiology has been associated with an atypical cortical network that involves auditory and non-auditory areas. This presentation synthesizes findings from three distinct studies investigating the (dys-) functional connectivity of brain networks associated with chronic tonal tinnitus. Study 1 utilized resting-state MEG recordings to examine functional connectivity in intrinsic cortical networks among tinnitus patients and controls. Results revealed that during resting state, tinnitus patients exhibited increased connectivity amongst prefrontal, medial temporal and posterior parietal regions, compared to controls. The second study discerned the cortical connectivity of tinnitus patients during sound processing. Event-related source space analysis revealed a significant difference between the cortical activation induced by tinnitus frequency and a control tone that primarily activated typical auditory regions suggesting a tinnitus-frequency-specificity of connectivity alterations. To identify the role of each region in the network, the third study introduced a causal approach that modulated the activity of the prefrontal node of the tinnitus network via tDCS. While the pre-intervention MEG results revealed a similar pattern of activity as in the previous studies, post-intervention assessments revealed that the anodal tDCS condition, eliminated the difference in cortical activity patterns between tinnitus and control tones. Implications for personalized approaches using targeted tDCS interventions informed by individual tinnitus frequency are discussed.

BEYOND SILENCE AND LOUDNESS

Marlies Knipper
University of Tübingen

There are conflicting views regarding the neural correlates of tinnitus (Knipper et al., 2020), which hinders the development of effective diagnostics and therapeutics. Although hyperacusis often co-occurs with tinnitus, it is not considered in clinical diagnosis or for targeted, individualized therapies. Successful individualized therapy of tinnitus sub-entities requires differentiation, identification, and classification of hearing disorders by objective tools. Based on our previous observations that distinguished behavioral animal models with tinnitus or hyperacusis, we hypothesized different neural correlates of tinnitus depending on the extent to which tinnitus subjects suffer from comorbidity with hyperacusis. Using a multifunctional approach that combined questionnaires, fine structure analysis of ABR, resting state or evoked BOLD fMRI, NIRS or EEG, we compared controls, patients with tinnitus, and patients with both tinnitus and hyperacusis in independent clinical trials. We were able to identify significant differences between tinnitus subjects with and without hyperacusis at all diagnostic tool levels, which questions previous opinions about the neural correlate of tinnitus. Here, we first discuss the distinct approaches as objective diagnostic tools for identifying specific tinnitus sub-groups and their use in designing individually tailored intervention strategies. Second, we discuss the connection between peripheral cochlear damage and changes in central contrast enhancement and noise cancelation, which might ultimately cause the corresponding pathologies.

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NEUROPHYSIOLOGICAL CHARACTERIZATION OF MISOPHONIA: GENERALIZATION LEARNING AND DEFENSIVE MOBILIZATION

Andreas Keil, Jourdan Pouliot, Richard Ward, Sarah Gardy, Faith Gilbert, Hannah Engle, Caitlin Traiser
University of Florida

Misophonia is a disorder characterized by strong negative emotional reactions in response to specific sounds that are considered “triggering”. It has been hypothesized that Misophonia arises from an overgeneralization process in which responses to aversive/disgusting events are generalized to mouth, nasal, and other common sounds. Current debate exists regarding how Misophonia is related to auditory disorders such as hyperacusis as well as disorders of fear, anxiety, and depression—conditions that often involve maladaptive overgeneralization. Addressing this debate, we examined self-report, autonomic, and neurophysiological (EEG) data during aversive generalization conditioning. Participants with and without Misophonia listened to sounds varying in similarity, with only one sound paired with an aversive (loud noise, electric shock)

outcome. In a separate study, we collected symptom-level data on fear, anxiety, and depression, along with Misophonia symptom reports. Findings show strong differences between people with Misophonia and controls, before conditioning. There was weak evidence of over-generalization in Misophonia across most of the dependent variables, but evidence of heightened attentional engagement with conditioned cues overall was associated with heightened Misophonia. In multivariate analyses of symptom-level data from a larger sample, Misophonia symptoms formed a cluster that was separate from hyperacusis, as well as from symptoms linked to fear, anxiety, and depression, emphasizing the need for dedicated diagnostic tools for examining Misophonia.
FUNDING: Misophonia Research Fund

SYMPOSIA VIII-1

AFFECTIVE INFLUENCES ON BODY AND BRAIN IN HUMAN MOTIVATION

Chair: Guido Gendolla
University of Geneva - Switzerland

This symposium presents new insights in different, partly understudied, affective influences on physiological processes involved in human motivation—the process determining choice and action. Bringing together researchers from three laboratories located in two countries, the contributions highlight influences of mood states, implicit motives, unpleasant noise, fatigue, and boredom. Mathias Pessiglione sets the stage with new research on moods' impact on decision making using measures of electrodermal activity, pupillometry, facial EMG, and computational modeling methods. Next, Kerstin Brinkmann discusses fresh studies investigating how implicit motives—individual differences in the preference for certain incentive types—influence cardiovascular responses by justifying effort. Third, Guido Gendolla presents recent experiments showing that personal task choice can —in contrast to external task assignment—efficiently shield against the effects of aversive acoustic noise on cardiac responses reflecting effort in cognitive tasks. Finally, Michel Audiffren highlights the roles of boredom and fatigue in performance decrements during long term cognitive work using cardiac and EEG measures. Taken together, the four contributions advance the understanding of how different affective variables influence physiological adjustments in brain and body involved in behavioral decision making and action execution.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.2 Myography (EMG etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 3.3 Lab Based Experiment, 4.19 Motivation, 4.21 Decision making, 4.23 Emotion/affect

HOW MOOD-RELATED PHYSIOLOGICAL STATES BIAS ECONOMIC DECISIONS

Mathias Pessiglione[1], Roeland Heerema[2]
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Despite intense theoretical debates, empirical studies have not yet converged on a consensual mapping of how emotions influence decisions. Here, we compared the incidental effects of induced happiness and sadness on unrelated economic choices between uncostly-but-small and large-but-costly monetary rewards. Emotions were induced by playing happy versus sad music accompanied by congruent text vignettes. Across a series of experiments, we observed a consistent bias exerted by transitory mood (rated happiness minus rated sadness) on economic decisions, whether they involved risk, delay or effort. The choice bias could be predicted both by self-reported mood and by a mood proxy constructed from physiological measures of autonomous arousal (skin conductance and pupil size) and facial expression (zygomaticus and corrugator electromyographic activity). Computationally, the choice bias was best captured by a mood-scaled bonus added to the costly option value, irrespective of the cost type. During decision-making, gaze tracking revealed an early preference for the costly option after happiness induction, and for the uncostly option after sadness induction. Together, these results confirm our recent theory that mood affects decisions by forming a predisposition to face costs and seek for more rewards. Under this assumption, model simulations show that mood fluctuations can drive adaptive behavioral responses to seasonal changes in environmental contingencies.

YOUR SMILE MAKES MY HEART BEAT STRONGER – BUT NOT ALWAYS: IMPLICIT MOTIVE'S IMPACT ON EFFORT-RELATED CARDIOVASCULAR REACTIVITY

Kerstin Brinkmann, Isabelle Schramm, Silvio Laloli
University of Geneva

Individual differences in implicit motives can be described as affective preferences for certain classes of incentives. Achievement-motivated people strive to reach standards of excellence, affiliation-motivated people seek need satisfaction in establishing social relationships, and

power-motivated people prefer situations where they can have impact on others. In a series of studies, we tested whether implicit motives determine the mental effort individuals invest in tasks that promise motive satisfaction and, therefore, positive affect. We measured implicit motives with the Picture Story Exercise, which quantifies the content of imaginative stories written in response to ambiguous picture cues. Mental effort was operationalized as sympathetically-driven cardiovascular reactivity (especially pre-ejection period, PEP) during cognitive tasks. Results revealed that affective stimuli like facial expressions of emotion lead to stronger cardiovascular reactivity when they are positive incentives for the individual (Study 1 on the affiliation motive, N = 98). However, they lead to weaker cardiovascular reactivity when they are negative incentives for the individual (Study 2 on the power motive, N = 68). Finally, we showed that affective stimuli only influence effort when the task is instrumental to need satisfaction (Study 3 on the achievement and affiliation motives, N = 81). These findings demonstrate that affective preferences for certain incentives can determine effort-related cardiovascular reactivity in instrumental tasks.

FUNDING: Swiss National Science Foundation.

PERSONAL TASK CHOICE SHIELDS AGAINST NOISE EFFECTS ON EFFORT INTENSITY: STUDIES ON CARDIAC RESPONSE

Guido Gendolla[1], Johanna Falk[1], Peter Gollwitzer[2], Gabriele Oettingen[2]
[1]*University of Geneva,* [2]*New York University*

Exposure to aversive acoustic noise is stressful and makes cognitive work more difficult. We tested the ideas that noise thus (1) increases cardiovascular adjustments reflecting effort during cognitive tasks when task characteristics are externally assigned, and that (2) the personal choice of task characteristics can efficiently shield against this noise effect. The latter effect was based on a recent action-shielding-model (Gendolla et al., 2021) and studies supporting it for other types of both experienced and implicit affective stimulation. Accordingly, personal task choice increases commitment and task focus and thus immunizes against biasing affective influences on action execution, as posited by volition theories. As expected, two laboratory experiments ($N = 228$) found that exposure to aversive noise increased responses of cardiac pre-ejection period (PEP) during moderately difficult short-term memory tasks—but only when the task stimuli's color was externally assigned. Importantly, this noise effect on PEP reactivity disappeared when participants could personally choose their stimulus color. Our results show that the simple act of personally choosing task characteristics leads to shielding against the effect of aversive noise on cardiac responses. This conceptually replicates and extends other evidence for choice-induced shielding against mood and affect prime effects that are evident in externally assigned tasks.

FUNDING: Swiss National Science Foundation.

PHYSIOLOGICAL AND BEHAVIORAL MARKERS OF MENTAL FATIGUE IN A LONG DUAL 2-BACK TASK

Michel Audiffren[1], Alison Lorcery[1], Axel Girauld[2], Abdel Benraïss[1], Nathalie André[1]
[1]*University of Poitiers,* [2]*University of Poitiers*

Long cognitive tasks involving executive functions generally induce a decrement in performance throughout the task or a shift toward less effortful strategies. However, in these protocols, it is often difficult to disentangle the respective contribution of boredom and mental fatigue. The purpose of the present study is to examine the changes in performance and effort deployment in a long effortful task with the help of psychophysiological indexes to interpret more clearly the mechanisms underpinning these changes. Seventy participants performed a 30-min dual 2-back task and a control task, which respectively require continuous updating of working memory and few effortful control (watching a documentary), in 2 counterbalanced sessions. Electrocardiogram, impedance-cardiogram and electroencephalogram were recorded continuously during the 2 tasks. Performance indexes during the dual 2-back task included reaction time and error rate. Subjective fatigue and boredom were collected before and/or after each cognitive task. Performances and psychophysiological data were analyzed as a function of time-on-task. We observed a progressive prioritization of speed over accuracy during the dual 2-back task favoring a less effortful strategy. The pre-ejection period reactivity was lower (i.e., higher sympathetic activity) during the dual 2-back task compared to the control task. Density of theta waves, an index of effortful control, decreased over time. These results, in addition to subjective data and correlational analyses, suggest a detrimental effect of fatigue rather than boredom.

FUNDING: Agence Nationale de la Recherche.

SYMPOSIA VIII-2

NEUROBIOLOGICAL MECHANISMS OF SCHIZOPHRENIA SPECTRUM DISORDERS: THE IMPORTANCE OF PSYCHOPHYSIOLOGICAL METHODS

Chair: K. Juston Osborne
Washington University in St. Louis

This symposium will highlight the utility of psychophysiological methods for informing our understanding of the neurobiological mechanisms underlying schizophrenia spectrum disorders. Across four talks, we consider a wide range of psychophysiological methods including actigraphy, electrophysiology, and neuroimaging, and how these methods can be leveraged to understand core clinical features of psychotic disorders including psychomotor slowing, working memory, and performance monitoring. First, Dr. Sebastian Walther used resting state fMRI and actigraphy to demonstrate that unique motor cortex connectivity patterns explain heterogeneity in psychomotor behaviors in psychosis. Second, Dr. Molly Erickson used electrophysiology to investigate specific neural processes that contribute to working memory impairment in schizophrenia. Third, Dr. Alexandra Moussa-Tooks will share findings on links between cerebellum abnormalities and a failure to update internal motor models in psychotic disorders. Finally, using an event-related potential (ERP) study in individuals at high-risk for developing psychotic disorders, Dr. K. Juston Osborne will discuss how we can best leverage small to moderate samples typical of psychophysiology research to inform our understanding of neurobiological mechanisms that contribute to the progression and onset of psychosis. Together, this symposium showcases how a wide range of psychophysiology methods can be employed to reveal the distinct neural mechanisms contributing to the heterogeneous symptoms present in schizophrenia spectrum disorders.
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.12 Ecological Momentary Assessment (EMA), 2.14 Computerized Tasks (e.g. neuropsychology), 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.18 Memory, 4.22 Learning/conditioning

FUNCTIONAL ORGANIZATION OF THE MOTOR CORTEX IN PATIENTS WITH SCHIZOPHRENIA AND PSYCHOMOTOR SLOWING

Sebastian Walther, Stephanie Lefebvre, Anastasia Pavlidou
University of Bern

Altered psychomotor behavior in psychosis is poorly understood. New studies on the primary motor cortex (M1) revised the motor homunculus. M1 contains intereffector regions with integrative connectivity patterns that may serve complex psychomotor behaviors also in psychosis. Here, we test whether patterns of connectivity differ between patients with and without psychomotor slowing. In 192 subjects, we acquired resting-state fMRI, including 63 healthy subjects and 129 patients with DSM-5 schizophrenia (83 with psychomotor slowing and 46 without, according to the Salpetriere Retardation Rating Scale (SRRS)). Wrist actigraphy recoreded physical activity. We tested ROI-to-ROI and seed-to-voxel functional connectivity using three effector seeds of M1 (hand, foot, mouth), the 3 M1 intereffector regions, cerebellum, supplementary motor area (SMA), thalamus, and putamen. We explored group differences and brain-behavior associations. Across groups, M1 intereffectors had a distinct connectivity pattern including M1 effectors, cerebellum, and SMA. The M1 intereffector regions had more connectivity with the motor network in patients with slowing compared to healthy controls. In patients with slowing, connectivity from M1 intereffectors to cerebellum or SMA was linked to higher SRRS scores. Likewise, increased physical activity was linked to increased connectivity within M1. Connectivity patterns from M1 subregions differ between patients with psychomotor slowing and other patients or controls. M1 connectivity patterns explain heterogeneity in psychomotor behaviors in psychosis.

NEURAL MECHANISMS OF ATTENTION LAPSING IN SCHIZOPHRENIA DURING WORKING MEMORY: OSCILLATORY ALPHA, OR APERIODIC NOISE?

Molly Erickson[1], Nicole Ogbuagu[1], Charlotte Li[1], Judy Thompson[2], Steven Silverstein[2]
[1]*Department of Psychiatry & Behavioral Neuroscience, University of Chicago,* [2]*Department of Psychiatry, University of Rochester Medical Center*

Working memory (WM) is robustly impaired in people with schizophrenia (PSZ), although the neural processes that give rise to these deficits are poorly understood. We

tested the hypothesis that disrupted sustained attention and its putative neural correlate—pre-stimulus alpha power—can partially account for poor WM task performance. Thirty-one PSZ and 42 healthy comparison subjects (HCS) completed 3 variants on a change detection paradigm while EEG was recorded: one in which participants were asked to remember the colors of the squares (memory condition), one in which participants were asked to attend to the squares in search of a target color (attention condition), and one in which participants passively viewed the colored squares (passive condition). We predicted: (1) PSZ would exhibit higher rates of attention lapsing compared to HCS; (2) PSZ would have elevated alpha power compared to HCS across all tasks; and (3) trial-by-trial fluctuations in alpha will be associated with memory task performance, but only at smaller set sizes in which poor performance is likely due to attention lapses. We did observe that PSZ exhibited behavioral indicators of attention lapsing ($p<0.05$); however, we also observed that PSZ had significantly *reduced* pre-stimulus alpha power compared to HCS ($p<0.05$). Furthermore, trial-by-trial analyses revealed that aperiodic elements of the EEG signal—not oscillatory alpha—were associated with task accuracy. These observations suggest that nonoscillatory EEG activity may be a stronger indicator of attention lapsing than alpha power during WM tasks.

ESTABLISHING MECHANISTIC MODELS OF THE ROLE OF CEREBELLUM IN MODEL UPDATING PROCESSES TO UNDERSTAND MOTOR PHENOTYPES IN PSYCHOTIC DISORDERS

Alexandra Moussa-Tooks[1,2], Jonathan Tsay[3], Baxter Rogers[2], Richard Ivry[3], Neil Woodward[2], Stephan Heckers[2]
[1]Indiana University, [2]Vanderbilt University Medical Center, [3]University of California, Berkeley

Motor disturbance is a key phenotype in psychotic disorders, with motor signs observed in upwards of 66% of unmedicated, first-episode patients, and before disorder onset. While recent work has linked cerebellum to sensorimotor processing deficits, brain-behavior relationships have been difficult to establish in part due to a muddling of distinct processes in current tasks. To address these gaps, we present pilot data from a new line of work using a motor learning task not yet utilized in the psychiatry literature. Participants (n=10) completed a computerized reaching task that allows us to capture directly measured (motor speed, implicit learning) and computationally modeled latent constructs (learning rate, motor system noise) with a modified state-space model. Cerebellar volume was calculated with the Spatially Unbiased Infratentorial (SUIT) toolbox. Analyses were performed in R; covariates included intracranial volume, age, sex, and chlorpromazine equivalents. We observed no differences between groups in any metrics of motor speed (initiation or execution of the reach). Psychosis participants did exhibit higher modeled motor noise (d=0.6) and implicit adaptation was positively correlated with cerebellar somatomotor network volume in the psychosis group (d=0.54). Our work provides evidence that the slowing observed in psychosis may not be due to mechanical limitations of the motor system, but noise present in the motor system and an inability to update internal motor models, driven by cerebellum. Continued work will track symptoms and task performance longitudinally.

STATISTICAL ISSUES IN PSYCHOPHYSIOLOGICAL STUDIES OF SCHIZOPHRENIA SPECTRUM DISORDERS: AN ILLUSTRATION USING AN ELECTROPHYSIOLOGY STUDY OF ERROR-RELATED PROCESSING IN PSYCHOSIS RISK

K. Juston Osborne
Washington University in St. Louis

A central goal of research in schizophrenia spectrum disorders is to disentangle the underlying neurobiological mechanisms that comprise the pathophysiology of psychosis. This can aid in understanding how these mechanisms contribute to progression and onset of disease. However, the tendency to rely on small to moderate sample sizes with null-hypothesis significance testing can often lead to inappropriate conclusions regarding the nature of psychosis. For example, researchers often interpret the absence of a statistically significant group difference as evidence for an intact process in the psychosis group. However, this is a misapplication of null hypothesis significance testing, and can lead to incorrect conclusions particularly in the context of small sample sizes. This problem is exacerbated in studies testing complex interaction models, such as those that are typical in clinical psychophysiology studies with multiple participant groups and multiple experimental conditions. Here, we provide a conceptual discussion of these and related issues. To illustrate, we present novel findings from an electrophysiology study investigating performance monitoring as indexed by the error-related negativity in individuals at high-risk for psychotic disorders and healthy controls ($N=83$). Together, we demonstrate a means for leveraging Bayesian approaches and effect sizes to understand the neural mechanisms of psychotic disorders.

SYMPOSIA VIII-3

NEUROBIOLOGICAL SUBSTRATES OF HITOP-RELATED DIMENSIONS

Chair: Antonia Kaczkurkin
Vanderbilt University

Discussant: Robert Krueger, University of Minnesota

The Hierarchical Taxonomy of Psychopathology (HiTOP) model attempts to redefine our mental health classification system based on hierarchically defined dimensions of psychopathology. At the same time, there has been a call for evidence that these dimensions are associated with neurobiological outcomes of interest. This symposium will present work that attempts to uncover the neurobiological correlates of HiTOP-related dimensions. Kaczkurkin et al. will present data showing that internalizing symptoms are associated with structural MRI differences in a sample of 11,868 children from the ABCD Study. Cocuzza et al. will extend this work by showing brain network dynamics associated with affective and psychotic symptoms in 203 transdiagnostic psychiatric patients and healthy controls. Paison will then present work showing that two latent ERP factors derived from P3 and ERN predict a broad externalizing factor, but not an internalizing factor, in a sample of 182 individuals. Brislin et al. will continue the line of inquiry into externalizing symptoms by showing that an EEG latent factor comprised of P3 amplitude, frontal theta, and posterior delta predicts an externalizing dimension in 8,735 adults from the Collaborative Study on the Genetics of Alcoholism. Patrick et al. will round out the symposium by showing that MRI-brain measures related to impaired cognitive performance predict externalizing problems concurrently and prospectively in 1,848 adolescents from the European IMAGEN study. Finally, Robert Krueger will provide a discussion of the implications of this body of work.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology

DIMENSIONS OF INTERNALIZING PSYCHOPATHOLOGY ASSOCIATED WITH BRAIN STRUCTURE IN YOUTH

Antonia Kaczkurkin, Leighton Durham, Hee Jung Jeong, Gabrielle Reimann, Camille Archer
Vanderbilt University

Modeling the hierarchical structure of psychopathology has advanced the way we conceptualize mental health symptoms; however, continual refinement of the model is needed, especially for samples of children. Such refinement would also benefit from the integration of neurobiological measures to either support or refute the proposed dimensional classification. Here we demonstrate the utility of applying a hierarchical framework for understanding the neurobiological mechanisms underlying psychopathology symptoms in youth, with an emphasis on internalizing symptoms. Using data from 11,868 children from the Adolescent Brain Cognitive Development (ABCD) Study, dimensions of internalizing symptoms were identified using an exploratory analysis, modeled hierarchically, and related to neurostructural measures. We identified a general internalizing factor and four subfactors reflecting fear, distress, cognitive, and somatic problems. Results revealed negative associations between brain volume and the general internalizing, distress, and cognitive problems factors (fdr-corrected p-values $< .001$). The direction of the effects for the fear and somatic problems factors depended on the type of model used. Taken together, this study revealed factors which may be important for the presentation of anxiety and depression in children and found neurostructural differences associated with these general and lower order factors of internalizing problems. These results suggest that a dimensional approach can be useful for uncovering neurobiological correlates of internalizing symptoms in youth.

FUNDING: R00MH117274 (AK).

ALTERED EXPRESSION OF BRAIN NETWORK DYNAMICS IN AFFECTIVE AND PSYCHOTIC ILLNESSES

Carrisa Cocuzza[1,2], Sidhant Chopra[1,2], Ashlea Segal[2], Rowena Chin[2], Avram Holmes[1]
[1]Yale University, [2]Rutgers University

Despite the importance of linking the dynamic functional architecture of the brain to behavior, the clinical relevance of across-state network dynamics remains largely unexplored. Here, in 203 participants (n=129: affective/psychotic diagnoses, n=74: no diagnosis), whole-brain functional connectomes from resting- and task-state fMRI were decomposed to identify dynamical constraints on across-state network interactions. Dynamical constraints were less variable across task contexts (versus permuted null network models, $p<0.001$) in patients, suggesting that de-differentiated (i.e., flattened) network dynamics are linked with failures to meet cognitive demands. We applied dimensionality reduction and hierarchical clustering to 94 self-report and clinical measures spanning psychopathology to uncover clusters of phenotypic

dimensions. After converting each participant's pattern of cluster expression into a phenotypic fingerprint, across-state network dynamics were able to classify dimensional phenotypes more robustly than traditional case-control status. Further, the extent that dynamics were de-differentiated was positively and negatively linked with externalizing features in patients and healthy controls, respectively. Graph theory revealed that a role of dynamical constraints on brain network reconfiguration may be enabling efficient information flow over shifting connectivity patterns. We found novel evidence that brain network dynamics are linked to prominent dimensions of the phenotypic hierarchy exhibited across healthy controls and transdiagnostic psychiatric patients.

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ERP FACTORS AS CORRELATES OF INTERNALIZING AND EXTERNALIZING PSYCHOPATHOLOGY

Rita Pasion
Lusófona University

The organization of the Hierarchical Taxonomy of Psychopathology (HiTOP) model provides unique opportunities to evaluate whether neural risk measures operate as indicators of broader latent liabilities (e.g., externalizing proneness) or narrower expressions (e.g., antisociality and alcohol abuse). Following this approach, the current study recruited a sample of 182 participants (54% female) who completed measures of externalizing psychopathology (also internalizing) and associated traits. Participants also completed three tasks (Flanker-No Threat, Flanker-Threat, and Go/No-Go tasks) with event-related potential (ERP) measurement. Three variants of two research domain criteria (RDoC)-based neurophysiological indicators - P3 and error-related negativity (ERN) - were extracted from these tasks and used to model two latent ERP factors. Scores on these two ERP factors independently predicted externalizing factor scores when accounting for their covariance with sex - suggesting distinct neural processes contributing to the broad externalizing factor. No predictive relation with the broad internalizing factor was found for either ERP factor. Analyses at the finer-grained level revealed no unique predictive relations of either ERP factor with any specific externalizing symptom variable when accounting for the broad externalizing factor, indicating that ERN and P3 index general liability for problems in this spectrum. Overall, this study provides new insights about neural processes in externalizing psychopathology at broader and narrower levels of the HiTOP hierarchy.

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SHARED AND UNIQUE ASSOCIATIONS BETWEEN ELECTROPHYSIOLOGICAL INDICATORS OF ATTENTION AND EXTERNALIZING SYMPTOMS

Sarah Brislin[1], Jacqueline Meyers[2], COGA Collaborators[2], Danielle Dick[1], Bernice Porjesz[2]
[1]Rutgers University, [2]State University of New York Downstate Medical Center

Externalizing disorders have been linked to shared neural dysfunction, captured in part by electrophysiological (EEG) response during attention tasks. We built upon recent work linking P3 response to a general externalizing factor in a large family sample with elevated risk for externalizing. The sample included adults (age 18-30) from the Collaborative Study on the Genetics of Alcoholism (N=8,735). P3 amplitude, frontal theta, and posterior delta to target stimuli were derived from a visual oddball task. DSM-5 symptom counts for Alcohol Use, Cannabis Use, Adult Antisocial, Conduct, and Oppositional Defiant Disorders were assessed via clinical interview and nicotine use was measured via the Fagerstrom Test for Nicotine Dependence. All Mplus analyses used FIML, were clustered by family, and included sex as a covariate. The EEG indicators loaded on common factor (avg. lambda = .73). A bifactor model fit the phenotypic data with a common factor (EXT, avg. lambda = .62), and lower order substance (avg. lambda = .48) and antisocial factors (AB; avg. lambda = .34). The EXT and EEG latent factors were significantly associated (psi = -.11, p<.001) suggesting that variance captured by the common externalizing factor was associated with neural activation during the visual oddball task. However, the EEG factor was also significantly associated with the AB factor (psi = -.13, p = .005) beyond the variance captured in the EXT factor. The current results provide insight into how neural indicators can inform our understanding of the etiology of the externalizing spectra and facets.

FUNDING: This national collaborative study is supported by NIH Grant U10AA008401 from the National Institute on Alcohol Abuse and Alcoholism (NIAAA) and the National Institute on Drug Abuse (NIDA).

A COGNITIVE-PERFORMANCE BASED APPROACH TO IDENTIFYING BRAIN-MRI INDICATORS OF EXTERNALIZING PSYCHOPATHOLOGY RISK

Christopher Patrick, Jens Foell
Florida State University

Proneness to externalizing psychopathology is associated with impairments in cognitive control, and twin research indicates a genetic basis to this association (Young et al., 2009). Cognitive-control performance relates in turn to P300, an ERP that also shows a genetic association with externalizing proneness (Yancey et al., 2013). We hypothesized that MRI-brain measures related to impaired cognitive performance would operate as indicators of risk for, and thus prospectively predict, externalizing problems. Using a composite of performance scores from 4 cognitive tasks, MRI activations from a monetary-incentive delay (MID) task, and externalizing symptom data from the 3-wave European IMAGEN study ($N = 1848$), we split the wave 1 (age 14) sample and identified regional MRI activations from the MID task that covaried with the performance composite in both half-samples. The MID-task regions that related to poorer cognitive performance were ones exhibiting less activation during reward anticipation and greater activation upon reward receipt. An aggregate score reflecting this brain activation pattern significantly predicted externalizing symptom scores, both concurrently (at age 14) and prospectively (at age 16). Importantly, the prospective association remained significant even when controlling for current-age symptoms. Findings illustrate how a known index of psychopathology risk from one modality (task performance) can be used to identify risk indicators from another modality (brain response). Implications for quantifying and conceptualizing clinical risk will be discussed.

SYMPOSIA VIII-4

COMPUTATIONAL MODELING FOR UNDERSTANDING GENERATIVE MECHANISMS OF EVOKED AND INDUCED BRAIN POTENTIALS

Chair: Eric Rawls
University of Minnesota

Electrophysiology offers exquisite temporal detail into cognitive processes, yet interpreting electrophysiological fields containing both phase-locked (evoked) and non-phase-locked (induced) potentials can pose significant challenges. We address these complexities, leveraging computational models to bridge large-scale synaptic fields recorded with EEG with underlying population spiking activity and neurotransmitter release. Michael Preston discusses thalamocortical dynamics underlying sensory evoked potentials, emphasizing the role of thalamic spiking activity using a novel ERP parameterization method. Darcy Diesburg applies biophysical modeling of cortical microcircuits to explore the significance of thalamocortical drive in higher-order cognitive functions indexed by frontocentral evoked potentials. Olivia Calvin bridges cellular activities with macroscale observations using biophysical models, implying that neurotransmitter activities can impact aperiodic power outside previously known frequency ranges. Eric Rawls shows evidence that aperiodic activity explains aspects of induced neural activity generally attributed to oscillations, elucidating the non-oscillatory nature of certain cognitive dynamics. Finally, Richard Gao integrates viewpoints using an advanced computational technique for analyzing enormous numbers of biophysical models, providing a holistic understanding of brain dynamics. We bring together new research into induced and evoked brain potentials, advancing our comprehension of the biophysical bases of cognition.

FUNDING: National Institutes of Health's National Center for Advancing Translational Sciences, grants TL1R002493 and UL1TR002494.

Topics: 1.8 Other (Multiple populations/methods, including human data, simulation, and rodent models.), 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.15 Computational / Simulation, 3.6 Other (Multiple designs including lab study, computational/simulation, and secondary analysis), 4.7 Psychopathology, 4.12 Sensation/perception/interoception, 4.25 Cognitive control/executive functions

BIOPHYSICAL MODELING OF THALAMOCORTICAL CONTRIBUTIONS TO VISUAL CORTICAL EVENT-RELATED POTENTIALS

Michael Preston[1], Dillan Cellier[2], Eena Kosic[1], Parsa Seyfourian[3], Leslie Claar[4], Lydia Marks[4], Christof Koch[4], Irene Rembado[4], Bradley Voytek[1]
[1]University of California San Diego, [2]University of California San Diego, [3]University of British Columbia, [4]Allen Brain Institute

Event related potentials (ERP) have been foundational in medical diagnosis and neuroscience research for decades, yet their physiological basis has not been fully characterized. Recent technological advancements have enabled an unprecedented look at the biophysical origins of ERPs.

Simultaneous recordings across electrophysiological scales—scalp electroencephalography (EEG), local field potentials (LFP), and single unit activity—and novel analysis methods are beginning to link features of the ERP signal to the underlying circuit dynamics. This talk will present a biophysically-informed model of the visual cortical ERP and a novel ERP parameterization method used to link features of the ERP to underlying spiking activity. We show that the visual cortical ERP is driven by synchronous thalamocortical excitatory postsynaptic potentials (EPSP). Our novel ERP parameterization method provides rich insights into the ERP shape and highlights features predictive of the underlying spiking dynamics. When population spiking activity in the thalamus is more synchronous, EPSPs integrate to produce a sharper, higher amplitude ERP. This work recapitulates recent empirical findings from our collaborators linking cortical ERP amplitude to thalamic burst firing. These findings provide a step towards understanding the physiological basis of visual ERPs.

BIOPHYSICALLY MODELING CIRCUIT-LEVEL MECHANISMS OF THE FRONTOCENTRAL EVENT-RELATED POTENTIAL DURING RESPONSE INHIBITION

Darcy Diesburg
Brown University

Frontocentral event-related potentials (FC-ERPs) are ubiquitous neural correlates of cognitive control in EEG, but the thalamocortical dynamics that produce them remain mostly unknown, limiting our ability to relate the neural computations they reflect to cognition and behavior. I will present a project in which we simulated the circuit-mechanisms underpinning the P2, N2, and P3 features of the FC-ERP after Stop-Signals in the Stop-Signal task (SST), using Human Neocortical Neurosolver's biophysical model of a neocortical column under thalamocortical drive. We found that a sequence of overlapping thalamocortical drives can produce the FC-ERP and used this model to evaluate circuit-mechanisms of features that distinguished successful from failed response-inhibition. Our simulations revealed that a difference in P3 onset is likely due to a later arrival of thalamocortical drive in failed stops, rather than a difference in its effective strength. In contrast, the same model predicted that earlier drives underpinning the P2 and N2 differed in both strength and timing across conditions. I'll explain how these findings do (and in some cases, do not) support links between neural signatures and predictions of the horse-race model of response inhibition. I'll also discuss ongoing work to investigate the influence of mechanisms producing spectral events related to inhibition in the same timeframe. Finally, I'll touch on how these models may be useful in probing mechanisms of FC-ERPs in other task contexts and in understanding changes in control observed in neuropsychiatric disease.

FUNDING: NIH T32MH126388, R25NS124530, NIH R01NS117753, NIH GR5271521, U24NS129945.

THE CONTRIBUTION OF SLOW GLUTAMATERGIC RECEPTORS TO SIGNAL APERIODICS DURING WORKING MEMORY

Olivia Calvin, A. David Redish
University of Minnesota

In psychosis there have been discussions about the role of excitation-inhibition (E-I) balance, of which there has been evidence of various abnormalities, and how it affects psychotic symptomatology and etiology. E-I balance should be evidenced in the synaptic efficacy of glutamatergic and GABAergic receptors, but this can be difficult to assess. One potential approach to assessing E-I balance is by examining knees in the signal aperiodic. Previous work assessed this by modeling how AMPA and GABA receptors could produce a knee in the aperiodic. I have extended this rationale to other glutametergic and GABA-ergic receptors to examine how they affect signal aperiodics within both traditional and non-traditional electrophysiological ranges. This modeling of electrophysiological receptor contributions suggests that the various receptors should contribute multiple 'knees' to the aperiodic. The frequencies that the aperiodic knees begin are inversely related to the opening and closing rates of the receptors with longer dynamics being visible at lower frequencies. Importantly, slow, glutamatergic NMDA receptors should produce a knee within delta frequency ranges. In many models of working-memory, in which people with psychosis often exhibit a deficit, NMDA and GABA receptors are particularly important as they mediate the ability to maintain a representation of information over a prolonged period. Thus, we examined how the aperiodic should change during spatial working given various biophysically realistic neural networks implementations of working memory.

FUNDING: NIDA T32-DA037183, NIH P50-MH119569.

OSCILLATORY AND APERIODIC CONTRIBUTIONS TO INDUCED SPECTRAL SIGNATURES OF COGNITIVE CONTROL

Eric Rawls[1], Olivia Calvin[1], Scott Sponheim[1,2]
[1]*University of Minnesota,* [2]*Minneapolis VA Healthcare System*

Oscillations entrain neuronal populations and facilitate task-relevant representations, but coexist with an aperiodic 1/f background. Classically, oscillations during cognitive tasks were believed to carry information while aperiodic activity was construed as noise. However, aperiodic shifts can be generated by distinct neurotransmitter activities, disrupting the notion that these activities are purely noise. We parameterized non-phase-locked EEG data recorded during a flanker paradigm into separate aperiodic and oscillatory time-frequency surfaces. Frontal theta-band synchronization and posterior alpha desynchronization following incongruent stimuli and errors reflected parameterized oscillations. Additionally, pre-response posterior alpha oscillations were increased prior to errors. On the other hand, aperiodic effects included 1) central delta increases following congruent stimuli and preceding a correct response to incongruent stimuli, and 2) central alpha-beta increases following congruent stimuli, and following a correct response to incongruent stimuli. We hypothesized that these aperiodic delta and alpha-beta effects could reflect neurotransmitter dynamics, which we tested using biophysical neural network models. Models suggest NMDA neurotransmission contributes delta aperiodic shifts, while GABA neurotransmission contributes alpha-beta aperiodic shifts. Ultimately, this research requires a re-interpretation of some event-related EEG activity and enables computationally-informed understanding of the mechanistic underpinnings contributing to cognitive control.
FUNDING: NIH CTSA TL1R002493, UL1TR002494, Department of Veterans Affairs Rehabilitation R&D Program I01RX000622, Congressionally Directed Medical Research Program PT074550.

INVERSE MODELING UNCOVERS DEGENERATE CIRCUIT MECHANISMS UNDERLYING NEURAL POPULATION DYNAMICS

Richard Gao, Michael Deistler, Auguste Schulz, Jakob Macke
University of Tuebingen

Mechanistic models, such as spiking neural networks (SNNs), are critical for linking neural activity to their underlying circuit parameters, in particular through the discovery of models that can produce data-consistent simulations (i.e., inverse modeling). However, it's extremely challenging to identify a single data-consistent model, let alone many such models to study the relationship between parameters. As a result, SNNs are often reduced to have few free parameters, limiting their potential as mechanistic models of neural circuits and dynamics. Here, we leverage simulation-based inference to perform automated model discovery for SNNs with high-dimensional parameter spaces. Simulating 1 million configurations of an adaptive exponential integrate-and-fire (AdEx) network with clustered connectivity, we observe complex dynamics with non-trivial dependencies to 28 model parameters representing neuronal, synaptic, and connectivity mechanisms. To perform inverse modeling, we train a deep neural density estimator on this simulated dataset to approximate the posterior distribution over parameters given observed data. We apply this methodology to gain mechanistic insight in three different scenarios: generation of gamma oscillation in silico, early development of human brain organoids in vitro, and circuit differences across mouse hippocampus in vivo. In all three cases, we identify many models that are quantitatively consistent with recordings of neural activity, and discover key changes in cellular and network parameters, as well as the relationship between parameters.
FUNDING: RG is supported by the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No. 101030918 (AutoMIND). MD, AS is supported by the International Max Planck Research School for Intelligent Systems (IMPRS-IS). RG, MD, AS, JHM are members of the Machine Learning Cluster of Excellence, EXC number 2064/1–390727645. This work was supported by the German Federal Ministry of Education and Research (BMBF): Tübingen AI Center, FKZ: 01IS18039A.

Symposia VIII-5: SPR SPECIAL SYMPOSIUM ON 100 YEARS OF EEG RESEARCH (3): ENHANCING INCLUSIVITY IN EEG METHODOLOGY: CONSIDERATIONS FOR EMPLOYING EQUITABLE RESEARCH PRACTICES WITH BLACK AND LATINE PARTICIPANTS

Chairs: Lisa Brown, McKenzie Figuracion
Purdue University

Psychophysiological research has not adequately addressed the underrepresentation of racially and ethnically diverse participants. This leads to difficulties obtaining high quality data and lack of attunement to participant

needs, perpetuating scientific racism within the field. To set the stage for this symposium, co-chair Brown will discuss the impact of systemic racism in research and highlight the methodological and historical barriers that, when inadequately addressed, sustain the continued exclusion of Black participants. Symposium presentations will focus on EEG studies designed to ensure accurate measurement and responsible reporting of data with participants from minoritized racial groups, with an emphasis on employing equitable research practices. Lees will consider misinterpretations of measurement bias that can occur with participants whose hair textures and styles have historically been considered incompatible with EEG. Figuracion will then present comparisons of signal quality and participant preference for three EEG systems in a sample of Black and Latine adults. Joyner will provide a practical approach to overcoming technical limitations in EEG equipment through novel and creative uses of hair styling for Black individuals. Finally, Moser will report staff training, participant recruitment, data collection, and analysis practices designed to center Black individuals in the research process. The work presented will stimulate discussion on equitable research practices and provide practical strategies researchers can use to enhance inclusivity in EEG research.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.1 Observational Study: Cross-Sectional, 4.6 Racism/prejudice

THE NEED TO MEASURE POTENTIAL MEASUREMENT BIAS IN EEG AND ERP RESEARCH

Ty Lees[1,2], Lisa Gatzke-Kopp[3]
[1]McLean Hospital, [2]Harvard Medical School, [3]The Pennsylvania State University

Recent conversations related to diversifying EEG/ERP research often focus on biases in recruitment and access, specifically with regard to under-represented minorities whose hair type or style is perceived to be incompatible with EEG. As we work to address these issues, must also consider whether there are potential biases within our measurements that need to be evaluated, as measurement bias that is systematically associated with race could be misinterpreted as psychological differences. In a recent paper, our lab used data collected from n = 213 individuals ages 17–19 years of varying hair-types to examine multiple EEG/ERP data quality metrics derived at the preprocessing, post-processing, and variable generation stages. In analyzing these data, we found that hair volume was associated with small but systematic differences in these metrics, and that said differences can be significantly reduced or, in most cases eliminated, by analytically accounting for gel-volume as a covariate. In this talk, following a brief presentation of these results, we will explore and discuss other domains and dimensions of EEG/ERP research that future studies need to investigate for similar methodological biases, including implications of hardware (e.g., cap density, electrode design) and data processing (e.g., defining noise, is bias more likely to manifest in certain frequencies of interest). We will then conclude by discussing and making recommendations for a future research agenda that would enable the field to develop concrete best practices and enable the diversification of EEG research.

FUNDING: National Institute of Health (UH3 OD023332).

A SYSTEMATIC COMPARISON OF SIGNAL QUALITY AND PARTICIPANT COMFORT BETWEEN SYSTEMS

McKenzie Figuracion, Lisa Brown, Kimberly Galvez-Ortega, Dan Foti, Sarah Karalunas
Purdue University

Studies utilizing EEG have historically suffered from limited generalizability, in part due to widespread underrepresentation of racially and ethnically diverse participants. In addition to systemic barriers, EEG research is additionally hampered by questions related to technical applicability of different EEG systems and acceptability of standard EEG recording practices for individuals from minoritized backgrounds who may also have course or curly hair textures. The current project with Black and Latine adults addresses data quality and participant-rated acceptability of research procedures across three EEG systems: gel-based, saline-based, and a dry-cap. Single-session recordings were completed for each system during an active visual oddball task and standard resting state task. Analyses compare electrode application times, rates of data rejection, and signal quality between EEG systems, as well as quantitative and qualitative reports of participant comfort immediately following and one week after the visit. Data collection is ongoing (*Ntarget* = 40) and preliminary analyses suggest data rejection is increased in the saline system but only during a visual oddball task. Questionnaires and qualitative interviews indicate little preference between systems but with some elevated concerns about removal of gel from their hair following the visits. Results will contribute to research efforts on improving EEG for racially and ethnically diverse participants and provides

suggestions for optimal methodological procedures and technologies.
FUNDING: Karalunas' Start Up Fund.

A PRACTICAL APPROACH TO OVERCOMING THE TECHNICAL LIMITATIONS OF ELECTROENCEPHALOGRAM FOR INDIVIDUALS WITH COARSER AND CURLIER HAIR

Keanan Joyner[1], Geremy Lowe[1,2], Danielle Jones[1,3], Rebecca Waller[4], Emily Perkins[4]
[1]University of California, Berkeley, [2]University of California, San Francisco, [3]Florida State University, [4]University of Pennsylvania

Electroencephalogram (EEG) is ubiquitous in psychology but suffers from technical limitations when used with individuals with coarser and curlier hair. Because of the need for close contact between the scalp and electrodes embedded in a cloth cap, individuals with these hair types – most prevalent in Black populations – are frequently excluded from EEG study samples, limiting generalizability of findings. This study sought to overcome the limitations of current commonly used EEG equipment through novel and creative uses of hair styling. This ongoing multi-site study in the Bay Area and Philadelphia recruits a sample of Black individuals (total target $N = 150$) with varying hair styles and textures to test ways to overcome the technical limitations of EEG. In collaboration with cosmetologists, several combinations of hair styling techniques (corn rowing, braiding, flat twisting, etc.) are systematically tested for their ability to 1) expose scalp locations following the 10/20 electrode layout, 2) minimize cap application time, and 3) provide optimal comfort for participants. We report these procedural results, as well as data from an emotion recognition task with actors of multiple races, including 1) the signal quality of common event-related potentials (N170, P200, P300, LPP) and 2) race and emotion-related effects on the amplitude of these ERPs. Results will contribute to ongoing efforts to overcome practical issues in producing generalizable EEG results.

ADDRESSING INCLUSIVITY IN ELECTROPHYSIOLOGICAL RESEARCH: A CASE STUDY FROM THE CLINICAL PSYCHOPHYSIOLOGY LAB AT MICHIGAN STATE UNIVERSITY

Chris Webster, Courtney Louis, Jason Moser
Michigan State University

Electrophysiological research has systematically excluded Black individuals due to various research practices, including how the equipment is developed and publication of findings largely based on WEIRD samples. Our group has taken systematic steps over the past four years to begin to address these exclusionary and biased practices. Dedicated lab meeting discussions were initiated that led us to grapple with inadequacies in our procedures, focusing on the inclusion of individuals with diverse hair styles and textures, particularly individuals from the Black community. This led to updated training materials to improve the ways in which we interacted with participants spanning recruitment scripts, EEG visit preparation, and visit execution practices that approached participants with cultural humility. Secondly, to address the fact that our findings are often based on WEIRD samples, we considered ways to utilize existing data to center Black female participants in an ongoing study of hormone effects on anxiety and cognition. We intentionally did not approach this analysis from a racial comparison perspective, that may evoke interpretations rooted in anti-Black racism, but rather developed hypotheses and an analysis plan that specifically examined questions relevant to Black females. Finally, we implemented our new approaches to recruitment, data collection, and analysis to design a study that focused on Black females in Michigan during the COVID pandemic. Findings from our studies and reflections on the lifelong journey to increase inclusivity will be discussed.

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PSYCHOPHYSIOLOGY SPR WILEY

ABSTRACT

Open Topic Symposia

NEURAL TIMESCALES ARE DYNAMIC, NOT INTRINSIC, AND REFLECT GRADATIONS OF TASK ABSTRACTION

Dillan Cellier[1], Justin Riddle[2], Bradley Voytek[1]
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Navigating everyday environments requires that the brain multiplex information processing over many different timescales. Variety in the timescales of the environment are therefore mirrored in large-scale anatomical and functional gradients of cortex. Association cortices such as the prefrontal cortex exhibit neural activity which remains self-similar over long timespans. Conversely, sensory cortices exhibit short neural timescales, with temporally variable neural activity. However, empirical evidence for a hierarchy of neural timescales across cortex was primarily driven by analyses of resting-state data. This calls into question whether neural timescales reflect a static network property of the brain, or alternatively, reflect a range of dynamic temporal capacities for a given cortical region. To assess whether neural timescales exhibited task-related dynamics, we quantified pre-to-post stimulus changes using electroencephalography (EEG) during a hierarchical cognitive control task. The task manipulated the level of contextual control required for participants to complete the task, defined here as task abstraction. We found that neural timescales are not static, but lengthened with stimulus onset. Furthermore, neural timescale length was greatest at prefrontal sites in task conditions that required the highest level of task abstraction. This suggests that neural timescales are not only a dynamic feature of the cerebral cortex, but also capture task-specific reorganization of functional network dynamics to facilitate higher order cognition.

FUNDING: NSF GRFP funding (to D.C.) NIH National Institute of General Medical Sciences grant R01GM134363-01 (to B.V.) R00MH126161 (to J.R.).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 2.15 Computational/Simulation, 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.20 Attention, 4.25 Cognitive control/executive functions

INDIVIDUAL DIFFERENCES IN ANHEDONIA MODERATE THE EFFECTS OF DOPAMINERGIC ANTIDEPRESSANT ON MOOD AND EVENT-RELATED POTENTIALS

Li-Ching Chuang[1], Nick Augustat[1], Philipp Bierwirth[1], Ty Lees[2], Diego Pizzagalli[2], Erik Mueller[1]
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Anhedonia is a cardinal symptom of depression characterized by loss of pleasure and is associated with impaired motivation and reward-based decision making, processes that are closely linked to dopamine (DA) functioning. As DA may also play a role in antidepressant placebo responses, our study investigated the interplay of anhedonia, DA, and placebo responses. In a randomized, double-blind, placebo-controlled 2×2 design, we assessed self-reported trait anhedonia in N=297 healthy participants and administered either inert pills or DA D2 receptor antagonist sulpiride (400mg). Regardless of the actual substance, pills were stated to be either inactive or antidepressant to induce low vs. high treatment expectations. Participants underwent an experimental depressed mood induction while mood ratings and EEG data were recorded. We also evaluated an ERP waveform within the 492-636 ms timeframe as identified by global field power minima and frontal alpha asymmetry as frequently used measures in depression research. Sulpiride reversed the association between anhedonia and low state positive affect under placebo. Furthermore, anhedonia was associated with a more pronounced frontal negativity in response to mood induction under placebo, and sulpiride reversed this association. Finally, alpha asymmetry was modulated by a complex interaction of treatment expectation, substance, and anhedonia depending on the experimental phase (depressed vs. control). The current findings point to a role for DA in neurobiological mechanisms of antidepressant placebo responses and anhedonia.

FUNDING: This work was funded by the German Research Foundation Grand/Award number 422744262 - TRR289 "Treatment Expectations".

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 2.16 Pharmacology, 3.3 Lab

Based Experiment, 4.7 Psychopathology, 4.11 Personality, 4.23 Emotion/affect

EVENT-RELATED POTENTIALS MODERATE THE ASSOCIATION BETWEEN BEHAVIORAL INHIBITION AND SOCIAL ANXIETY

Margaret Penner, Alina Hoff, Sarah Myruski, Kristin Buss
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Behavioral inhibition (BI) is one of the strongest predictors in development of social anxiety (SA) symptoms (Chronis-Toscano et al., 2009). Yet not all adolescents with high BI develop SA; Prior work has implicated neurocognitive vulnerabilities that predict greater likelihood of strong associations between BI and SA. Past research indicates that error-related negativity (ERN), an error monitoring event-related potential (ERP), is associated with and moderates the link between BI and SA (Lahat et al., 2014). Attention bias in the presence of threat has also been associated with BI and anxiety (Thai et al., 2016). This study builds on prior work by measuring two ERPs reflecting neurocognitive vulnerabilities [blunted cognitive control (N2) in the presence of threat, and exaggerated error monitoring (ERN)] as joint moderators of the BI-SA link. Eighty adolescents (13-16; M_{age} =13.6, 59% female; 89% White, 3.8% Black, 7.5% multiracial; 6.3% Hispanic/Latinx) completed attention bias (Dot Probe) and response monitoring (Flanker) tasks while EEG was recorded. Consistent with past work, exaggerated (more negative) ERN significantly predicted greater SA [b = -1.44, t =-2.21, p = .032]. Blunted N2 significantly predicted a stronger association between BI and SA when ERN was *not* exaggerated [ERN*N2*BI: deltaR^2 = .06, F (1, 51) =4.99, p = .030]. Results provide initial evidence that blunted N2 (low cognitive control in the presence of threat) represents an additional vulnerability predicting the BI-SA link specifically when ERN is *not* exaggerated.

FUNDING: This study was funded by a grant from the NIH (RO1MH075750) to Dr. Kristin A. Buss.

Topics: 1.2 Human Studies: General Population - Children/Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.2 Development, 4.7 Psychopathology, 4.23 Emotion/affect

COMPARING SENSORY ATTENUATION IN ACTION EXECUTION, IMAGERY, AND OBSERVATION – A PREREGISTERED ERP STUDY

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Faculty of Mathematics and Natural Sciences, Heinrich Heine University Düsseldorf, Düsseldorf, Germany

Evidence of overlapping neural activation during the execution, imagination and observation of motor action has raised the question to which extent these might be computationally equivalent. Behavioural studies suggested that imagery but not observation of an action involves motor-based prediction of sensory action consequences, as in action execution. In this preregistered study (n=45), we investigated neurophysiological correlates of sensory prediction, i.e. attenuation of the N1 and P2 component of the auditory ERP, of sounds caused by self-performed, imagined, and observed motor actions, and of cued external sounds compared to uncued external sounds, respectively. We expected gradual attenuation for motor-related conditions for the N1 (execution>imagery>observation), but comparable effects for the P2. Our analyses revealed N1 attenuation only for self-generated and cued sounds, while the former was stronger than the latter. For the P2, we observed attenuation of all motor-related and cued sounds. The effect was stronger for action execution compared to all other conditions, but comparable between imagery and observation. Importantly, the effect was stronger for sounds following observed (but not imagined) actions than for cued sounds. While these results suggest functional similarities between action execution, imagery, and observation, differences in magnitude challenge computational equivalence. Furthermore, they indicate that motor-related prediction might also be reflected in later processing stages (P2) and not, as previously thought, exclusively in the early N1.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception

PLENARY: PRESIDENT'S SYMPOSIUM ON PSYCHOPHYSIOLOGY BEYOND THE USUAL SUSPECTS

NOISE POLLUTION AS A MODERATOR OF TYPICAL AND ATYPICAL AUDITORY SENSORY GATING

Emily Martinez[1], Kaia Sargent[1], Anika Guha[1,2], Morgan Bartholomew[1], Alexandra Reed[1], Victoria Rosen[1], Alexis Worthley[1], Kenneth Subotnik[1], Joseph Ventura[1], Keith Nuechterlein[1], Gregory Miller[1], Cindy Yee[1]
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Exposure to persistent and unwanted environmental noise has been shown to have harmful effects on physical and mental health. A major task of the human auditory system is limiting the amount of sound from the environment that enters awareness. The separation of signal from noise is supported by auditory sensory gating, which activates inhibitory mechanisms that filter out redundant or irrelevant inputs. As the amount of noise in the environment increases, suppressing noise becomes increasingly demanding. Exposure to noise pollution may disproportionately burden individuals who have preexisting impairments in filtering and auditory attention, such as individuals with schizophrenia (SZ). We examined whether auditory sensory gating, as indexed by the P50 ERP component, varied based on levels of transportation-related noise at an individual's residence, obtained using community noise pollution data. The present study included 50 clinically-stabilized first-episode SZ outpatients and 39 demographically-matched healthy comparison (HC) participants. Initial findings indicated sensory gating is poorer among SZ who live in high-noise areas than among SZ who live in low-noise areas, whereas a minimal difference in sensory gating was observed among HC living in low- vs. high-noise areas. Results suggest that environmental noise pollution exacerbates auditory dysfunction in SZ, representing an important interaction between a vulnerability to SZ and an urbanicity-related environmental stressor and highlighting a potential target for public health intervention.
FUNDING: This work was supported by the National Institute of Mental Health (R01 MH110544 and R01 MH110544-S1).
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.19 Other, 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.12 Sensation/perception/interoception, 4.26 Other

INGESTIBLE PILLS SHED LIGHT ON THE ROLE OF THE GASTROINTESTINAL SYSTEM IN SHAPING EMOTIONAL EXPERIENCES

Giuseppina Porciello[1], Alessandro Monti[2], Maria Serena Panasiti[3], Salvatore Maria Aglioti[4]
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Whether emotions are characterized by distinct physiological signatures remains hotly debated, that gastrointestinal (GI) signals play a crucial role in those processes seems to be taken for granted. However, empirical evidence confirming the connection between GI signals and emotional reports are limited. This is because it is difficult to monitor GI system. To assess the impact of gastric markers on emotional responses, we asked a group of healthy male participants to ingest a pill that measured pH, pressure, and temperature of their GI tract while they were exposed to videos that consistently induced disgust, fear, happiness, sadness or a neutral state. These internal markers of GI physiology were complemented by participants' self-reported visceral sensations (gastric, respiratory and cardiac), perceived emotions, as well as heart rate (HR), heart rate variability (HRV) recordings, and spontaneous eye blinks. Our findings revealed that GI sensations were mostly evoked by fearful and disgusting videos, and that perceived emotions were clearly linked to the stomach activity. Specifically, the more acidic the pH, the more participants reported feelings of disgust and fear; the less acidic the pH, the more they reported happiness. Additionally, disgusting videos were associated with a significant increase in HRV and together with fearful videos with a decrease in HR. These findings highlight a crucial role of the stomach in the emotional experience of disgust, fear and happiness and that ingestible pills may open new avenues for exploring the deep-body physiology of emotions.
FUNDING: The support of the Institut d'études avancées de Paris to SMA is gratefully acknowledged. This research was supported by ERC Advanced Grant 789058

(eHonesty) to SMA; by Regione Lazio grant A0375-2020-36612 to SMA and MSP; and by Italian Ministry of Health Young Researcher Grant (2018- 2367636 and 2021–12372815) to GP and MSP, and SEED PNR21 to GP.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 2.19 Other, 3.3 Lab Based Experiment, 4.23 Emotion/affect

DOI: 10.1111/psyp.14692

PSYCHOPHYSIOLOGY SPR WILEY

ABSTRACT

Poster Abstracts

Poster Session I

POSTER SESSION I-001 | A NOVEL NORMALIZATION PROCEDURE OF ERP WAVEFORMS TO IMPROVE THE SIGNAL-TO-NOISE RATIO OF DATA COLLECTED AT A SCIENCE FESTIVAL

Marijtje Jongsma, Nele Ziegler, Clementina van Rijn
Radboud University, Nijmegen, Netherlands

Citizen science can be used to contribute to science education and to obtain data for research. However, these data might have a lower signal-to-noise ration compared to data recorded in a controlled lab environment. Within the context of a science festival, visitors were invited to participate in an ERP replication study demonstrating the At a science festival, the "pain inhibits pain effect" - known as conditioned pain modulation (CPM) - was induced by having participants submerge their left hand to the wrist for 90 sec. in a bucket with either ice-cold water in the experimental condition, or in water at room temperature in the control condition (counterbalanced). Event-Related Potentials (ERPs) to 20 brief electric shocks delivered at the anterior brachial part of the right arm were extracted from the ongoing EEG from 3 midline electrodes. In addition, after the last electric stimulus, participants verbally rated the intensity of the electric stimulus on a 0-100 numeric rating scale (NRS). Because the data were recorded in a noisy environment, we normalized the full ERP waveforms per participant by rescaling the 9 recorded ERPs per individual from -50 to 50 (a.u.). ERPs contained a clear P_3 component. Both the ERP P_3 amplitude and NRS were diminished after exposure to ice water but not after exposure to water at room temperature compared to baseline. Statistical analyses on the P3 components extracted from the conventional ERP as well as the normalized ERPs were compared. This way, we were able to replicate the "pain inhibits pain" effect at a science festival.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.9 Pain

POSTER SESSION I-002 | SOCIAL PAIN IS ATTENUATED DURING CARDIAC SYSTOLE THAN DIASTOLE

Tsubasa Izaki[1], Toshiyuki Himichi[1], Michiko Sakaki[2]
[1]Kochi University of Technology, Kochi, Japan, [2]University of Tuebingen, Tübingen, Germany

Introduction: Social pain is a painful feeling evoked by social rejection, exclusion, or loss of significant others. Previous research suggests that physical pain is reduced by increased interoceptive signals from baroreceptors (baroafferent signals). This pre-registered study investigated whether social pain is attenuated by increased baroafferent signals during cardiac systole than diastole as seen in physical pain. Given that heart rate variability (HRV) at rest is associated with the vagus nerve (which transmits baroafferent signals), we also examined if resting HRV is associated with the effects of cardiac cycles on social pain. Method: Participants played the cyberball task, a computerized game of ball tossing with two other players. In the rejection condition, the ball was rarely thrown to the participant and the other two players kept throwing the ball to each other. The throws between the other players were defined as exclusion events and were presented at cardiac systole (systole condition) or diastole (diastole condition). Resting HRV was estimated based on the root mean square of successive differences (RMSSD) in the interbeat intervals recorded at rest (before the cyberball task). Results: We found that exclusion events evoked social pain significantly lower in the systole condition than in the diastole condition. Furthermore, the effects of the cardiac cycle were greater in participants with higher HRV than in those with lower HRV. Discussion: Our results suggest that cardiac afferent signals affect not only physical pain, but also social pain.

FUNDING: This study was funded by JSPS KAKENHI Grant Numbers JP23K12869 and 22H01084.

Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.5 Hemodynamic (BP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.9 Pain, 4.12 Sensation/perception/interoception, 4.20 Attention

POSTER SESSION I-003 | EFFECTS OF DISTRACTION ON EMOTIONAL PROCESSING: INSIGHTS FROM EYE TRACKING AND BRAIN ELECTRICAL ACTIVITY

Jose Mora Quiroga, Juan Abril Rondeos, Milena Lamprea, Andrea Suarez, Marisol R. Lamprea
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Distraction is a powerful emotion regulation strategy that intervenes early in the time course of emotional processing. The aim of the present study was to describe changes in visual scanning and brain electrical activity produced by distraction during the presentation of negative valence images. For this purpose, neutral and negative images from the Affective Picture System were presented with and without the superimposition of a distractor element (arithmetic problem). Distractor dwell time and differences in pupil size during picture viewing were recorded, alongside the amplitude of the Late Positive Potential (LPP) at centro-parietal electrodes and the power in the theta band in the midline-frontal region. Results showed that participants (N = 25) fixated on the distractor and that time of fixation was shorter when negative images were in the background. Additionally, the distractor element produces increases in pupil dilation in both image types. Reductions in LPP amplitude were observed in the early window during negative images presentation with the distractor compared to negative images without it. Finally, it was observed that negative images with the distractor produced an increase in the power of theta. These results suggest that participants were engaged in the distractor task, which required cognitive effort. This notion is supported by the increases in the theta power, which were only significant for aversive stimuli. Results suggest that cognitive effort interferes with the early emotional response to aversive images.

FUNDING: División de Investigaciones de la Sede Bogotá Universidad Nacional de Colombia. Project 57594.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.6 Eye Tracking (blink, movement, size), 3.3 Lab Based Experiment, 4.23 Emotion/affect

POSTER SESSION I-004 | PSYCHOPHYSIOLOGICAL FLUCTUATIONS IN FACIAL AND FINGER SKIN BLOOD FLOW

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The skin blood flow (SkBF) changes in response to external stimuli and internal states. Previous studies have reported contrasting facial and finger SkBF responses to painful electrical stimulation, with a general increase in the face and a decrease in the finger. However, it remains unclear whether these fluctuations are related to the stimuli's intensity or subjective feelings of pain. This study aims to clarify the factors that influence both SkBF fluctuations and examine the relationship between SkBF fluctuation and the psychiatric traits of participants. We presented electrical stimuli from a patch applied to the participants' arms, and the intensity gradually increased. Participants responded when they felt the pain induced by the stimuli. We focused on the interval when the stimuli were presented and after the participants responded with pain. As a result, the finger SkBF began to decrease before they perceived pain and decreased further as the stimulus intensity increased. In contrast, facial SkBF did not change during stimulation but increased after the pain response. In addition, participants' anxiety and depressive traits differed according to the direction of increase or decrease in both SkBF immediately after the start of stimulation. Our results suggest that finger SkBF decreases depending on sympathetic vasoconstriction in response to nociceptive stimuli, whereas the feeling of pain induces facial SkBF fluctuations. Both SkBF fluctuations after the start of stimulation may associated with psychiatric traits.

FUNDING: JSPS Grant-in-Aid for Scientific Research (A) [JP20H00108] JSPS Grant-in-Aid for Challenging Research (Exploratory) [JP19K21819] JSPS Grant-in-Aid for Challenging Research (Pioneering) [JP22K18264].

Topics: 1.1 Human Studies: General Population - Adults, 2.19 Other (Skin blood flow), 3.3 Lab Based Experiment, 4.9 Pain, 4.23 Emotion/affect

POSTER SESSION I-005 | SEARCH FOR MEANING AND CONSERVED TRANSCRIPTIONAL RESPONSE TO ADVERSITY

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Background: As Frankl highlighted our nature as a 'meaning-seeking species' (Frankl, 1992), human beings are inherently driven to comprehend their place in the world, even amidst life's challenges. Individuals actively seeking meaning in life may perceive stress as a challenge to be overcome, potentially leading to different physiological stress responses than those with a less active search for meaning. We employed a functional social genomics framework to examine the link between the search for meaning and Conserved Transcriptional Response to Adversity (CTRA), a prior-defined gene expression profile indicative of reactions to stress. Methods: Blood samples were obtained from 152 Korean adults (mean age = 44.64 years; 50% female) to quantify CTRA RNA profiles. We conducted mixed-effects linear model analyses to explore the relationship between the search for meaning and CTRA expression. Additionally, we assessed this association while controlling for purpose in life. Results: The search for meaning is significantly correlated with the down-regulation of CTRA expression. Notably, this relationship persists even after controlling for purpose in life, which has been previously associated with CTRA expression, indicating the distinct influence of the search for meaning. Conclusions: The findings indicate that actively seeking meaning can down-regulate CTRA expression and may enhance the body's stress response. Furthermore, these findings suggest that the act of searching for meaning and the experience or realization of purpose are distinct concepts.

FUNDING: This study was supported by Center for Happiness Studies via the Center for Social Sciences at Seoul National University and National Research Foundation of Korea (NRF) grant funded by the Korean government (MSIT) (NRF-2021R1C1C2095353).

Topics: 1.1 Human Studies: General Population - Adults, 2.9 Immunology, 2.10 Blood markers, 2.11 Questionnaires/ Interviews, 3.1 Observational Study: Cross-Sectional, 4.10 Stress, 4.26 Other

POSTER SESSION I-006 | QUESTIONING THE SUITABILITY OF THE QUALITY CRITERION SME FOR EEG DATA: EXPLORATION OF THE INFLUENCE OF THE QUANTIFICATION METHOD AND REFERENCE SCHEME ON FRN AND SME OF FRN AMPLITUDES

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Various approaches have been taken over the years to quantify event-related potentials (ERP) and these approaches may vary in their utility connecting empirical research and scientific claims. In this work we compared different quantification methods as well as the influence of three reference methods (linked mastoids, average reference, and current source density) on the resulting ERP amplitude and the bootstrapped standard error of the means (SME, Luck et al., 2021), which was recently suggested as a quality criterion for ERP research. Our example for an ERP is the feedback-related negativity (FRN) to feedback about trustee behavior in a trust game with participants in the trustor position. We found that the quantification methods concerning the FRN influenced the absolute value of condition effects in the experimental paradigm. Yet, the patterns of effects were detected by almost all chosen methods. In addition, our findings stress the importance of checking the reference electrodes concerning effects of the experimental conditions. Furthermore, interactions of topographical distribution and reference choice should be considered. Finally, we were able to show that the SME is lower for more datapoints that are given in the quantification period of the FRN, and higher for more negative FRN amplitudes. These biases may lead to divergence of SME and effect size detection. Therefore, if the SME was used to compare different processing choices one should consider controlling for these important aspects of the data and possibly include other quality criteria like effect sizes.

FUNDING: This publication was funded by the European Union through the project “Individualisierung Digital” (Fonds 823881) and the project “Hyperautomation Ökosystem (Hyko)” (1.2-StMWK- F.4-UFR-002) in the Europäischer Fonds für regionale Entwicklung and the National Natural Science Foundation of China (71942002).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.21 Decision making, 4.26 Other

POSTER SESSION I-007 | THE AUTONOMIC SELF-REGULATION AND COORDINATION DYNAMICS ACROSS CONTEXTS IN EARLY CHILDHOOD

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Cardiac self-regulation (SR) and coordination (CO) indexed by pre-ejection period (PEP) and respiratory sinus arrhythmia (RSA) are critical to mental and physical health (Quigley & Moore, 2018) and predict self-regulation outcomes among young children (Zeytinoglu et al., 2022). Despite the dynamics of RSA and PEP measures, prior studies primarily used static measures or mean-level reactivity scores. Thus, less is known about dynamical SR and CO across tasks. This study examined children's within-person SR (e.g., how well PEP is predicted by PEP at a prior moment) and CO (e.g., how well PEP is predicted by RSA at a prior moment) of PEP and RSA as 30-second epochs, as well as the between-person CO of PEP and RSA, at rest and during a cognitive challenge task measuring executive function (Zelazo, 2006). Participants were 86 children (61-81 months; M_{age} = 67.7 months; 47% female; 88% White). Separate random-intercept cross-lagged panel models were conducted for the resting conditions and the cognitive challenge task. Results for resting conditions revealed evidence of SR but not CO for PEP and RSA. During the cognitive challenge task, there was evidence for PEP but not RSA SR, and the between-person positive CO of PEP and RSA was found, indicating the reciprocal parasympathetic activation. These results revealed a cooperative coordination of autonomic systems (Gatzke-Kopp et al., 2019) and more within-person RSA variations during the cognitive challenge task but not at rest. This pattern may help young children physiologically regulate and engage in cognitive challenges.

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Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.26 Other (Self-regulation)

POSTER SESSION I-008 | NO EVIDENCE OF AUTOMATIC PAIRING OF COMPLEX STIMULI IN YOUNGER AND OLDER ADULTS: A VISUAL MISMATCH NEGATIVITY STUDY

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Contextual information can enhance or inhibit task performance. How and to what extent contextual information is used may change with age, e.g. inhibiting task-irrelevant information is more difficult for older adults, which may be an advantage when context facilitates performance. A simple example of context is when frequent simultaneous presentation leads to the association of two stimuli. The automatic activation of this association could be studied through the visual mismatch negativity (vMMN), an event-related potential (ERP) correlate of detecting violations of regularity in task-irrelevant stimuli. In our study, we presented context images (a nature or a city scene) followed by an emotional face (happy or angry) in oddball sequences to younger (N=18, M=21.2 ± 2.1 yrs) and older (N=17, M=69.8 ± 2.8 yrs) adults. There were frequent and rare pairings of context and emotion with equal overall frequencies of the stimuli. An association in the frequent pairings is expected to elicit a vMMN to the emotional face in the rare pairings. We also explored age-related differences. A control oddball condition with only emotional faces ensured that the emotions were automatically recognized. The images were presented in a colour frame and the participants had to press a key to colour changes. While the expected vMMN was elicited for the rare emotional faces in the control condition, no discernible vMMN emerged for faces in rare context-emotion pairings. Thus, no association between context and emotional face was observed in either age group under the conditions of our study.

FUNDING: The research was supported by the Hungarian Research Fund (OTKA K 132880).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.1 Aging, 4.18 Memory, 4.20 Attention

POSTER SESSION I-009 | INCREASED NEURAL EXCITABILITY, BUT NORMAL FUNCTIONAL INHIBITION IN THE VISUAL CORTEX OF PATIENTS WITH VISUAL SNOW SYNDROME

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Visual snow syndrome (VSS) is a form of visual perception impairment characterized by a persistent illusion of flickering dots that resemble the noise of a poorly tuned television. VSS is frequently associated with migraine, tinnitus and other neurologic disorders. There is evidence for increased neural excitability of the visual cortex in people with VSS, but it is unclear whether it is associated with a deficit of functional inhibition. To answer this question, we recorded in VVS (N=20) and control participants (N=27) magnetoencephalographic (MEG) responses to drifting visual gratings. In a separate psychophysical experiment, we estimated the effect of stimulus size on their perceptual ability to distinguish direction of visual motion. We focused on parameters that are thought to reflect efficiency of functional inhibition: (1) habituation of visual responses evoked by appearance of a grating, (2) suppression of sustained gamma response at increasing grating drift velocity, and (3) perceptual suppression associated with increasing size of a moving object. Sustained gamma responses to visual gratings were increased in VSS irrespective of the drift rate, suggesting increased neural excitability. However, neither of the studied inhibition-sensitive parameters in patients with VSS differed from normal. The findings suggest that increased neural excitability in the visual cortex in VSS is not the result of a deficient functional inhibition. Our results contribute to the understanding of the pathophysiology of VSS and may help in the development of effective treatments.
FUNDING: Ministry of Education of the Russian Federation from 13.02.2023 (N 073-00038-23-02).
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.16 Neurological disorders / Neuropathology

POSTER SESSION I-010 | THE EFFECTS OF TRANSCRANIAL FOCUSED ULTRASOUND ON ALPHA POWER

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This project investigated transcranial focused ultrasound (tFUS) and alpha (8-12 Hz) power modulation in the human brain. The effects of different pulse repetition frequencies (PRFs) on alpha was tested. Thirty participants were assigned to one of three ultrasound neuromodulation conditions: sham, individual alpha frequency (IAF) stimulation with PRF tuned to each participant's individual peak alpha frequency, and stimulation with PRF at a standard 10 Hz, the center of the typical alpha range. Participants first underwent a 5-minute eyes-closed EEG session to collect baseline data, whereby IAF was calculated. They then completed a number of surveys before receiving 5-minute ultrasound stimulation or sham stimulation. This period was followed by a 5-minute eyes-closed resting state EEG recording and subsequent survey completion. Stimulation targeted the posterior cingulate cortex (PCC), a central node of the default mode network and known generator of alpha oscillations. After analysis of these data, a significant decrease in power was noted at electrodes FP1, CP2, and CP4. Surprisingly, correlation analysis between changes in individual alpha frequency and alpha power revealed a negligible correlation, suggesting that frequency modulation occurs independently of power changes. This finding challenges existing hypotheses regarding tFUS mechanisms, particularly those implicating disrupted alpha synchrony. Further research is needed to elucidate the underlying mechanisms driving the effects of PRF on tFUS-induced modulation of alpha oscillations.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.19 Motivation, 4.23 Emotion/affect, 4.26 Other

POSTER SESSION I-011 | CONCORDANCE OF PARENTAL RESPIRATORY SINUS ARRYTHMIA AND SUBJECTIVE ANGER IN CLINICALLY REFERRED DYADS

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Children of parents with borderline personality disorder (BPD), of which anger is a cardinal symptom, are at greater risk of developing psychopathology. This intergenerational transmission of psychopathology may be partly explained by the nature of parents' anger presentations, e.g., anger concordance, or co-occurrence of responses across domains. We tested whether high parental anger concordance would be related to (1) parents' BPD severity and (2) psychopathology symptoms in their children during a sensitive developmental window. 161 clinically referred parent-child (M_{age} = 12.03) dyads participated. Parent BPD was assessed via severity scores from a gold-standard clinical interview. Child psychopathology was computed as an established composite psychopathology score (CBCL). Dyads completed a naturalistic conflict discussion, during which RSA was estimated as high-frequency heart rate variability (HF-HRV; .12 to .50 Hz respiratory power band). Parents also self-reported anger at baseline/post-conflict. Anger concordance was modeled using response surface modeling, a type of polynomial regression analyses used to understand patterns of agreement between variables. Response surface models showed that, as expected, higher parental anger concordance was associated with higher parent BPD severity, a_4=1.38; 95%CI[0.54,1.78], p<.001 as well as with higher child psychopathology severity, a_4=7.94; 95%CI[3.84,12.03], p<.001. Findings extend emotion concordance research into clinically referred dyads and suggest a potential mechanism of psychopathology transmission in families.

Topics: 1.8 Other (Clinically Referred Parent-Child Dyads), 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.23 Emotion/affect

POSTER SESSION I-012 | THE EFFECTS OF A SHORT BOUT OF EXERCISE ON ERROR-RELATED NEGATIVITY (ERN) AND ACADEMIC ACHIEVEMENT IN CHILDREN

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Exercise improves conflict monitoring (i.e., detect errors and make behavioral adjustments) in children, which is foundational for academic success and adaptive development. However, a significant barrier in a classroom setting is the practicality of implementing traditional exercise due to limitations in time and space. This challenge was addressed by examining the effects of a short bout (9-minutes) of high-intensity interval exercise (HIIE) on brain markers of conflict monitoring (error-related negativity; ERN) and academic achievement in children (n = 25; 12 females; age range: 9–12 years old). Utilizing a within-subjects cross-over design, children completed a session of HIIE (including high knees, star jumps, jumping jacks, lunges, air squats) and seated rest (watch educational video) on separate days. ERN event-related potentials (ERPs; mean amplitude at site FCz recorded during a flanker task) and academic achievement fluency (word recognition, word decoding, silent reading, and math) were assessed following HIIE and seated rest. Results revealed smaller ERN amplitude and greater word recognition fluency following HIIE compared to seated rest. These findings highlight the significance of short HIIE exercise bouts to modulate brain markers of conflict monitoring and improved academic performance, supporting the integration of short exercise breaks in a classroom to enhance learning.

Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.2 Development, 4.25 Cognitive control/executive functions

POSTER SESSION I-013 | THE ROLE OF NEURAL CUE RESPONSES IN ANXIETY

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Trait-anxiety is associated with an increased attentional bias toward threat, reflecting less top-down modulation of goal-directed attention and greater behavioral inhibition.

However, less research has examined whether anxiety similarly mediates approach motivation to reward cues. It is possible that anxiety is associated with exhibiting broad attentional bias towards stimuli with a negative valence, suggesting that individuals higher in anxiety would be more attentive to cues of loss than of reward. However, several recent studies have found higher state-anxiety to be associated with increased behavioral and neural reward processing. In the present study, we examine whether this association extends to individuals with trait-anxiety. Data were collected from 243 participants (27.1% Black), aged 17-19 years ($M = 18.51$, $SD = .47$), with self-reported anxiety scores spanning the full range of the PROMIS scale (0-40; M = 15.87; SD = 8.08). EEG was recorded during the Monetary Incentive Delay task, and P3 amplitude to cues denoting potential for reward and loss were extracted. Trait-anxiety did not correlate with either Cue P3 amplitude, indicating that anxiety was not linked to globally greater attentional engagement to the task. However, higher trait-anxiety was associated with a more positive Cue P3 difference score ($\beta = 0.04$, p=.02), indicating relatively greater attentional allocation to the opportunity for reward. Results are consistent with an emerging framework in which anxiety protects individuals from acute threat to facilitate pursuit of reward.

FUNDING: Funding for this project was provided by the National Institute of Health (UH3 OD023332).

Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.5 Secondary Analysis, 4.7 Psychopathology, 4.20 Attention

POSTER SESSION I-014 | FUNCTIONAL CONNECTIVITY OF THE SALIENCE NETWOK EVOKED BY SWITCHING STIMULI

Yasunori Kotani[1], Hajime Kageyama[2,3], Nobukiyo Yoshida[4], Yoshimi Ohgami[1], Hiroyuki Akai[2], Akira Kunimatsu[5], Shigeru Kiryu[5], Yusuke Inoue[6]
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The salience network (SN) of the human brain is thought to be involved in the function of switching between other brain networks based on the saliency of stimuli. However, it is still unclear which regions within the SN contribute to this switching process. In this fMRI study, we used generalized psychophysiological interaction (gPPI) analyses with the bilateral anterior insula (aINS), bilateral rostral prefrontal cortex (RPFC), and anterior cingulate cortex as seed regions to explore how the SN responds to switching stimuli that convey reward-related information. Thirty-one participants performed a time estimation task where switching stimuli with reward information were presented after a time estimate, informing them whether they could receive a monetary reward (RW) or not (NR), thereby changing the functional connectivity of the SN based on the reward information. Analyses showed that, in the RW condition, the left aINS demonstrated significant connectivity with the right middle temporal gyrus, a region associated with processing unexpected reward information. Additionally, the left RPFC showed significant connectivity to the left superior parietal lobule, implicated in visual perception and attention. In contrast, the NR condition did not exhibit significant connectivity from the SN. These findings suggest that the left aINS may activate brain networks related to the subjective experience of reward, while the left RPFC may engage attentional networks.

FUNDING: This work was supported by JSPS KAKENHI Grant Number 23K10778.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.20 Attention

POSTER SESSION I-015 | NO CONCORDANCE BETWEEN TWO CONTINUOUS MEASURES OF EMOTION INTENSITY

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When studying emotion, the selection of measures is often driven by features of the experimental design, such as its physical (e.g., need for use of hands) and temporal characteristics. This selection process is further constrained by the frequently demonstrated low coherence between physiological and subjective measures. Few studies of emotion, however, have simultaneously employed continuous physiological and subjective measures of ostensibly the same feature of emotion. The current study recruited 118 undergraduates to view a series of eight videos selected to elicit varying levels of emotion intensity. During the videos, continuous measures of emotion intensity were collected through electrodermal activity (EDA) and a manual rating dial. Coherence between EDA and the rating dial responses was assessed via a series of correlational analyses. Although each measure was separately effective in capturing task-related changes in emotion intensity, they were not significantly related to each other. These

findings reaffirm the need for thoughtful consideration of theoretical and methodological features when selecting measures for indexing emotion states.
Topics: 1.1 Human Studies: General Population - Adults, 2.7 Skin responses, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.23 Emotion/affect

POSTER SESSION I-016 | PROPRIOCEPTIVE-BRAIN FUNCTIONAL CONNECTIVITY: CORTICO-KINEMATIC COHERENCE

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Proprioception is the sense of position, motion, or force generated by the body. Its loss leads to difficulties in coordinating movements. While measuring proprioception is challenging, cortico-kinematic coherence (CKC) - a measure derived by co-recording magneto- or electroencephalogram (MEG or EEG) with movement or force signals registered by sensors attached to one's limbs – provides a promising measure for this purpose. This study aimed to explore the feasibility of an EEG-, and wrist-movement-based CKC derivation, to establish a method suitable to monitor proprioceptive recovery in stroke patients, who typically recover proprioception faster in more proximal parts of the affected limbs. We recorded EEG and acceleration signals using periodic (2 Hz) passive wrist flexions of both dominant and non-dominant hands in 32 healthy young adults. We found that this arrangement provided a derivation of CKC that was comparable to previous results: CKC peaks were observed at 2 Hz and at its 4 Hz harmonics, around C3, CP3, FC3 for the right; and FC2, FC4 for the left wrist. These results demonstrate the feasibility of the method and provide a promising tool for the assessment of proprioceptive processing and its recovery in stroke patients.
FUNDING: The study has been implemented with the support provided from the National Research, Development and Innovation Fund of Hungary financed under the K funding scheme (Project no. 134787).
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.12 Sensation/perception/interoception

POSTER SESSION I-017 | RESUMING AFTER INTERRUPTIONS, TO HURRY UP OR TO TAKE YOUR TIME?

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Interruptions are a common aspect of everyday life, affecting both task performance and long-term psychological well-being. However, research suggests that the effects of interruptions can be mitigated in several ways. Here, we used a retrospective visual working memory task to investigate the effects of duration and flexible resumption after interruptions, with 28 participants. The task was sometimes interrupted with an arithmetic task (presented before the retro-cue), and the period after the interruptions was either short, long, or self-determined; with the fixed duration conditions being balanced within the no-interruptions. Interruptions lowered the main task performance, which could be seen in both angular error and response times, while the latter showing an additional benefit of flexibility even over no-interruptions. Additionally, EEG analysis revealed an overall reduced evoked theta to the retro-cue following interruptions. This reduction in oscillatory response was also visible in alpha suppression following interruptions. But more importantly, for the trials where participants had more time before the retro-cue when they were not interrupted, the alpha power suppression was stronger compared to the short duration trials. Further, this oscillatory response was indistinguishable from the no-interruption conditions when participants were able to self-determine the resumption time. These results indicate that flexibility in task resumption helps reducing the interruption deficits, even being able to boost the main task performance compared to not being interrupted.
FUNDING: DFG.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.18 Memory, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION I-018 | EEG INVESTIGATIONS OF PERCEPTUAL PROCESSING IN BIRDS: CHALLENGES AND RESULTS

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Mammalian neocortex has a laminar and columnar structure, which allows excellent propagation of the brain's electrical signals in electroencephalogram (EEG) recording. In contrast, avian brains have a nuclear structure (but see Stacho et al., 2020) so it is unclear how well electrodes situated outside of the brain can capture EEG. Nevertheless, the method has been successfully used to study sleep and navigation in birds. Here, we describe our attempts to study sensory processing in two bird species using cranially implanted electrodes placed above auditory (caudolateral nidopallium) or visual and multimodal (hyperpallium; caudal nidopallium) areas, respectively. In canaries (*Serinus canaria*), we exposed 2 females to auditory playback of male song that was manipulated in its attractiveness. In ring doves (*Streptopelia risoria*), we ran pilot experiments in 5 males employing simple sensory paradigms designed to elicit evoked potential responses (auditory oddball, visual flicker, rapid serial visual presentation, visual random dot probes). Overall, we found high within- and between-subject variability in single-trial responses, raising the question of whether the evoked potential approach is appropriate. This is in spite of known similarities of avian auditory event-related potentials to typical mammalian responses, as shown in intracranial recordings made directly in an auditory area in pigeons (Schall et al., 2015). More general similarities and differences of mammalian and avian EEG are discussed.

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Topics: 1.7 Animal Studies (e.g., rodent models), 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception

POSTER SESSION I-019 | CARDIAC VAGAL TONE DOES NOT PREDICT FLEXIBLE RESPONDING IN AFFECTIVE OR COGNITIVE TASK-SWITCHING PARADIGMS

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Cardiac vagal tone (CVT) is often presented as a marker of adaptive or flexible responding; however, this purported relationship is tenuous due to how the broad construct of "flexibility" is more narrowly conceptualized and operationalized in individual studies. Drawing from recent research that operationalized cognitive and affective flexibility via task-switching paradigms,we sought to test the strength of CVT's relationship with flexible responding via metrics of switch costs. In this study, undergraduate participants had CVT assessed via a 5-minute electrocardiography recording, then completed cognitive and affective task-switching paradigms. Cognitive task-switching required subjects to switch between making judgments on the parity or magnitude of numbers. Affective task-switching required subjects to switch between indicating the gender or emotional expression of faces. Flexibility was operationalized through calculating the response time cost from applying a different task rule than on the previous trial. There was no significant relationship between CVT and switch cost metrics from either the cognitive or affective flexibility paradigms. Although past research has empirically linked switch costs from these paradigms to related individual differences constructs (e.g., resilience), the findings of the current study do not support the use of CVT as a marker of affective or cognitive flexibility as indexed by task-switching.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 3.3 Lab Based Experiment, 4.25 Cognitive control/executive functions

POSTER SESSION I-020 | NEURAL PROCESSING OF PERFORMANCE FEEDBACK DURING ACTIVE AND OBSERVATIONAL LEARNING IN OBSESSIVE-COMPULSIVE DISORDER: AN ERP STUDY

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Obsessive-compulsive disorder (OCD) has been associated with overactive error monitoring, indexed by larger

error-related negativity in the event-related potential. However, overactive error monitoring is not OCD specific, but has also been linked to anxiety. Whether monitoring of errors as indicated by external feedback is altered in OCD and differs between feedback for self-performed and observed actions is less clear. The present study compared OCD patients with healthy controls (HC) and patients with social anxiety disorder (SAD) by using an active and observational variant of a probabilistic feedback learning task while EEG was recorded. Learning performance was generally decreased in OCD versus HCs but not SAD. Relative to HCs, OCD patients showed reduced feedback-related negativity (FRN), especially for wins, but larger win-loss differentiation for active learning only. The feedback-P3 was increased for losses versus wins in active but not observational learning in OCD relative to HCs. Strikingly, P3 amplitudes were generally enhanced in OCD, independent of feedback valence. Comparing OCD with SAD, no differences emerged for the FRN or P3. The present results suggest aberrant feedback monitoring in OCD for own and observed outcomes, primarily affecting the processing of positive feedback during active learning. As no differences were found between OCD and SAD, altered feedback monitoring may underly shared symptoms including need for reassurance or perfectionism, while enhanced P3 amplitudes may reflect overactive feedback evaluation and subjective outcome salience.

FUNDING: German Research Foundation (Deutsche Forschungsgemeinschaft, DFG): project number 438203225.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 2.15 Computational / Simulation, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.21 Decision making, 4.22 Learning/conditioning

POSTER SESSION I-021 | CHARACTERIZING CEREBELLAR OSCILLATIONS DURING RESTING STATE: EVIDENCE OF AGE-RELATED SLOWING

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While not yet well understood, the posterior cerebellum (CB) is critical for cognitive processing, with involvement in networks that change with age, such as the default mode network (DMN). Characterizing oscillatory signals from the CB will expand upon existing research by providing direct neural measures to complement existing functional-MRI data, which is an indirect measure. Further, the posterior CB is gaining importance as an area critical for understanding cognitive aging processes. Thus, this study analyzed oscillatory EEG activity in source-localized CB regions involved in the DMN (bilateral lobule VIIb, crus I, and crus II) in cognitively intact older adults (n=46, M_{age}=79). Relative power from eyes closed resting state was computed for delta, theta, lower and upper alpha, lower and upper beta, and lower gamma. Across CB regions, lower alpha was the dominant frequency band, with average relative power = 0.37±0.14. Delta, theta, and upper alpha had the next highest strength, with relative power ranging from 0.15 to 0.19. The high-frequency bands of lower and upper beta and lower gamma all had relative power values below 0.10. Within this older sample, age positively correlated with theta power in right hemisphere regions and negatively correlated with bilateral upper alpha power. This is consistent with age-related slowing of neural oscillations, in which slower frequencies become more dominant. Further characterization of EEG oscillatory activity in CB may be valuable in identifying early neural indices of risk for future cognitive decline in aging.

FUNDING: This work was supported by: NSF IRES NSF-1854158; Way-Klingler Science Fellowship, Marquette University; NCATS UL1TR001436, TL1TR001437.

Topics: 1.3 Human Studies: General Population - Elderly/ Geriatric, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.1 Aging, 4.26 Other

POSTER SESSION I-022 | STRESS AND CARDIAC CYCLE EFFECTS INTERACT TO MODULATE BEHAVIORAL AND ELECTROPHYSIOLOGICAL CORRELATES OF STIMULUS-STIMULUS AND STIMULUS-RESPONSE CONFLICTS

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Variations in cardioafferent traffic are relayed to the brain and have been shown to modulate sensorimotor processing. Stress potentially influences these effects via both humoral and neuronal pathways. We investigated whether cardiac cycle effects are modulated by stress and differ based on conflict type by contrasting a Simon and Spatial Stroop Task. In two sessions, 30 participants performed three blocks of the combined tasks where stimulus presentation was aligned to the ECG, targeting systole versus diastole i.e., high versus low cardioafferent

activity. Before each block, subjects were exposed to the cold pressor test (CPT) or a control condition. The CPT increased saliva cortisol, cardiovascular measures, and subjective stress and arousal ratings. We found the expected compatibility effects in both tasks i.e., incompatible vs. compatible trials showed higher response times and percentage errors, delayed lateralized readiness potential onset (LRP), and increased anterior N2 amplitude. Stress slowed responses during systole compared to diastole specifically in Simon trials. Moreover, stressed participants showed delayed LRP onset during diastole for compatible but earlier onset for incompatible trials, compared to control in Simon trials. Finally, N2 amplitude was significantly increased in Stroop vs. Simon trials during diastole in the control condition. Our results point to conflict specific cardiac cycle effects on ERP correlates of conflict detection and motor preparation. Second, our results demonstrate that stress modulates cardiac cycle effects on the brain

FUNDING: German Research Foundation LA4830.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.10 Stress, 4.12 Sensation/perception/interoception, 4.25 Cognitive control/executive functions

POSTER SESSION I-023 | I'M GOING MOBILE! EVIDENCE SUPPORTING THE IMPLEMENTATION OF WIRELESS DEVICES TO MEASURE PHYSIOLOGY IN THE LAB (AND BEYOND)

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Advances in technology have provided mobile methods for physiological data collection. Despite prevalence of wireless devices, uptake by researchers has been limited. Thus, the present work demonstrates the utility of these tools in experimental research. Experiment 1 ($N=72$) used wireless electrodermal activity (EDA) allowing for mobile data collection in virtual reality. Men who virtually took the perspective of a woman exhibited higher EDA, which predicted positive equality attitudes. Experiment 2 ($N=61$) used wireless EDA while participants were interviewed for a lab manager position. When ideal candidates were described using masculine traits, women exhibited higher EDA during the interview compared to controls, predicting poorer cognitive performance. Experiment 3 ($N=30$) used wireless electroencephalography (EEG) to assess cortical activity among students during a problem-solving activity in a classroom setting. Students exhibiting approach motivation (e.g., left frontal cortical activity) demonstrated greater executive functioning compared to students exhibiting avoidance motivation (e.g., right frontal cortical activity). Experiment 4 ($N=33$) used wireless EEG to assess cortical activity after right hand contractions versus alcohol intoxication. Approach motivation following right hand contractions predicted higher impulsivity, whereas acute intoxication diminished this relationship while increasing impulsivity. Experiments support use of wireless devices for data collection, providing insight for application of tools in ecological settings outside of the lab.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.4 Gender, 4.10 Stress, 4.19 Motivation

POSTER SESSION I-024 | USING MOBILE NEUROSCIENCE TECHNOLOGY TO MONITOR DECISION MAKING IN THE "REAL-WORLD"

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Every day we are forced to make a myriad of decisions, some quite simple, some quite complex. A key problem is that if one is to examine the neural mechanisms of decision-making, it almost always must occur in a laboratory-based setting due to the limits and restrictions of neuroimaging methodologies. Here, we demonstrate that both mobile electroencephalography and mobile functional near infrared spectroscopy were able to accurately capture human-decision making processes in a “real-world” setting. In a series of experiments, we used both mobile electroencephalography (mEEG) and mobile functional near infrared spectroscopy (mfNIRS) to measure neural activity while participants completed a series of simulated flight scenarios. In our first experiment an unexpected incident (e.g., engine failure) occurred at a random point in time in half of the flight scenarios. In our second experiment the overall flgiht difficulty was greater in half of the simulated flights (e.g., flying through turbulent skies versus flying on a calm day). In the first experiment, shortly after the difficult incidents we observed an increase in frontal theta power and the frontal hemodynamic response relative to a matched “easy” point in time. In the second experiment, we saw an overall increase in frontal theta power and the frontal hemodynamic response for the duration of the hard flights relative to the easy flights. In sum, our results

demonstrate that it is possible to monitor human-decision making processes in "real-time" in the "real-world".
FUNDING: NSERC Discovery Grant.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.21 Decision making, 4.22 Learning/conditioning, 4.25 Cognitive control/executive functions

POSTER SESSION I-025 | FEAR-CONDITIONED EXPECTATIONS INCREASE AVERSIVENESS AND CARDIAC ACCELERATION TO BENIGN UNCONDITIONED STIMULI

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Objectively benign events might be subjectively perceived as aversive and evoke corresponding psychophysiological responses due to the top-down effects of expecting them to be aversive. To investigate the effect of expectations of aversiveness on the perception of and psychophysiological response to benign unconditioned stimuli (US), this study used classical conditioning to induce expectations in healthy participants (N = 21). In the expectancy induction phase, one conditioned stimulus (CS_aversive) was paired with high-intensity USs, while another CS (CS_benign), was paired with low-intensity USs. In the test phase, the CS_aversive was paired with both low- and high-intensity USs while the CS_benign continued to be paired only with the low-intensity US. We analyzed subjective aversiveness ratings of the US, evoked heart period (HP) and skin conductance responses (SCR). Ratings, SCR, and HP for the CS_aversive were higher than the responses to the CS_benign, indicating successful expectation induction through classical conditioning. Critically, subjective ratings of the US revealed that low- to mid-intensity USs were perceived as more aversive when they were preceded by the CS_aversive compared to the CS_benign. This expectation-driven effect was also evident for HP responses to the US, where the same USs evoked more cardiac acceleration when they were preceded by the CS_aversive than the CS_benign. These results show that affective and psychophysiological responses to a benign stimulus may be intensified when aversive events are expected due to prior conditioning.
FUNDING: This project was funded by the Research Training Group Breaking Expectations (RTG 2271, project number 290878970-GRK 2271).
Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.22 Learning/conditioning, 4.23 Emotion/affect

POSTER SESSION I-026 | DO MORE INFLUENTIAL JOURNALS ENFORCE HIGHER REPORTING TRANSPARENCY STANDARDS FOR ERP STUDIES?

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We re-analyse data from an earlier systematic review of N400 papers (Šoškić et al., 2021) to examine whether papers from journals more influential at the time of publishing are more transparent about their methodology than papers from less influential journals. Out of the 132 papers in the original sample, we considered 101 papers published since 2001, a year after publication of the first detailed publication guidelines (Picton, 2000). We compared 30 papers published in journals with the highest SJR (SJR > 2) with 30 papers from journals with lowest SJR (SJR <1.32) on 37 selected properties of ERP methodology. The properties included aspects of sample size, number of trials, hardware and software, recording montage and settings, filtering, trial timing, artifact removal procedure, epoch and baseline selection, reference, amplitude measurement, statistical analysis, order of operations. On average, the two groups had comparable proportion of transparently described properties (more influential 72% vs. less influential 68%). Transparency of reporting was similar for some properties, but not for others. Transparency was high in both groups for, e.g., sample size, analysis window, number of trials presented, and low for, e.g., details on filtering and the number of trials averaged together. Papers from more influential journals were more transparent about artifact correction algorithm, baseline, order of processing steps, offline filter slope, but less so about analysis montage choice rationale and reference choice.
FUNDING: This study was funded by Ministry of Science, Technological Development, and Innovations of the Republic of Serbia (contract no. 451-03-65/2024-03/200138).
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.6 Other (systematic review of literature), 4.26 Other (research methodology)

POSTER SESSION I-027 | ASSOCIATING VISUAL VS. AUDITORY STIMULI WITH IMMEDIATE AND DELAYED FEEDBACK: EFFECTS ON THE N170

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With increasing feedback delay, feedback processing appears to shift from the striatum to the hippocampus. In addition, higher-order sensory areas might be involved in bridging the temporal gap between stimulus and feedback by reactivating the representation of the feedback-predicting stimulus. We hypothesized that the feedback-locked N170, an occipito-temporal event-related potential component linked to hippocampal feedback processing as well as higher order visual processing, is more pronounced when delayed feedback in a learning task is provided for choices between visual compared to auditory stimuli. In total 40 subjects completed a probabilistic feedback learning task with immediate (1s) and delayed (7s) feedback for choices between visual or auditory stimuli. While EEG was continuously recorded, participants successfully learned which of two stimuli led to positive feedback more frequently. A mixed linear model analysis revealed a significant interaction between stimulus modality, feedback timing and hemisphere: Over the right hemisphere, the N170 following immediate feedback was significantly more pronounced for the task involving auditory compared to the task with visual stimuli. However, for delayed feedback the pattern was reversed, with a significantly more pronounced N170 when choosing between visual stimuli. This supports the idea that the N170 following delayed feedback reflects (re) activations in higher order visual areas that could help to assign credit to a previously selected visual stimulus.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.22 Learning/conditioning

POSTER SESSION I-028 | THE TIME COURSE OF ACTIVATING, MAINTAINING, AND IMPLICITLY OR EXPLICITLY SWITCHING BETWEEN ATTENTIONAL TEMPLATES IN VISUAL SEARCH

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Research on task switching often focuses on stimulus-guided response selection and execution. In contrast, processes associated with updating task settings for covert attentional control have been less well studied. Here, we focus on the dynamics of activating and switching mental representations of target-defining features (attentional templates) during the preparation for visual search. We employed a new high-definition rapid serial probe presentation paradigm, wherein a series of lateral "clouds" of differently coloured dots are rapidly presented during intervals between target displays containing a colour-defined target. By measuring N2pc components triggered by cloud probes that match a currently task-relevant colour, feature-specific search template activation processes can be tracked with very high temporal resolution. Participants prepared for and responded to a specific "early" target colour that appeared on a subset of trials or switched to a different "late" target colour on other trials. In one experiment, the absence of the early target was the cue for switching to the late target colour. In a second and third experiment, an explicit visual or auditory stay/switch cue was presented when the early target was absent, indicating that the initial template should either be maintained or changed to a different colour. Results showed that target templates were activated and switched with remarkable speed and temporal precision, in line with changes in task demands. They also provided new evidence for the simultaneous co-activation of multiple attentional templates.

FUNDING: This work was funded by a grant by the Economic and Social Research Council, UK (ES/V002708/1).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.14 Unconscious processes, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION I-029 | INTERACTION OF ATTENTIONAL AND LEARNING PROCESSES DURING FEAR ACQUISITION AND EXTINCTION

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Threat cues are capable of quickly capturing and maintaining visual attention. The extent to which this attentional bias is indicative of threat characteristics or linked to the prediction of reliable outcomes remains uncertain. Moreover, the process of attentional exploration is shaped by learning, which tends to be selective towards more accurate predictors of an event. In order to explore the interaction of attentional and learning processes during fear

acquisition and extinction, we created a novel multiple-cue paradigm. Initially, participants were sequentially presented with single visual cues (threat, safety, and ambiguous), each differing in their predictiveness for an aversive unconditioned electrotactile stimulus. In randomly interspersed multiple-cue displays (ambiguous cues together with either threat or safety cues), we tested whether attentional exploration is biased towards the predictive components of the display or influenced predominantly by the threat value. In the second part, we examined how expectations are readjusted after switching associations between visual cues and aversive outcomes (reversal learning). Shock expectancy ratings and autonomic responses (heart rate, skin conductance) indicated that participants flexibly learned the associations of cues to unconditioned stimuli, but they exhibited a threat-related bias reflecting a better-safe-than-sorry strategy. Reinforcement learning models will be used to determine whether eye movements are predominantly modulated by threat value, outcome predictability, or a combination of both factors.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.6 Eye Tracking (blink, movement, size), 2.7 Skin responses, 3.3 Lab Based Experiment, 4.9 Pain, 4.20 Attention, 4.22 Learning/conditioning

POSTER SESSION I-030 | DEVELOPMENT OF A NON-CONTACT BRAIN ACTIVITY SENSING METHOD USING FACIAL REDNESS

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Recent studies indicate that facial blood flow changes may reflect brain activity, supported by the brain cooling mechanism where heat from brain activity dissipates through facial blood vessels. RGB color data from facial videos can also track heart rate, suggesting that video images can capture facial blood dynamics. This study tests if facial blood flow changes during mental arithmetic tasks can indicate brain activity. Twenty-three adults (20 males, 3 females, average age 24.5) completed mental arithmetic tasks, multiplying numbers presented on a screen, with answers entered via keypad within 18 seconds. The experiment, consisting of alternating rest and task phases for 9 minutes, recorded facial and brain blood flow using a digital camera and near-infrared spectroscopy (NIRS). The facial erythema index was calculated from video frames using CIE-Lab* color space. Correlation analysis showed a significant positive correlation between erythema index and oxyhemoglobin (OxyHb, $r = .54$, $p < .001$), and a negative correlation with deoxyhemoglobin (DeoxyHb, $r = -.86$, $p < .001$), indicating that brain activity affects facial blood dynamics. These results underscore the potential of non-contact methods for monitoring brain activity and call for further studies with varied task demands. This research supports the feasibility of non-contact facial analysis as a method to reflect brain activity, setting a basis for future tests in less demanding scenarios and various conditions.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.20 Attention

POSTER SESSION I-031 | TASK RELATED ALPHA POWER DURING THE HEARTBEAT TRACKING TASK IS ASSOCIATED WITH INTEROCEPTIVE SENSIBILITY

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Cardiac interoceptive skills are important for health. We can separate interoceptive accuracy (IAcc) and sensibility (IS), at least. While IAcc measures the correspondence between recorded and perceived heartbeats, IS means the confidence in performing the task. The present study investigated if the brain activation assessed during the heartbeat tracking task is associated with IAcc as well as IS. Specifically, we were interested if task related power (TRP) in the alpha band, known to represent task-related brain activation patterns associated with cognitive functions and attentional processes relevant for the task at hand, are associated with IAcc and IS. In a sample of 30 participants, we found that the TRP in the alpha band was negatively associated with task related IS ratings but positively (at a trend) with IAcc (independent from IS). These findings suggest that higher IS goes along with a brain activation associated with higher cortical activation, and more internal attention during the interoception task might benefit IAcc. The pattern of findings favors task related IS ratings (i.e., confidence ratings) and IAcc to gain a better access to interoceptive processes and to improve our comprehension of the neural underpinnings of (cardiac) interoception.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception

POSTER SESSION I-032 | THE EVALUATION OF ERROR TYPES, THE AFFECTIVE VALENCE OF ERRORS AND SOCIAL ANXIETY

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Evaluative priming studies have shown that behavioral errors are associated with negative affective valence. Negative words were categorized better than positive words when preceded by errors but not when preceded by correct responses in an unrelated GoNogo task. Remarkably, the error-related negativity (Ne/ERN) as a marker of error monitoring in the GoNogo task predicted this evaluative priming effect suggesting that it encodes the affective valence of actions. Here, we investigated this evaluative priming effect for different error types and its relationship with social anxiety. We combined the evaluative priming task with a four-choice flanker task, where errors can either occur by mistakenly responding to the flankers (flanker errors), or by executing a response unrelated to the stimulus (nonflanker errors). Flanker errors usually show a larger Ne/ERN than nonflanker errors, presumably indicating the increased significance of flanker errors for attentional adaptation. We replicated the evaluative priming effect for errors versus correct responses, but neither the Ne/ERN nor the evaluative priming effect differed for flanker errors and nonflanker errors. However, participants with high social anxiety showed larger Ne/ERN and stronger evaluative priming effects for flanker errors than for nonflanker errors. This indicates that error type evaluation is affected by social anxiety and involves a rapid evaluation of the affective valence of errors.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.20 Attention, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION I-033 | TYPE 1 DIABETES DEVELOPMENT AFFECTS BRAIN CORTICAL THICKNESS IN YOUNG, WELL-CONTROLLED PATIENTS

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In the general population, a thicker cortex in frontal areas is related to better executive performance, while a thinner cortex is associated with cognitive decline. Previous reports indicate reductions in cortical thickness (CT) for Type 1 Diabetes (T1D) patients with long-standing illness and/or the effect of microangiopathy. Most of the studied samples are very heterogeneous, so we aimed to evaluate the CT measures in young, well-controlled T1D patients with typical cognitive performance and free from diabetes complications. Twenty-five T1D patients between 16-30 years of age and their controls paired by age, sex, and education were recruited. CT estimations were obtained using a fully automatic pipeline (vol2Brain) for whole-brain segmentation and analysis of MRI T1w images. One-way ANOVAs were conducted for each brain region CT. We found that the T1D group has CT reductions in left insular regions (posterior insula, central and frontal operculum), left inferior frontal gyrus, left transverse temporal gyrus, and left occipital pole. Pearson correlations were used to test the relationship between CT, the years of disease evolution, and the age of disease onset. We found negative correlations between CT of multiple brain areas and the years of illness development, but not with the age of onset. In conclusion, even young, well-controlled, and free from complications, T1D patients are susceptible to subtle brain structure alterations. Further studies are necessary to evaluate the relationship between CT reductions with cognitive, emotional, or interoceptive processes.
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.26 Other (Cortical thickness)

POSTER SESSION I-034 | THE EARLY "DISTRACTOR POSITIVITY" IN VISUAL SEARCH DOES NOT REFLECT DISTRACTOR HANDLING OR ATTENTIONAL DEPLOYMENT

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Salient stimuli can attract attention, even when irrelevant and detrimental to visual search. When distractors are effectively handled or suppressed, a lateralized positivity (Pd) is often observed in the electroencephalogram, with a variable latency that has been argued to reflect a preparatory suppression (early; 100-200ms after onset) or a corrective reaction to attentional capture (late; 300ms+). This functional explanation of the latency shift in the distractor positivity is mostly derived from designs where distractor-associated colors are fixed, allowing feature expectancies to form and proactively guide attentional deployment. We added a context-dependent search item (CDI) to a standard visual search task, that served unpredictably as either

a salient distractor or as the target, depending on whether it appeared along with a fixed, higher priority target. As a result, observers could not prepare for the CDI, but instead avoid or attend it only after processing the whole search context. We compared lateralized positivities for the CDI-distractor to those occurring for a fixed distractor in the same session, to explore distractor handling with and without preparatory suppression. Unexpectedly, both distractor types produced an early distractor positivity, despite a clear difference in search performance effects. Lateral salient targets also produced a positivity in the same time window. Together, this suggests that the early positivity likely reflects a purely sensory response to unilateral salient stimulation, rather than proactive distractor handling.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.20 Attention

POSTER SESSION I-035 | CORTICO-KINEMATIC COHERENCE REFLECTION OF PROPRIOCEPTIVE PROCESSING DURING A SELF-PACED LIGHT-FLASH PRODUCING TASK

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Sensory action-effects are hypothesized to be differentially weighted in the action representation according to their task-relevance. The present study investigated whether providing force-contingent visual feedback affected proprioceptive processing in a self-paced action production task. Proprioception was characterized by cortico-kinematic coherence (CKC): coherence between the applied force and the electroencephalogram (EEG). 36 adult participants pressed a force-sensitive device in a 2 Hz rhythm with the index finger of their dominant hand. In one condition, a red light emitting diode (LED) showed continuous intensity changes commensurate to the force, whereas it produced a constant stimulation in another. The previously produced LED signal was replayed in a third condition. As a secondary task, participants counted rare blue LED flashes in all conditions. It was hypothesized that the force-contingent visual effect would compel participants to represent their actions primarily in terms of the visual effect instead of the proprioceptive re-afference, and thus CKC should differ between conditions. The visual coherence peak at the movement frequency was observable slightly right-lateralized at parieto-occipital leads, which allowed the comparison of the CKC peaks observable at fronto-central sites contralateral to the active hand. In contrast with the hypothesis, CKC did not significantly differ as a function of visual action-effect availability. This result suggests that visual feedback does not dominate the action representation over proprioception.

FUNDING: The study has been implemented with the support provided by the National Research, Development and Innovation Fund of Hungary financed under the K funding scheme (Project no. 128083).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.25 Cognitive control/executive functions

POSTER SESSION I-036 | VOLUNTARY REGULATION DURING LISTENING TO MUSIC DECREASES EMOTIONAL INTENSITY: SUBJECTIVE SELF-REPORTS AND PERIPHERAL PHYSIOLOGY

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Music has long been recognized as a powerful tool for inducing and regulating emotions despite the limited empirical literature. In the present study, we aimed to explore the potential of instructed regulation (reappraisal) to influence negative emotions induced by music listening in a sample of 89 healthy undergraduate students. Here we presented a set of neutral or unpleasant standardized musical excerpts from the Film Music Stimulus Set (FMSS) in a laboratory emotion regulation task. Each trial began with a 2-s cue ("listen" or "down-regulate") followed by a period of music listening during 8-s. After each excerpt offset, participants rated their emotional experience based on a 9-points scale for several affective dimensions (i.e., arousal and hedonic valence, among others). Psychophysiological measures such as heart rate (HR), electrodermal activity (EDA), and facial electromyography (corrugator) were recorded through the task. Our results showed a significant decrease in peripheral reactivity for the down-regulation condition, particularly in EDA and facial EMG but not for HR. Subjective ratings also showed that unpleasant musical excerpts were rated

as less arousing for that same condition. According to our results, voluntary regulation of negative emotions induced by unpleasant music leads to diminished emotional intensity as stated by self-reported arousal and peripheral physiology. More experimental studies are needed to further elucidate the underlying mechanisms and to explore its implications for clinical practice and intervention development.

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Topics: 1.1 Human Studies: General Population - Adults, 2.2 Myography (EMG etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 3.3 Lab Based Experiment, 4.23 Emotion/affect

POSTER SESSION I-037 | TEMPORAL DECODING AND EVENT RELATED THETA SYNCHRONIZATION DURING A SEQUENTIAL WORKING MEMORY RETRO-CUE TASK

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The ability to store and manipulate sequential information for short periods of time (sequential working memory) is essential for performing motor or cognitive tasks. However, there is debate about how item memories are actively maintained within a sequence. The present study aimed to define the brain dynamics during the encoding phase of a sequential working memory task. In this ongoing study with expected final sample of 30 participants had to identify the identity and position of letters in a sequence with four letters in four different positions randomized in two conditions, each with120 trials. In the first condition, after sequence presentation and a retention period, an ordinal letter retro-cue (a number followed by the letter) was presented, while in the second condition a spatial cue was presented in which the letter was in one of the four divisions of a grid. When decoding each of the four possible letters in the sequence, we did not find a differential ERP related activity in any condition. Contrary, when decoding each of the four possible positions in the sequence, we did find above chance ERP discrimination for the spatial condition but not for the ordinal condition after cue presentation. Interestingly, there were no differences in the number of correct responses between the two conditions. Finally, both order and spatial conditions showed a period of event-related theta synchronization during the sequence coding, the retro-cue presentation and the beginning of the response.

FUNDING: This poster is part of a financed project from the National University of Colombia.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.17 Machine Learning/ Deep Learning, 3.3 Lab Based Experiment, 4.18 Memory, 4.20 Attention

POSTER SESSION I-038 | EFFECT OF HIGH FREQUENCY YOGA BREATHING ON PSYCHOPHYSIOLOGY AND BRAIN PLASTICITY

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Background: Yoga breathing, or pranayama, involves controlled breathing techniques to influence the autonomic nervous system (ANS), promoting relaxation or alertness. Aim: The study aimed to investigate the effect of high frequency yoga breathing (HFYB) on physiological, biological and cognitive measures. Methods: 120 participants aged 18–25 who satisfied the inclusion and exclusion criteria were randomly assigned 1:1 to the HFYB, breath awareness (BAW), and running groups. Before data collection, each group was oriented, then brain electrical activities, HRV were recorded during resting, and n-back performance. BDNF concentration was tested after Statistical analysis was done using repeated measures ANOVA with a 'within-subjects' and 'between subjects' factor: groups; HFYB, running, and breath awareness; states; pre and post. Results: There was significant improvement in accuracy (%) and reaction time (ms) after HFYB and running practice. There was heightened sympathetic arousal during running and modulation was improved after HFYB ($p < 0.05$). BDNF secretion was also higher after HFYB compared to running group ($p < 0.05$). Similarly, the brain gamma wave was higher during HFYB in frontal ($p < 0.05$), central and temporal regions. Conclusion: In light of the findings, it appears that HFYB may have the capacity to enhance cardiac autonomic balance, which would be associated with alterations in brain activity related to attention and memory. A possible increase in brain plasticity may be inferred from the fact that gamma oscillation and BDNF concentration both improved after doing HFYB.

FUNDING: The Department of Science and Technology (DST): Science and Technology of Yoga and Meditation

(SATYAM) (project DO No. SR/SATYAM/186/2016), which is part of the Government of India, provided funding for this research that was submitted.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.18 Memory, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION I-039 | INTERROGATING THE NEURAL MECHANISMS PRIOR TO SACCADE ONSET

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Eye movements are a fundamental brain mechanism intricately linked to perception and attention. Our eyes move several times a second, dramatically changing the picture of the visual world on our retinas - yet our visual world remains stable. In this study we interrogate the neural activity just prior to saccade onset to further understand the nature and time course of the neural events preceding an eye movement. Participants (n=35) engaged in the Parks and Corballis (2010) "presaccadic remapping" paradigm in which saccades are made either across (cross) or away from (within) large gratings to a target. In a third condition (saccade only) saccades were made to a target with no gratings presented. We recorded high-density (128-channel) EEG throughout the experiment. Saccade-locked ERP topographies showed a right hemisphere positivity that persisted across conditions during the antecedent potential (AP), 150 to 40ms prior to saccade onset. A visible 30Hz oscillation during the AP was confirmed with both Hanning window and Morlet wavelet decompositions. For both parietal and frontocentral electrodes this activity was reliably contraversive to saccades and highly coherent. Analysis of the spike potential (SP; 40 to 0ms prior to saccade) support a conceptual replication of Parks and Corballis (2010). We found a stimulus location and saccade direction interaction but no involvement of hemisphere, which is required for a remapping interpretation. Rather, our findings are more consistent with a right-hemispheric spatial updating mechanism.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.20 Attention

POSTER SESSION I-040 | ELECTROPHYSIOLOGY OF LEARNING IN A SERIAL FEAR CONDITIONING PARADIGM

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In a serial compound conditioning paradigm, a sequence of several conditioned stimuli (CS) is predictive of an unconditioned stimulus (US) (e.g., CSA->CSB->US). Animal research has shown that when the US is aversive, CSA elicits the strongest conditioned response, while CSB appears redundant. These effects of primacy and proximity are rarely investigated in humans, and neurophysiological data underlying learning under such conditions are lacking. To study the effects of temporal proximity of imminent threat and safety, we analyzed brain event-related potential responses in an aversive serial compound conditioning experimental paradigm. In two EEG experiments (discovery sample: N = 22; replication sample: N = 38), participants were presented with sequences of four vowels [CSA->CSB->CSC->CSD]. The first vowel in the sequence differed between CSA+ and CSA- (e.g., [ah] or [uh]), while the remaining three (CSB, CSC, CSD) were identical (e.g., [oh]). CSD+ was followed by a painful electrical shock (US), while CSD- was not. No ERP component distinguished between CS- and CS+ for the first three stimuli in the sequence (i.e., CSA, CSB, CSC). The last CS (CSD+) elicited a strong fronto-central stimulus-preceding negativity (SPN) developing 400 ms before shock administration. Our data indicate that the main neural mechanism for responding to predictable threat is related to the flight response, as manifested in the SPN immediately preceding US.

FUNDING: Deutsche Forschungsgemeinschaft. Grant Number: KO1753/13-4.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.22 Learning/conditioning

POSTER SESSION I-041 | INVESTIGATING THE INFLUENCE OF GABRA6 GENE POLYMORPHISM AND CORTISOL ON TELOMERE LENGTH

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Telomere length (TL) is considered a biomarker of aging, with shortened TL in leukocytes associated with age and stress-related health risks. Cumulative stress over a lifetime has been tied to shorter TL, yet the exact mechanisms remain unclear. In this preregistered study, we explored whether leukocyte TL is shorter in individuals with the GABRA6 TT genotype, which, compared to CC carriers, has been linked to dysregulated diurnal and stress-induced cortisol levels, the end product of the hypothalamic-pituitary-adrenal axis. We also examined whether individuals carrying the GABRA6 TT genotype had heightened cortisol response to stress, increased diurnal cortisol levels, and if these cortisol indexes could explain variations in TL. Our study involved 108 participants aged 18-55 years, with 55 carrying the TT genotype and 53 carrying the CC genotype for GABRA6. GABRA6 TT carriers had shorter TL in CD28+ cells. TT carriers also showed lower stress-induced cortisol reactivity, but there were no significant differences in diurnal cortisol secretion compared to CC carriers. No significant associations between TL and cortisol indexes were observed. In conclusion, this study shows, for the first time, that individuals carrying the TT genotype for GABRA6 have shorter TL in CD28+ cells compared to their counterparts carrying the CC genotype. Although this difference could be linked to an increased susceptibility to stress in the TT carriers, it could not be attributed to the direct influence of cortisol, suggesting the involvement of other mechanisms.

FUNDING: The data used for this study is part of the Common Cold Project. The project was supported by the National Center for Complementary and Integrative Health (NCCIH AT006694). The conduct of the study was supported by grants from the National Institute of Allergy and Infectious Diseases (R01 AI066367). Secondary funding was provided by National Cancer Institute Cancer Center Support Grant (P30CA047904), the Pennsylvania Department of Health through a Commonwealth Enhancement Grant (08-01-2), National Center for Complementary and Integrative Health (NCCIH RC1AT005799) and by the National Institutes of Health; grant awarded to the University of Pittsburgh Clinical and Translational Science Institute (UL1 RR024153 and UL1 TR000005). Supplemental support was provided by John D. and Catherine T. MacArthur Foundation Research Network on Socioeconomic Status & Health. MMP and RDR are funded by the Research Foundations FWO and F.R.S.-FNRS under the Excellence of Science (EOS) program (EOS 40007528).

Topics: 1.3 Human Studies: General Population - Elderly/Geriatric, 2.8 Genetics, 2.10 Blood markers, 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.1 Aging, 4.10 Stress, 4.26 Other

POSTER SESSION I-042 | FAST-PACED BREATHING INTERVENTIONS: AUTONOMIC NERVOUS ACTIVITY AND BREATHING DISCOMFORT

Maša Iskra[1], Sylvain Laborde[1], Caterina Salvotti[1], Elisa Weinand[1,2], Tasha Poppa[3,4], Markus Raab[1], Laura Voigt[1]
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To effectively deal with psychomotor demands, individuals in performance domains require adequate activation of their body and mind. Slow-paced breathing (SPB) and fast-paced breathing (FPB) have been recognized as activation-regulation strategies. Sympathetic activation and parasympathetic withdrawal have been proposed as mechanisms behind the performance-facilitating effects of FPB interventions. Addressing the theoretical and methodological limitations, the present study aimed to develop a foundation for using FPB as an evidence-based psychological intervention by testing its effects on autonomic nervous activity and breathing discomfort. In a within-subject design, 58 physically active participants were breathing abdominally at 6, 15, 35, and 55 cycles per minute. Cardiac vagal and sympathetic activity were indexed via the root mean square of successive differences [RMSSD] and the pre-ejection period. A main effect of breathing condition on RMSSD was identified ($p < .001$, $\eta_p^2 = .70$). Cardiac vagal activity gradually decreased as the breathing frequency increased. Preliminary analysis revealed no significant changes in sympathetic activity across conditions. Higher breathing discomfort was reported as the breathing frequency deviated from the spontaneous range, suggesting the need for caution when evaluating the intervention feasibility. Findings suggest parasympathetic withdrawal as one of the mechanisms behind the activating effects of FPB. Further specification of existing theoretical models is needed to explain the reported effects of FPB on psychomotor performance.

FUNDING: The project was funded by the university-internal research funding (HIFF) of the German Sport University Cologne.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.15 Biofeedback

POSTER SESSION I-043 | DURING MUSIC, AUTONOMIC INDICES BECOME SIGNIFICANTLY DIFFERENT BETWEEN HIGH AND NORMAL BASELINE BP PARTICIPANTS

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Hypertensives have higher sympathetic nervous system (SNS) activation than normotensives. Music lowers blood pressure (BP) in the long-term, but the acute autonomic impact of music-listening is not well understood. This study aims to determine whether individuals with high and normal BP have different autonomic nervous system (ANS) responses to music. Music was rendered on a reproducing piano to 40 participants (23 females, mean age of 43.46 (95 CI: 39.05-47.90)), 20 with baseline BP above 140/90 mmHg (H-bBP) and 20 below (N-bBP). Continuous BP and ECG was recorded whilst they listened to 9 pieces of music (40 min) after a 5-minute baseline silence. Symbolic dynamic analysis found that H-bBP participants had higher fixed heart rate intervals (V0) than N-bBP participants during music but not during baseline: music 26.92% (24.64-29.20) vs 21.53% (19.55-23.51); $p = 0.00092$; baseline 31.05% (23.86-38.25) vs 24.39% (16.77-32.00); $p = 0.18$. Similarly, the proportion of highly variant heart rate intervals (UV2) associated with parasympathetic nervous system (PNS) activity were lower for H-bBP participants than N-bBP participants: music 16.76% (15.42-18.10) vs 20.95% (19.46-22.43); $p = 3.10e\text{-}05$; baseline 14.41% (10.80-18.02) vs 18.07% (14.10-22.05). We found that autonomic indices, not significant during baseline, become significantly different between H-bBP and N-bBP participants during music, with H-bBP participants showing higher SNS and lower PNS activity than N-bBP participants.

FUNDING: This result is part of the COSMOS and HEART.FM projects, which have received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (Grant agreement Nos. 788960 and 957532).

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.5 Hemodynamic (BP), 3.3 Lab Based Experiment, 4.5 Population-specific health, 4.14 Unconscious processes, 4.26 Other

POSTER SESSION I-044 | INSIGHTS FROM BRAIN OSCILLATIONS: THE ROLE OF WORKING MEMORY IN CHILDREN'S SPEECH COMPREHENSION IN NOISE

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Aims: The study addresses the limited understanding of the influence of working memory on speech comprehension in noisy environments in children, specifically examining the role of event-related theta and alpha oscillations measured through EEG. Methods: 27 participants between the ages of 8-10 were included in the study with three groups according to working memory levels. 32-channel EEG was recorded during the speech comprehension task in quiet and noisy conditions. Event-related power spectrum and phase-locking were analyzed for theta (4-7 Hz), and alpha (8-13 Hz) frequency bands. The statistical analyses were run with repeated measures of ANOVA ($p<0.05$). Results: In each group, frontal theta power significantly increased in noisy conditions compared to the quiet condition during the speech comprehension task ($p<0.01$). The group with low working memory demonstrated significantly higher levels of parieto-occipital alpha response during the task in the moderate noisy condition compared to other groups ($p=0.012$). However, when noise levels were highest, the group with medium working memory showed a significant increase in alpha response to compensate for the noise, whereas the group with low working memory struggled to maintain high alpha levels due to excessive cognitive load ($p=0.001$). Conclusions: The study highlighted the influence of working memory on speech comprehension in noise, while also emphasizing the crucial roles of frontal theta and parieto-occipital alpha in cognitive load management during speech processing.

Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.13 Speech/language, 4.18 Memory

POSTER SESSION I-045 | CRITICAL DISCUSSION OF THE NEUROVISCERAL INTEGRATION MODEL AND OF POTENTIAL STRATEGIES FOR FURTHER THEORY SPECIFICATION

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The neurovisceral integration model (NIM), describes how autoregulation processes happen in humans at a

physiological, emotional, and cognitive level, through the coordinated activity of the central autonomic network and peripheral structures and organs, supported mainly by the vagus nerve. The activity of the vagus nerve efferent fibers towards the heart can be measured by vagally mediated heart rate variability, considered as a unique index of vagal efferent activity as well as of cardiac, emotional, and cognitive autoregulation. In this narrative review, a critical analysis of the literature regarding the NIM allowed the identification of knowledge gaps involving vagus nerve afferent activity and sympathetic nervous system afferent and efferent fibers activity, which are not explained in detail in the NIM. We will discuss potential strategies to investigate these gaps further, proposing to use breathing frequency manipulation as a tool to systematically manipulate the level of autonomic nervous system activation and to assess the effects this could potentially produce on cognitive functioning and on the heartbeat-evoked potential, generating knowledge with which the NIM theory could be further specified.

Topics: 1.1 Human Studies: General Population - Adults, 2.19 Other (Narrative review on the literature regarding the Neurovisceral Integration Model, individuating knowledge gaps), 3.6 Other (No experimental design, narrative review), 4.12 Sensation/perception/interoception, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION I-046 | HARNESSING HEART RATE VARIABILITY TO TRIGGER JUST IN TIME ADAPTIVE INTERVENTIONS: A MICRO-RANDOMIZED TRIAL FOR STRESS REDUCTION

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In previous research we introduced a simulation approach to derive algorithm settings for detecting transient, non-metabolic heart rate variability reductions (so-called additional HRV reductions; AddHRVr) in everyday life, potentially indicating moments of psychophysiological vulnerability. AddHRVr is quantified via the root mean squares of successive differences (RMSSD) controlling for bodily movement. In the present pre-registered micro-randomized trial, we applied this algorithm to trigger a slow breathing intervention (0.1 Hz) with the aim to stabilize autonomic function and relieve perceived stress. A sample of 60 individuals participated. Following a 1-day calibration period to derive individualized trigger settings, participants received AddHRVr-triggered and random prompts throughout the following 3 days asking for perceived stress and initiating a 1-minute slow breathing exercise. Multilevel analyses confirmed higher stress ratings following AddHRVr-triggered relative to random prompts, suggesting that the real-time trigger identified stressful moments in time. Following the breathing exercises perceived stress significantly declined irrespective of the kind of prompt. However, performing the slow breathing exercises when triggered by AddHRVr resulted in a stronger increase in HRV during slow breathing as well as elevated HRV following the intervention. Overall, results suggest that delivering short breathing interventions in moments of highest need in everyday life could stabilize autonomic function, thus potentially promoting cardiac health in the long run.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.12 Ecological Momentary Assessment (EMA), 3.6 Other (Micro-randomized trial;micro-longitudinal), 4.10 Stress, 4.23 Emotion/affect

POSTER SESSION I-047 | THE EFFECTS OF TRANSCRANIAL FOCUSED ULTRASOUND STIMULATION TO THE POSTERIOR CINGULATE CORTEX ON INDIVIDUAL ALPHA FREQUENCY

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Transcranial Focused Ultrasound (tFUS) is a relatively novel approach to neuromodulation that uses noninvasive focused ultrasound waves to target specific regions of the brain. Given previous research indicating that increased alpha frequency is correlated with improved cognitive performance and mindfulness, our aim was to drive alpha frequency through the Posterior Cingulate Cortex (PCC), a region known to generate alpha bursting activity. The effects of different pulse repetition frequencies (PRFs) on alpha was tested. Thirty undergraduate students were assigned to one of three ultrasound modulation groups: sham, 10 Hz PRF, and individualized stimulation based on the participants' unique individual alpha frequency (IAF). Each group received 5 minutes of stimulation, and EEG was recorded pre- and post-stimulation to characterize alpha frequencies. Self-reported mindfulness scales were completed pre- and post-stimulation. The results demonstrated a significant increase in alpha frequency between pre- and post-stimulation for those who received IAF-tuned stimulation (estimate = 0.33723 Hz, $p = .00314$), while sham ($p = 0.70454$) and 10 Hz ($p = 0.96383$) yielded no statistically significant change in alpha frequency. There was no significant change in the qualitative behavioral analysis, although a nonsignificant upward

trend in the Global Affect subscale of the Visual Analog Mood Scale was observed. These results hold promise for the future use of tFUS as a therapeutic psychological intervention.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.19 Motivation, 4.23 Emotion/affect, 4.26 Other

POSTER SESSION I-048 | UNRAVELING THE NEUROANATOMICAL BASIS OF WORKING MEMORY IN FIBROMYALGIA: EXPLORING THE MODERATING INFLUENCE OF DEPRESSION

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Fibromyalgia (FM) is a chronic pain syndrome characterized by persistent pain, fatigue, anxiety, depression, and cognitive impairments, notably in working memory. This dysfunction has been linked to abnormal frontoparietal network functioning. The research aimed to investigate brain volume differences in frontoparietal regions between FM patients and healthy controls (HC), and their relation to working memory performance. Depression and anxiety levels were analyzed as potential modulating variables between working memory and brain volume. The study included 30 FM patients and 27 HC. Voxel-Based Morphometry analyzed brain morphology, and working memory was assessed using neuropsychological tests. FM patients scored lower in arithmetic, letter-number sequencing, and working memory index, with no significant grey matter volume differences. Lower brain volume correlated with poorer working memory in HC while lower brain volume in specific areas correlated with poorer working memory performance in HC, this association was minimal and inconsistent in FM patients. In the FM group, depression affected the relationship between brain volume and performance on working memory tests. These results offer valuable insights into the intricate relationship between working memory deficits in FM, their neural substrate, and the moderating effect of socio-affective variables such as depression. This information could contribute to the development of intervention strategies better tailored to this patient population.

FUNDING: This research is funded by the project PID2020-115463RB-I00; 2021-2025 of the Ministry of Science and Culture and from the Rey Juan Carlos University: A515 'Proyectos Impulso' young PhD researchers–URJC–INEMODOL2023.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.9 Pain, 4.18 Memory

POSTER SESSION I-049 | THE SOUND OF SCIENCE: DATA SONIFICATION AS A TOOL FOR NEUROSCIENCE RESEARCH AND EDUCATION

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Sound offers a natural medium to represent physiological signals, as both comprise rich frequency information that unfolds over time. We present examples of sonification using EEG and EKG to illustrate how transforming data into sound can both advance research insights and facilitate public engagement. For researchers, data sonification can provide a window into the dynamics of physiological processes that are typically obscured by averaging signals across time. Specifically, we show that phase-amplitude coupling (PAC) between neural oscillations, which generally requires a long recording period to quantify, can be observed in real time as natural fluctuations in the sonically-represented amplitude of EEG rhythms. This offers a method for the assessment and quantification of dynamic PAC. Sonification can also be used to make physiological data more accessible and intuitive to the general public and can facilitate teaching advanced concepts such as frequency decomposition. We illustrate this using a sonification example designed for *You: Quantified*, a Web application for physiological data visualization/sonification developed as part of a data literacy program focusing on biometrics. Students can connect EEG headsets to hear their brainwaves represented as audible frequencies and can create mixtures of sine waves at different frequencies in order to reverse-engineer the EEG signal. These examples illustrate the potential for data sonification to shed light on physiological processes for researchers and the public.

FUNDING: Society for Psychophysiological Research-Research Training Grant.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 3.6 Other (Methods), 4.15 Biofeedback

POSTER SESSION I-050 | PSYCHOLOGICAL AND PHYSIOLOGICAL CORRELATES OF ADOLESCENT JUDO ATHLETES' WELL-BEING AND PERFORMANCE

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Engagement in sports during adolescence is crucial for holistic development, yet understanding the interplay between subjective well-being, physiological responses, and performance levels among adolescent judo athletes remains incomplete. A multidimensional assessment protocol was employed, encompassing heart rate variability analysis, performance evaluation, and subjective well-being assessment using the "Subjective Well-Being" scale by A. Perue-Badu. A diverse sample of 23 male adolescent judokas(aged 10-16) from the judo club "Zeytun" participated, ensuring representation across different kyu levels and ages. Moderate levels of subjective well-being were observed (SWB: M=43.43±13.09), with participants reporting moderate symptom manifestation, emotional tension, and satisfaction with daily activities. Significant associations were found between performance levels and psycho-emotional symptom manifestation (r = .564**, p = .005) and social environment influence (r=.498*, p=.016). Additionally, HRV analysis revealed significant pre- to post-exercise changes, with decreased parasympathetic activity and increased sympathetic dominance. Importantly, HF was correlated with overall well-being scores (r=.520*, p=.027), indicating its potential as a physiological marker of well-being in adolescent judo athletes. These findings underscore the holistic development promoted by judo, emphasizing its positive impact on psychosocial well-being and physiological adaptability, thereby contributing to the enhancement of overall wellness and performance optimization among adolescent athletes.
FUNDING: This work supported by the NAS RA within the framework of the "Young Scientists' Support Program" under the code 22-YSSP-029.
Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.5 Population-specific health, 4.11 Personality

POSTER SESSION I-051 | PRELIMINARY RESULTS ON THE ASSOCIATION BETWEEN HAIR CORTISOL LEVELS AND LONG-TERM AIR POLLUTION EXPOSURE: INSIGHTS FROM THE CZECH STUDY ON HEALTHY AGING IN AN INDUSTRIAL ENVIRONMENT

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Background: Although there have been notable enhancements in ambient air quality recently, air pollution continues to be a significant environmental health issue worldwide. Long-term exposure to ambient air pollution may lead to chronic stress. Hair cortisol concentration (HCC) serves as a validated biomarker for long-term cortisol secretion, yet research on its relationship with air pollution exposure is limited. Thus, our study aimed to investigate the association between HCC and long-term exposure to air pollution in apparently healthy adults. Methods: We analyzed cross-sectional data from the Czech Healthy Aging in Industrial Environment study-Programme 4. HCC was measured in the proximal 2 cm of scalp hair of 182 apparently healthy adults aged 18-65 (mean age=38.15, SD=9.90, males=11.05 %) living in either an area with historically high air pollution (N=109) or in an area with no or low air pollution (control region; N=72). Linear regression was applied. Results: Linear regression analysis between log-transformed HCC and residential area (polluted/control), adjusting for age, sex, and education, revealed higher HCC among individuals residing in the air-polluted region, although this trend did not achieve statistical significance (β=0.23, SE=0.12, t=1.84, p=0.067, 95% CI= -0.02 to 0.48). Conclusion: While a statistically significant association between air pollution and HCC was not observed, the limited research in this field highlights the need for additional studies. We aim to execute detailed analyses of individual exposures to improve the accuracy of our findings.
FUNDING: The submitted study has been produced with the financial support of the European Union under the LERCO project number CZ.10.03.01/00/22_003/0000003 via the Operational Programme Just Transition. Data were collected in the project “Healthy Aging in Industrial Environment – HAIE (No. CZ.02.1.01/0.0/0.0/16_019/0000798”.
Topics: 1.1 Human Studies: General Population - Adults, 2.19 Other (hair cortisol concentrations - ELISA/LC-MS/MS), 3.1 Observational Study: Cross-Sectional, 4.5 Population-specific health

POSTER SESSION I-052 | HEART RATE VARIABILITY MODULATION IN DEEP BRAIN STIMULATION FOR TREATMENT-RESISTANT DEPRESSION: INSIGHTS INTO TREATMENT RESPONSE

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Modulation of heart rate variability (HRV) may elucidate mechanisms by which deep brain stimulation (DBS) as an intervention for treatment resistant depression (TRD) exerts its antidepressant effects. Low HRV has been linked to depression and here we examine whether it may serve as a useful indicator of treatment response to DBS for depression. Nine TRD patients received DBS to the subcallosal cingulate cortex (SCC). HRV metrics were derived from ECG recordings acquired at baseline (pre-implantation). HRV was indexed by the root mean square of successive differences (RMSSD). We explored whether depressive symptoms moderate the relationship between baseline RMSSD and time to therapeutic response. Time to therapeutic response was the number of weeks after implantation until there was a 50% reduction from baseline for scores on the Hamilton Depression Rating Scale for two consecutive weeks. Depression severity at baseline moderated the association between RMSSD and time to therapeutic response ($p<.02$, $SE=0.2778$, $t=2.381$). To interpret the interaction, simple effects were observed at three levels of depression severity. When depressive symptoms were one standard deviation below the mean, a significant negative association was present between RMSSD and time to treatment response. At the mean and one standard deviation above the mean for depressive symptom, the effect of treatment response on RMSSD were not significant ($p>.05$). HRV may thus signify flexibility that leads to symptomatic response to DBS intervention, but severe depression disrupts this relationship.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.18 Brain stimulation, 3.5 Secondary Analysis, 4.7 Psychopathology, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION I-053 | COGNITIVE CONFLICT IS NOT ALWAYS EFFORTFUL: INSIGHTS FROM THE CARDIOVASCULAR SYSTEM

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Cognitive conflict is usually described as being effortful. However, there is little conclusive evidence supporting this idea. We argue that the reason relies on the procedures used to investigate this question, namely the use of conflict-related tasks. Doing so is problematic, as it remains unclear whether the higher resources that are typically mobilized for processing incongruent task trials are due to the elicitation of conflict-related negative affect or due to the mere higher response difficulty in incongruent task trials. This poster presents two studies that objectively assessed effort in terms of responses of the cardiovascular system, especially the cardiac pre-ejection period (PEP). Furthermore, we used a conflict priming paradigm that imbedded pictures of either conflict-related (incongruent) or non-conflict-related (congruent) Stroop items in memory tasks that were not conflictful per se. This allowed us to disentangle the aforementioned confound. Results of Study 1 showed that in an easy-to-moderate task difficulty context, conflict primes led to stronger PEP reactivity—i.e. more effort—than non-conflict primes. Replicating this effect, Study 2 further showed that when the task difficulty increased, conflict primes did not lead to more effort but instead led to early disengagement, as evidenced by reduced PEP reactivity. That is, our results provide evidence that cognitive conflict can indeed be effortful, but not always.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.19 Motivation, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION I-054 | EMOTIONAL REACTIVITY AND FOOD CHOICES IN NON-OBESE FEMALE UNIVERSITY STUDENTS: INSIGHTS FROM HEART RATE VARIABILITY

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Research shows that the eating habits of university students do not follow the national recommendations. While most

studies on this population have focused on the increased risk of overweight/obesity, it is recognized that avoiding unhealthy food or maintaining a normal weight does not necessarily result in a regular consumption of healthy essential nutrients. We investigated the interplay between emotional reactivity and inhibitory control in 42 non-obese female students exposed to healthy (fish/lean meat, fruit/vegetables) and unhealthy (savory and sweet junk food) food pictures, after an average fasting of 7.5h. We measured valence, arousal and craving during picture viewing and assessed inhibitory control in an emotional Go/NoGo task. Resting HRV was used as an index of dispositional emotion regulation/cognitive control. Hunger, dietary habits and frequency of physical activity were also collected. Unhealthy foods elicited higher pleasantness, arousal and craving than healthy foods, indicating stronger appetitive motivation. Hierarchical regressions showed that emotional reactivity was predicted by hunger or fasting duration. However, HRV positively predicted reaction times to Go stimuli for all food types except fruit/vegetables. Importantly, HRV and physical activity negatively predicted the habitual consumption of sweet junk food and positively predicted that of fruit/vegetables. Results suggest that HRV might help regulate the intake of healthy and unhealthy foods by tempering prepotent responses to emotional cues and supporting reflective processing of food choice.

FUNDING: This research was supported by a grant from Department of Communication Sciences, Humanities and International Studies, University of Urbino (Progetti di Ricerca sulla Sicurezza Alimentare - 2019) to Michela Sarlo.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.5 Population-specific health, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION I-055 | ADULTS WITH AUTISM SPECTRUM DISORDER DURING LOW-RISK PROBABILISTIC CHOICES EXPERIENCE ATYPICAL AROUSAL, WHICH IS RELATED TO INTOLERANCE OF UNCERTAINTY

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Adults with autism spectrum disorder (ASD) experience stress in probabilistic environments, but the underlying mechanisms are still debatable. Prior research into decision-making using probabilistic tasks in adults with ASD often involved high-volatility environments, which are inherently frustrating, thus adding an unaccounted factor into the quest. Our current study differs in that we examined behavioral responses and pupil dilation in a stable non-volatile task, which posed an exploitation-exploration dilemma to participants. We found that both adults with ASD and age-matched neurotypical individuals alike developed a strong preference for high-value 'low-risk' probabilistic options (i.e. exploitatory strategy). On some trials, they both ventured into directed exploration and deliberately chose the low-value 'risky' option. Notably, in the ASD group – in contrast to the group of neurotypical participants – probabilistic high-value 'low-risk' decisions were accompanied by a pronounced pupil dilation, indicating strong arousal. This response was not attributable to environmental unpredictability or misjudged volatility, as the reward structure was consistent throughout the experiment. Instead, the pronounced pupil responses among adults with ASD may signify a greater subjective uncertainty in the expected value of choices, suggesting a fundamental lack of confidence in their predictive processing rather than a mere cognitive difficulty. Indeed, pupil dilation evoked by 'low-risk' decisions in probabilistic environment was positively related to intolerance for uncertainty.

FUNDING: Funded by Moscow State University of Psychology and Education.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.6 Eye Tracking (blink, movement, size), 3.3 Lab Based Experiment, 4.10 Stress, 4.16 Neurological disorders / Neuropathology, 4.21 Decision making

POSTER SESSION I-056 | VISUAL CONTEXT AFFECTS CHILDREN'S AND ADULTS' COGNITIVE LOAD DURING PREDICTIVE LANGUAGE PROCESSING

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We know that infants use sentence contexts to predict upcoming words (Mani et al. '16) and that word prediction facilitates language processing among age groups (Ankener et al. '18, Tamási et al. '17). However, less is known about how children and adults predict when complex visual scenes show multiple predictable objects, i.e., allow multiple predictions. We studied if 1) children and adults use sentence contexts and visual scenes with multiple prediction options to predict one or multiple words and 2) age differences in cognitive load of predictable sentences

caused by such visual scenes. Children (5–6 yrs, n=23) and adults (19–31 yrs, n=36) listened to predictable sentences ("He *eats* a pie") and saw scenes of four objects of which 0, 1, 3, or 4 were predictable (e.g., *edible*). We examined eye-fixations as an index of prediction and the Index of Cognitive Activity (ICA) as a pupillometric measure of cognitive load. 1) Fixation patterns indicated that both groups use sentence contexts and visual scenes to predict single or multiple words, depending on the number of visual prediction options. 2) The ICA results showed that both groups have highest load when three objects fit prediction while one distractor is ambiguous to prediction. Adults also showed higher load when one vs multiple objects fit prediction, i.e., when predicting multiple words. In sum, our results suggest that both groups predict one or multiple words by the visuo-linguistic context, but that cognitive load varies depending on the number of predicted words. Also, the ICA seems to be more sensible in adults.

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Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.6 Eye Tracking (blink, movement, size), 3.3 Lab Based Experiment, 4.2 Development, 4.13 Speech/language, 4.25 Cognitive control/executive functions

POSTER SESSION I-057 | NEURAL CORRELATES OF VOICE LEARNING WITH DISTINCTIVE AND NON-DISTINCTIVE FACES

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Recognizing people from their voices may be facilitated by a voice's distinctiveness, in a manner similar to that which has been reported for faces. However, little is known about the neural time-course of voice learning and the role of facial information in voice learning. Based on evidence for audiovisual integration in the recognition of familiar people, we studied the behavioral and electrophysiological correlates of voice learning associated with distinctive or non-distinctive faces. We repeated twelve unfamiliar voices uttering short sentences, together with either distinctive or non-distinctive faces (depicted before and during voice presentation) in six learning-test cycles. During learning, distinctive faces increased early visually-evoked (N170, P200, N250) potentials relative to non-distinctive faces, and face distinctiveness modulated voice-elicited slow EEG activity at the occipito–temporal and fronto-central electrodes. At the test, unimodally-presented voices previously learned with distinctive faces were classified more quickly than were voices learned with non-distinctive faces, and also more quickly than novel voices. Moreover, voices previously learned with faces elicited an N250-like component that was similar in topography to that typically observed for facial stimuli. The preliminary source localization of this voice-induced N250 was compatible with a source in the fusiform gyrus. Taken together, our findings provide support for a theory of early interaction between voice and face processing areas during both learning and voice recognition.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.13 Speech/language, 4.18 Memory, 4.22 Learning/conditioning

POSTER SESSION I-058 | FORCE TO WITHDRAW: RIGHT LATERALIZED LPP'S RELATE TO MOVEMENT FORCE IN A NOVEL APPROACH-AVOIDANCE TASK

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Predicated on the idea that affects high in withdrawal motivation are crucial in goal-directed behaviors, research has found that withdrawal-motivated stimuli activate withdrawal motor movements. Previous research suggests that right prefrontal cortical regions are associated with withdrawal motivation. The present research examined LPPs over the right and left frontal cortex to disgust and neutral pictures and assessed the relationship of these LPPs to motor movements. This study used a novel tablet-based version of the approach-avoidance task. The task allowed participants to move disgust and neutral images presented on a screen towards or away from themselves while EEG was measured. In addition, it allowed measures of force to be recorded during motivationally consistent (e.g., pushing away disgust images) vs. inconsistent (pulling towards disgust images) movements. LPP amplitudes over lateral frontal sites revealed that motivationally consistent withdrawal (push) movements toward disgust images activated more motivated attentional processing over the right hemisphere than motivationally inconsistent approach (pull) movements. Greater relative right LPP amplitudes related to greater force exertion when moving away from disgust pictures. These results suggest a connection between motivated attentional processing, greater relative right frontal LPP amplitudes, and avoidance movements. In conclusion, this study extends our understanding of withdrawal behavior by relating these

neural activation patterns with force exertion in a novel movement task.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 3.3 Lab Based Experiment, 4.11 Personality, 4.19 Motivation, 4.23 Emotion/affect

POSTER SESSION I-059 | EFFECTS OF STIMULATION TYPE AND DURATION OF TRANSCUTANEOUS AURICULAR VAGUS NERVE STIMULATION (TAVNS) ON THE P300 RESPONSE

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Non-invasive transcutaneous auricular vagus nerve stimulation (taVNS) has attracted increasing interest as a neurostimulation tool to modulate cognitive processes such as attention and memory, possibly via activation of the locus-coeruleus noradrenaline system. Studies examining the P300 as a central correlate of noradrenergic activity, however, have shown inconsistent findings, highlighting the need for further investigation. In this ERP study, involving 61 participants, we explored how changes in taVNS parameters – specifically stimulation type (interval vs. continuous stimulation) and duration – affected the P300 during a visual novelty oddball task, in which non-target, target (easy and hard) and novel stimuli were presented. Consistent with previous findings (Ventura-Bort et al., 2018), our results revealed a stimulus-specific effect of taVNS on the P300 response (larger P300 amplitudes for easy targets after taVNS compared to sham stimulation). Notably, our findings also suggest that the type of stimulation plays a significant role in modulating the effects of taVNS on the P300, with continuous stimulation demonstrating greater efficacy than interval stimulation in certain conditions (larger P300 amplitudes for hard targets and standards after continuous taVNS). We found no interaction effects of stimulation duration for the target-related P300. While our findings partly replicate previous results, further research is needed to fully understand the influence of taVNS on the P300 component and its potential as a reliable marker for neuromodulation in this field.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.20 Attention, 4.26 Other

POSTER SESSION I-060 | HIDING IN PLAIN SIGHT: THE ERN IS INVISIBLE TO MEG, BUT THETA POWER IS ROBUSTLY REPRESENTED

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The Error Related Negativity (ERN) has been actively researched over the last >3 decades (>130K citations). However, there has not been a definitive source estimation of this component using magnetoencephalography (MEG). Unlike electrical fields, magnetic fields do not spread due to volume conduction. Unfortunately, this limits estimation to tangential dipoles: radially oriented neurons can only be observed with sensors 90 degrees from the electrical dipole. This complicates the search for a radial generator thought to underlie the ERN. Yet there are more to errors than a single component. MEG was collected from a 306-sensor Elekta Neuromag during a 400-trial flankers task with 25 non-depressed adults. Error minus correct trial fields lacked a magnitude increase in the 70ms-90ms range, in contrast to the prominent ERN recorded in this window in a separate sample on the same task with EEG (n=21). While the ERN was invisible, dynamic imaging of coherent sources (DICS) revealed increased theta power (4Hz-8Hz; cluster-permutation correction, $p < 0.01$) in bilateral rostral and caudal anterior cingulate cortex, superior frontal, and caudal middle frontal gyrus. Interestingly, a hemispheric bias was present with strong representation from right caudal inferior frontal gyrus and insula. These null results suggest that the ERN is indeed radially oriented, and these positive results indicate that theta is evoked by a much broader set of interactive systems.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.25 Cognitive control/executive functions

POSTER SESSION I-061 | RTMS OVER THE RIGHT INFERIOR FRONTAL GYRUS INTERACTS WITH TRAIT IMPULSIVITY TO ENHANCE APPROACH-MOTIVATION

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The drives to approach rewards and avoid punishments are essential mechanisms of motivated behavior. Prior neuroimaging studies indicate that the right inferior

frontal gyrus (IFG) executes inhibitory control over motor systems via projections to the basal ganglia. While literature suggests the inhibitory role of the right IFG, few studies have investigated the causal relationship between IFG activity and motivated behavior regulation. The current study applied repetitive transcranial magnetic stimulation (rTMS) across two counterbalanced sessions to alternately inhibit the right and left IFG. Thirty-three participants answered questions to assess trait impulsivity (UPPS-P Behavioral Impulsivity Scale), and then low-frequency rTMS was applied to disrupt the right or left IFG. Next, participants completed a novel tablet-based approach-avoidance task where they saw images of delicious desserts or neutral objects. During the task, they pushed images away or pulled images closer. Individuals reporting high impulsivity reacted faster to pull dessert images after rTMS of the right IFG compared to after rTMS of the left IFG ($F(1,28)=7.248$, $p=0.012$, $\eta^2=0.206$) while controlling for reaction times to neutral objects. Regressions showed that impulsivity related to faster reaction times after rTMS of the right IFG ($r=0.415$, $p=0.018$) but not left IFG ($r=0.078$, $p=0.668$). This study suggests a causal relation between right IFG activity and inhibitory control, and that inhibition of the right IFG may lead to enhanced approach behavior for individuals with high trait impulsivity.

Topics: 1.1 Human Studies: General Population - Adults, 2.11 Questionnaires/Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.11 Personality, 4.19 Motivation, 4.25 Cognitive control/executive functions

POSTER SESSION I-062 | THE NEUROPHYSIOLOGY OF OLFACTORY REVERSAL LEARNING

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Reversal learning plays a crucial role in conditioning experiments as it can serve as an important indicator of cognitive flexibility, offering valuable insights into the process of association formation and re-learning. When it comes to olfaction, it stands out from other sensory modalities due to its unique thalamic and extra-thalamic pathways. In light of this, our research focused on investigating olfactory conditioning using a reversal paradigm. In our experiment, one odor (CS+) was paired with an aversive loud sound (US), while the other odor served as control (CS-). After half of the trials, we reversed the contingency, making the CS+ odor the CS- odor, and vice versa. To gather comprehensive data, we employed multiple measures, including behavioral observations, skin conductance, heart rate, pulse wave, nostril muscle activity, and EEG. A total of 41 subjects participated in the study. The results revealed that only perceived intensity of the odors could be conditioned, but this learned response seemed to persist the reversal, and was not re-learned for the new CS+ odor. In contrast, perceived pleasantness and all neurophysiological measures showed minimal effects, indicating no significant differences between the two conditions overall. These findings suggest that establishing an association between an olfactory stimulus and an aversive auditory event may pose challenges. This difficulty could potentially arise from the unique nature of the extra-thalamic olfactory pathways, which might be crucial for the formation of such associations.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.4 Respiratory, 2.7 Skin responses, 3.3 Lab Based Experiment, 4.14 Unconscious processes, 4.22 Learning/conditioning, 4.23 Emotion/affect

POSTER SESSION I-063 | CAN MULTIPLE EQUALLY SALIENT DISTRACTORS BE SUPPRESSED?

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There is a growing body of research suggesting that task-irrelevant salient visual objects can be suppressed rather than automatically capture attention. While previous research has focused on the suppression of one salient distractor, we recently showed that, for displays with two salient distractors, suppression was stronger for the more salient distractor (Drisdelle & Eimer, 2023). Here, we examined how equally salient distractors are suppressed using behavioural (Experiment 1) and electrophysiological measures (Experiment 2). Participants searched for a shape-defined target among target-coloured distractors and salient distractors (one or two). Salient distractors always had the same colour. In Experiment 1, participants reported probe letters superimposed on the shapes (capture-probe paradigm). Suppression effects, i.e., an impaired ability to report letters at a salient distractor location, were equally strong regardless of salient distractor numerosity, indicating efficient multiple-distractor suppression. Experiment 2 provided converging electrophysiological evidence, where the P_D (considered a neural marker of suppression) was larger for displays with two lateral salient distractors than displays with one lateral salient distractor, reflecting the combined contribution of suppression that is applied simultaneously to multiple

salient distractors. Taken together, our results suggest that it is possible to suppress multiple distractors that are equally salient, and that this suppression does not result in behavioural costs relative to single-distractor suppression.
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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.20 Attention

POSTER SESSION I-064 | SEX DIFFERENCES EARLY INFLUENCE THE SEMANTIC DECISIONS WHEN READING SENTENCES IN SPANISH: AN ERP STUDY

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Prediction is a crucial feature of language comprehension. The information provided by preceding words generates expectations about the upcoming ones via top-down mechanisms that pre-activate the most probable forthcoming words. It has been proposed that sex differences in linguistic processing might be due to the underlying cognitive strategy. We aimed to explore whether sex may influence the event-related brain potential responses preceding the last word of a sentence semantic decision task. Forty-four native (22 females) Spanish-speaking young adults read 80 six-word (sequentially presented) sentences with congruent or not congruent closing words with simultaneous EEG recording. Females showed significantly fewer errors than males while judging the semantic incongruent sentences. Moreover, the electrophysiological results showed a significantly higher, frontally located, P200-like component in women for the second word of the sentence corresponding to correct responses. The predictive qualities in sentence processing -probably indexed by P200- seem to be greater in females, thus suggesting sex differences in reading underlying cognitive strategy and the temporal dynamics of the engagement of the neural substrates involved.
FUNDING: Instituto de Neurociencias. Universidad de Guadalajara.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.1 Observational Study: Cross-Sectional, 4.3 Sex differences, 4.4 Gender, 4.13 Speech/language

POSTER SESSION I-065 | RELIABILITY OF THE LATE POSITIVE POTENTIAL ELICITED BY THE COMPLEX AFFECTIVE SCENE SET

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The late positive potential (LPP) is used to index individual differences in engagement with emotionally significant content. Previous research has used the International Affective Picture System to elicit the LPP using affectively extreme stimuli (e.g., erotic/mutilation content). Recently, the complex affective scene set (COMPASS) was established to elicit emotions occurring in real-world social/non-social environments as opposed to extreme environments. To our knowledge, no past work has assessed whether COMPASS stimuli can be used to elicit reliable LPPs. Twenty-four participants (58% female; age range=18-32 years) completed an Emotional Interrupt Task consisting of 60 images (20 positive, 20 neutral, and 20 negative) presented twice while the electroencephalogram was recorded. COMPASS stimuli, which included varied contextual content (e.g., outdoor scenes, animals, natural disasters), were selected to differ on normative self-assessment manikin ratings of valence (positive: M=6.8; neutral: M=5.6; negative: M=2.2) and arousal (positive: M=4.5; neutral: M=3.4; negative: M=5.7). Although no differences in LPP to positive and negative stimuli were observed, there was a larger LPP to emotional compared to neutral content (t[23]=1.8, p=.04). Spearman-Brown split-half reliability coefficients of the LPP to positive, neutral, and negative stimuli were .78, .82, and .85, respectively. These findings are among the first to indicate that COMPASS stimuli can elicit reliable LPPs; however, researchers should consider which stimuli are most appropriate for the purpose of each study.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.23 Emotion/affect, 4.26 Other

POSTER SESSION I-066 | NEUROPHYSIOLOGICAL AND BEHAVIORAL SIGNATURES OF REWARD LEARNING AND RESPONSIVENESS ARE CONSERVED ACROSS HUMANS AND RATS

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Alterations in reward learning and responsiveness – transdiagnostic constructs of interest for psychopathology – have been directly implicated in several disorders, most notably depression. Unfortunately, preclinical models of such disorders often provide limited translational validity, perhaps, partly due to challenges in cross-species measurement. EEG, which can index these reward processes, may be useful for overcoming such challenges, and, thus, was used here to compare neural indices of reward-processing in rats and humans. EEG data were recorded from 25 healthy adults (14 female; aged 27.40 ± 5.60 years) and 22 Long-Evans rats (14 males, 226 – 250g; 8 females, 176 – 200g), all of whom completed a probabilistic reversal learning task following treatment with placebo and varying doses of methylphenidate (MPH). Neural responses were analyzed using event-related potentials (ERP) and underlying delta and theta spectral activity. Reward learning was evaluated using task performance metrics (e.g., Win-Stay and Lose-Shift Ratios, number of reversals) and estimated using computational models. Analyses revealed equivalent ERP indices of reward processing in both species. Furthermore, mixed-effects models revealed that MPH did not moderate these ERP indices regardless of dose. Additional analyses evaluating behavioral and spectral indices from both species are currently ongoing. Overall, these results support the view that reward processes may be similarly regulated across species and that EEG may provide useful metrics for translating preclinical models.

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Topics: 1.8 Other (Human (Adults) and Rodent cohorts), 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.15 Computational / Simulation, 2.16 Pharmacology, 3.3 Lab Based Experiment, 4.25 Cognitive control/executive functions, 4.26 Other

POSTER SESSION I-067 | DIFFERENTIAL NEURAL PROCESSING OF TONE FREQUENCY ODDBALLS IN CHILDREN WITH AUTISM SPECTRUM DISORDER, ATTENTION-DEFICIT HYPERACTIVITY DISORDER, AND NEUROTYPICAL CHILDREN

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Children with autism spectrum disorder (ASD) and attention-deficit hyperactivity disorder (ADHD) have increased prevalence of sensory anomalies as compared to neurotypical children (NT). Anomalies pertain to abnormal sensitivity and/or reactivity to specific sensory modalities and are associated with distress and dysfunction in everyday life. To gain insight of the neurophysiological substrates of sensory anomalies, we aim to detect a psychophysiological marker for tone frequency sensitivity by means of electroencephalography (EEG). In this study, we presented a train of tones (8 Hz stimulus rate) with imbedded oddballs (every 5th sound, i.e. 1.6 Hz stimulus rate) to 23 children. This protocol allows "frequency tagging" neural responses, differentiating the standard and oddball tone responses. We used a four-semitone (high saliency) and a half-semitone (low saliency) oddball, in a 3x2x2 design with factors: group (NT, ASD, & ADHD), condition (high & low saliency), and novelty (oddball & standard tone). Preliminary results suggest a condition*group*novelty interaction. The NT group showed larger responses to high saliency oddballs compared to low saliency oddballs. In contrast, the ASD group showed relatively large responses to low saliency oddballs, whereas the ADHD group showed relatively small responses to the high saliency oddballs. These results suggest that the saliency of frequency changes are differentially processed by children with neurodevelopmental disorders. Updated results with a larger sample size will be presented at the meeting.

FUNDING: Independent Research Fund Denmark Svend Andersen Fonden.

Topics: 1.5 Human Studies: Clinical Samples- Children / Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.12 Sensation/perception/interoception

POSTER SESSION I-068 | ORGAN-SPECIFICITY IN VISCERA-MOTOR COUPLING: THE PHASE OF THE HEART, LUNGS, AND STOMACH ALL DRIVE MOTOR CORTEX EXCITABILITY, BUT INDEPENDENTLY

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The rhythms of the heart, lungs, and stomach interact with cognition, exteroception, and action, and are coupled to a widespread network of brain areas. While many similarities between these organs exist (shared afferent pathways, general function of keeping the organism alive), they also show many specificities (rhythms at distinct frequencies, dedicated pathways, and respective functions). Despite this, interoception is typically defined in a holistic manner, and the extent of organ specificity in brain-body interactions rarely empirically tested. We here aim to bridge this gap by assessing whether the cardiac, respiratory, and gastric rhythm are coupled to the excitability of primary motor cortex (M1), and whether this coupling occurs in an organ-specific or organ-general manner. We combined continuous physiological recordings with single pulse Transcranial Magnetic Stimulation (TMS) to probe phase-amplitude coupling between the phase of the cardiac, respiratory, and gastric rhythm and the amplitude of Motor Evoked Potentials (MEP). The phase of all three visceral rhythms was coupled to MEP amplitude. Importantly, participants displaying high coupling between one organ and M1 did not necessarily display high coupling between the other organs and M1, suggestive of unique interoceptive profiles. Self-reported awareness of each of these organs was not related to the extent to which the organ was coupled to the motor cortex. Together these results bring forward the importance of defining interoception in an organ-specific manner.

FUNDING: The research is supported by Agence Nationale pour la Recherche (ANR- 21-CE37-0031).

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception

POSTER SESSION I-069 | SALIVARY MICRORNAS AND PSYCHOPHYSIOLOGICAL RESPONSES TO AN IMMERSIVE MULTIMODAL VIRTUAL ENVIRONMENT STRESS TEST

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MicroRNA (miRNA) are small non-coding RNAs which play a role in the epigenetic regulation of gene expression. Research has suggested that circulating levels of certain miRNA families may change in response to stress, making them novel promising biomarker of stress. The aims of this study are (i) to investigate potential changes in salivary miRNAs concentrations – as a non-invasive procedure - in response to an Immersive Multimodal Virtual Environment Stress Test (IMVEST), and (ii) to explore their potential correlation with established psychological, physiological, endocrine, and inflammatory markers of the stress response. 104 adult healthy subjects (52 males and 52 females) between 20 and 40 years of age were investigated. Perceived stress (VAS score) was significantly higher after stress exposure compared to baseline. Also, stress exposure provoked an increase in heart rate and a reduction in heart rate variability, alongside an increase in salivary cortisol and C-reactive protein levels. We identified n=8 miRNAs in saliva samples. For some of them (e.g., miR-144, miR-20b, miR-21) expression levels changed after stress exposure. Interestingly, we found a negative correlation between salivary cortisol concentrations and expression levels of some miRNAs (e.g., miR-21, miR-29a). These preliminary data suggest that expression levels of several miRNAs are influenced by exposure to acute psychological stress. These results warrant further investigation of the potential utility of miRNAs as novel stress biomarkers.

FUNDING: Work supported by #NEXTGENER[1] ATIONEU (NGEU) and funded by the Ministry of University and Research (MUR), National Recovery and Resilience Plan (NRRP), project MNESYS (PE0000006) – A Multiscale integrated approach to the study of the nervous system in health and disease (DN. 1553 11.10.2022).

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.10 Stress

POSTER SESSION I-070 | USING EMOTIONAL MOVIES TO INVESTIGATE BRAIN FUNCTIONAL CONNECTIVITY AND DISCLOSE THE ROLE OF THE VENTRAL ATTENTION NETWORK IN WOMEN WITH HIGH EMOTIONAL DYSREGULATION

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Emotion dysregulation is a common feature of many mental disorders. Thus, the identification of a potential biomarker to be used as a screening tool in at-risk community samples is highly warranted. We collected resting state EEG (rs-EEG) data from 25 young women with high traits of emotion dysregulation (HD group) and 25 with low traits (LD group). We performed a seed-based functional connectivity (FC) analysis based on Alpha and Gamma power, and we focused on the Ventral Attention Network (VAN) because of its relevance in the automatic orienting of attention toward the internal visceral state and the emotional responses to intense stimuli. In the HD group we found higher Gamma FC between VAN and all the other resting state networks (RSNs) compared to the LD group, and no differences for VAN Alpha FC. Also, we found significant correlations, only for the HD group, between the Depression/Elation subscale of ALS-18 and VAN Gamma power and ($\rho = 0.47$, $p_{FDR} < .05$), and VAN Alpha power ($\rho = -0.45$, $p_{FDR} < .05$). No correlation was found for the LD group. Both VAN power and FC were associated with high emotion dysregulation, even if our HD group was a non-clinical sample. Our finding on the higher Gamma FC between VAN and all the other RSNs points to a strong automatic orienting of attention in HD individuals toward their inner emotional turmoil. VAN Alpha power seems to represent a potentially protective factor. By analyzing rs-EEG data, we showed that the VAN FC in Gamma might be a promising index of the risk of developing emotion dysregulation and related psychiatric disorders.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.4 Gender, 4.7 Psychopathology, 4.23 Emotion/affect

POSTER SESSION I-071 | THE NEURAL PROCESSING OF IMMEDIATE AND DELAYED FEEDBACK - DIFFERENCES BETWEEN ACTION- AND STIMULUS-FEEDBACK ASSOCIATIONS

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Delaying feedback leads to a change in the neural correlates of feedback processing: The feedback-related negativity (FRN), reflecting striatal reward system activity, is reduced for delayed feedback, while the N170, associated with medial temporal lobe (MTL) activity, is increased. Apart from feedback timing, the type of the learned association could also affect which system is involved: We expected the striatal reward system to be adept to learning action-feedback (AF) associations and the MTL to be primarily involved in learning stimulus-feedback (SF) associations, which should be reflected in stronger prediction error (PE) representations in the FRN and N170, respectively. 40 participants learned either AF or SF associations with immediate and delayed feedback, while EEG was recorded. As in previous studies, the amplitude of the FRN reflected the PE and was most negative for unexpected negative feedback and most positive for unexpected positive feedback. Surprisingly, this PE by feedback valence interaction was more pronounced for SF than AF associations. Interestingly, we found a PE by feedback valence interaction also in the N170, but with most negative amplitudes for unexpected positive and expected negative feedback. This interaction appeared across feedback timings for SF associations, but only for immediate feedback for AF associations. The results suggest that striatal and MTL learning systems work in tandem across feedback timings for SF associations, but not for AF associations learned with delayed feedback.

FUNDING: DFG Individual Research Grant "The Processing of Immediate and Delayed Feedback – A Critical Role of the Learned Type of Association?" by Marta Ghio & Christian Bellebaum.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.22 Learning/conditioning

POSTER SESSION I-072 | THE ASSOCIATION OF ADAPTIVE EMOTION REGULATION WITH RESTING VAGAL TONE, AN INDIVIDUAL PARTICIPANT DATA META ANALYSIS

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Background: The neurovisceral integration model proposes that the ability to flexibly adapt to stress is related to biological flexibility within the central autonomic network, of which vagal tone is an indirect measure. A higher vagal tone therefore would signal a better emotional adaptation. Emotion regulation strategies typically indicate the extent to which people employ more or less adaptive strategies. The current study examined to what extent adaptive emotion regulation is associated with resting vagal tone. Methods: In a total of 1154 participants derived from 4 individual studies (INHIBIT I & II (n=455; 75% w, Avg age 22.5±8.4; NL); PHEMORE (n=101; 84% w; Avg age 19.5±2.9; NL); PULS (n=113 46% w; Avg age=41.6±9.2; Ger; MIDUS n=485; 54% w; Avg age=57.5±12.9; USA)) we examined the relation between cognitive reappraisal (ERQ-Reappraisal), and short-term resting vagal tone, assessed by RMSSD, distributionally normalized by square root. Single-step IPDMA was performed using multilevel analysis. Results: The samples significantly differed from each other in terms of age, sex distribution, reappraisal scores, and RMSSD, with the older samples showing higher reappraisal scores, and lower RMSSD. Taking sample into account, results showed that the unstandardized estimate for the association of reappraisal with RMSSD was -.017; p=.113 (β=-.049). Discussion: The absence of a relationship between ERQ-Reappraisal and vagal tone begs the question of whether resting vagal tone is the best indicator of adaptive functioning, or whether it may be secondary to sympathetic activation.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/ Interviews, 3.5 Secondary Analysis, 4.10 Stress, 4.23 Emotion/affect

POSTER SESSION I-073 | SHOTS IN THE DARK: ALCOHOL DAMPENS STARTLE POTENTIATION IN A NOVEL THREAT-OF-DARKNESS PARADIGM

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Understanding the stress dampening properties of alcohol is key to characterizing its reinforcing properties which contribute to addictive patterns of use. Using paradigms translated from rodents to humans, alcohol has shown to more robustly dampen startle potentiation during uncertain threat of electric shock than during certain threat across multiple manipulations of threat of shock uncertainty. The present study aimed to extend prior work on alcohol and uncertain stressors by investigating alcohol's effects in a refined dark-enhanced startle paradigm which newly allows for the assessment and control of participant attention. This paradigm maintains the translational properties of previous threat of shock work and generalizes previous findings to a novel type of uncertainty, darkness, further clarifying alcohol's pharmacological effects on psychophysiological stress and the involved neurobiological mechanisms. Participants received alcohol (target BAC of 0.08%), placebo or no alcohol before experiencing both bright and dark conditions. Within-subjects comparisons revealed that darkness potentiated the startle response relative to bright light ($p < 0.001$) without affecting emotionally motivated attention as measured via startle Probe P3 ERP. Alcohol dampened dark-enhanced startle ($p < 0.05$), extending evidence of alcohol's effects on uncertain stressor response to darkness and implicating stressor uncertainty—rather than other stressor characteristics—as a key variable in alcohol stress response dampening.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.2 Myography (EMG etc.), 2.16 Pharmacology, 3.3 Lab Based Experiment, 4.10 Stress, 4.15 Biofeedback, 4.20 Attention

POSTER SESSION I-074 | DO WE CRAVE WHAT THE BODY NEEDS? CARDIOVASCULAR THREAT PREDICTS ACUTE ALCOHOL CONSUMPTION AFTER EXPERIENCING SOCIAL STRESS

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Despite being an essential component of the body's stress response, knowledge of how cardiovascular systems influence alcohol use and relapse is underdeveloped. In the periphery, the sympathetic-adrenal-medullary (SAM) axis increases blood flow to help overcome a stressor (i.e., cardiovascular challenge). Yet, co-activation of the hypothalamic-pituitary-adrenal (HPA) axis may limit this increased blood flow via arterial constriction to worsen coping ability (i.e., cardiovascular threat). Therefore,

stress may only promote alcohol craving when the HPA axis is engaged, in an attempt to diminish the antagonistic effects experienced during cardiovascular threat (e.g., vasodilation, reduced anxiety). Across two experiments, blood pressure, electrocardiography (ECG), and impedance cardiography (ICG) were assessed during social stressors (i.e., Trier Social Stress Test) prior to an ostensible taste test of beer. Experiment 1 ($N=55$) found participants experiencing social stress exhibited cardiovascular challenge compared to controls exhibiting cardiovascular threat. Cardiovascular threat predicted greater beer consumption and mediated the relation between condition and consumption. Experiment 2 ($N=48$) demonstrated that reinterpreting physiology as helpful during social stress (i.e., cognitive reappraisal) promoted cardiovascular challenge, whereas participants instructed to ignore the source of stress exhibited cardiovascular threat. Similarly, cardiovascular threat predicted beer consumption, in addition to mediating the relation between condition and consumption.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.10 Stress, 4.23 Emotion/affect

POSTER SESSION I-075 | USING MOBILE ELECTROENCEPHALOGRAPHY TO DETECT MILD COGNITIVE IMPAIRMENT

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Mild cognitive impairment (MCI) presents a risk state for dementia and Alzheimer's disease. Early detection of MCI is essential, as it potentially allows for improved outcomes through early lifestyle change interventions. Current methods used to detect and diagnose MCI rely on clinical interviews, cognitive and functional assessments, and laboratory testing, all of which require skilled administrators and significant time investment. As prevalence rates of MCI grow with an aging population, there remains a clear need for an accessible, efficient, and objective method of detection. EEG is well established to be sensitive to the presence of MCI but the cost, time, and technical requirements of traditional EEG systems limit their feasibility as a diagnostic tool. Mobile electroencephalography (EEG) provides a potential solution to this problem. Mobile EEG systems are quick to set up and do not require skilled technicians to operate. We used mobile EEG to assess the P300, an event-related potential (ERP) component which represents detection of unexpected stimuli, in 200 participants between the ages of 64 and 86. Participants diagnosed with MCI exhibited a reduced P300 amplitude relative to age-matched controls. Our results demonstrate that the P300 may present a potential electrophysiological biomarker of MCI and, more importantly, that mobile EEG presents a means for early MCI detection. Screening for MCI could become more accessible given that our testing time was less than seven minutes and required no technical expertise, thus leading to better patient outcomes.

FUNDING: NSERC Discovery Grant Island Health.

Topics: 1.6 Human Studies: Clinical Samples - Elderly/Geriatric, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.1 Aging, 4.5 Population-specific health, 4.16 Neurological disorders / Neuropathology

POSTER SESSION I-076 | AGING NATURALLY: UNDERSTANDING HOW SPENDING TIME IN NATURE AFFECTS OLDER ADULTS' EXECUTIVE FUNCTIONING, HEART RATE VARIABILITY, AND MOOD

Sharde Johnson[1], Joshua Hofecker[1], Sara-Ashley Collins[1], Jordan Rivera[1], Michaela Rice[1], Rachel Masters[1], Dylan Schreiber[1], Emily Scott[2], Victoria Interrante[3], Francisco Ortega[1], Deana Davalos[1], Sara LoTemplio[1]
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As the global population of older adults increases, the prevalence of Alzheimer's Disease (AD) is expected to rise. Greater executive functioning (EF) protects against cognitive decline, and higher heart rate variability (HRV) is associated with lower levels of plasma amyloid beta—a biomarker of AD. Past work shows that nature exposure can improve EF and HRV, suggesting that spending time in nature may promote healthy aging. This study examined how real-world nature and virtual reality nature exposure affected healthy younger and older adults' EF, HRV, mood, and perceived stress. Participants were randomized to a real-world nature, virtual reality nature, or an indoor, do-nothing control condition. Outcomes were assessed before and after 20 minutes of exposure to environmental manipulation. HRV data were collected using an electrocardiogram and respiratory data were concurrently recorded with a chest belt. Respiratory Sinus Arrhythmia and Root Mean Square of the Successive Differences were extracted during analysis to measure parasympathetic influence on HRV. Results from a sample of 35 younger

adults (MAge = 26.09, SDAge = 5.05) and 26 older adults (MAge = 64.73, SDAge = 7.10) showed no significant condition-by-time interactions. Nature manipulations did not influence outcomes as hypothesized, however, we observed an insignificant yet interesting trend in RMSSD which gives insight into past work. To our knowledge, this is the first study to use experimental methods to simultaneously measure the studied variables. We discuss implications, limitations, and future directions.

FUNDING: Funding for this poster was provided by the Colorado State University College of Natural Science's Dean's Grant.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.4 Clinical Trial (RCT etc.), 4.1 Aging, 4.10 Stress, 4.25 Cognitive control/executive functions

POSTER SESSION I-077 | FAILING TO CAPTURE THE EFFECTS OF FEAR ON COGNITION IN VIRTUAL REALITY

Gina Grimshaw[1], Christopher Maymon[1], Jordan Schulde[1], Damian Tjiptono[1], Tim Gastrell[1], Madison Jones[1], Botes Andre[2], David Carmel[1]
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Fear is thought to induce many cognitive changes, including narrowing of attention and impairments in executive control. These changes might be caused by fear itself, or by use of emotion regulation mechanisms that compete for cognitive resources. The relationship between fear and cognition has traditionally been studied using computer-based cognitive tasks in which threatening stimuli (e.g., pictures) appear. Although these tasks provide a high level of experimental control, they do not induce strong fear responses, nor do they afford the range of behaviors that frightened people typically exhibit. Virtual reality could be the ideal solution to this problem: it allows us to induce authentic emotional responses while allowing participants freedom of movement in a highly controlled virtual environment. We can also continuously monitor physiological and motion-tracking measures, so we can capture fear and cognition in "real time". Across five experiments, we show that VR is actually not an ideal solution. In all studies, participants performed a cognitive task while standing on a virtual plank, suspended high above a city street. Participants exhibited strong fear responses when stepping onto the plank, as indicated by both subjective ratings and physiological measures. However, once they engaged with the cognitive task, participants showed clear reductions in markers of fear, with heart rate even returning to baseline levels. While VR might not be a effective way to study how fear affects cognition, it appears to be an excellent way to study how cognition affects fear.

FUNDING: Marsden Fund of the Royal Society of New Zealand.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.10 Stress, 4.20 Attention, 4.23 Emotion/affect

POSTER SESSION I-078 | SUSTAINED CONSCIOUS VISUAL PERCEPTION: AN EEG STUDY

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The search for neural correlates of conscious visual perception is mainly based on experiments with very short stimulus presentations. These experiments do not allow to separate transient from sustained neural mechanisms underlying conscious perception. Previous research on visual perception revealed an early event-related potential (ERP), the visual awareness negativity (VAN), associated with stimulus awareness. However, due to the use of brief stimulus presentations in previous studies, it remains unclear whether awareness-related negativities represent a transient onset-related response or correspond to the duration of a conscious percept. In this talk, we present a novel stimulation design that aims to tackle this challenge. Our design, to our knowledge, for the first time, allows for prolonged stimulus presentations in both an aware and an unaware condition. In this EEG study, participants (n=62) performed a visual distractor task with line stimuli presented in the background, which sometimes obtained an abstract human face for either 500 or 1000 ms. Half of the participants were informed of the presence of the face, resulting in faces being perceived by the informed but not by the uninformed participants. Comparing ERPs between the informed and uninformed group revealed an enhanced negativity over occipitotemporal electrodes that persisted for the entire duration of stimulus presentation. Our results suggest that sustained visual awareness negativities (SVAN) are associated with the duration of stimulus presentation.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception

POSTER SESSION I-079 | MATURING OUT: A DUAL PROCESS INVESTIGATION OF DRINKING ABATEMENT IN EMERGING ADULTHOOD

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Purpose: Maturing out of problematic alcohol involvement in early adulthood is normative in the developmental course of alcohol use. Yet, a proportion of individuals fail to mature out of heavy drinking, leading to persistent problematic alcohol involvement (PAI). Dual process models posit that strong appetitive motivation for alcohol (AMA), coupled with weak cognitive control (CC), might prevent the normative "maturing out" of PAI. Here, we tested this idea by examining ERP correlates of AMA and CC in relation to changes in PAI. Methods: Participants (170 drinkers [59% women], aged 18-20 at enrollment, recruited from a large midwestern university and surrounding community) reported on their alcohol use and alcohol-related consequences and underwent ERP assessment at two time points separated by ~10 months. Analyses focused on Wave 1 P3 amplitude elicited by alcohol images (AlcP3)—an index of AMA—and N450 amplitude elicited during alcohol avoidance trials—and index of CC in an alcohol-specific context—as predictors of change in PAI from Wave 1 to Wave 2. Preliminary Results: Multiple regression analysis indicated that neither AlcP3 ($\beta = -.07$, $p = .32$), alcohol avoidance N450 ($\beta = .01$, $p = .97$), nor their interaction ($\beta = -.01$, $p = .26$) predicted maturing out of PAI. Conclusion: The present findings do not support the utility of a dual-process model framework for understanding maturing out of PAI in early adulthood. Future analyses will consider additional indices of these constructs as well as other theoretical frameworks that might better account for maturing out.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.2 Observational Study: Longitudinal, 4.19 Motivation, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION I-080 | INFLUENCES OF SPEED AND ACCURACY INSTRUCTIONS ON PERFORMANCE MONITORING: RESULTS FROM OSCILLATORY BRAIN RESPONSES

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The ability to detect errors and to adequately adjust the behavior accordingly to avoid future errors is fundamental to successful adaptations in changing and complex environments. Errors lead to a burst in theta power in EEG oscillations. Theta has been proposed to represent a mechanism to communicate the need for cognitive control across prefrontal brain regions. Error processing and theta but also delta power have been repeatedly shown to be increased in OCD patients. In addition, OCD patients show reduced flexible adjustments in error-monitoring under speed and accuracy instructions. However, it remains unclear to what extent these changes are associated with altered frequency dynamics. Therefore, the aim of this project is to re-analyze EEG data collected in a previous study (Riesel et al., 2019, *Journal of Abnormal Psychology, 128 (7)*) on error-monitoring and instruction dependent adaptions in OCD patients. Data from 28 healthy participants and 28 patients with OCD was analyzed applying a time-frequency analysis and a coupling analysis using magnitude-squared coherence. Results indicate an overall increase in theta and delta power as well as a tendency towards less theta power differences between speed and accuracy conditions in OCD patients compared to healthy controls following errors. Coherency results give reason to assume that for OCD patients in prefrontal cortex frequency coupling is increased and less flexible. All this provides support for the hypothesis that cognitive control is altered and flexibility of performance-monitoring is reduced in OCD patients.
FUNDING: Data collection was funded by DFG-Grant KA815/7-1. PhD Project/ current study is funded by DFG-Grant RI2853/2-2.
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.19 Motivation, 4.25 Cognitive control/ executive functions

POSTER SESSION I-081 | THE AUTHENTIC SELF FACILITATES COGNITIVE CONTROL

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Cognitive control underlies self-regulation. However, the nature of this relationship may depend on which part of the self is salient. We tested competing hypotheses about how authenticity (i.e., the perception of being one's true self) shapes cognitive control relative to another highly salient self-representation, the presented

self. A self-enhancement view suggests that negative information should undermine cognitive control when the authentic self is salient. By contrast, self-accuracy and self-consistency views suggest an opposite pattern, because information is processed in an unbiased manner. Participants ($N = 147$) completed a self-relevant emotional Stroop task while EEG was recorded. We showed participants positive or negative statements in coloured (blue, green, or red) text that referenced the *authentic self* (e.g., "I am genuinely honest"), *presented self* (e.g., I am outwardly honest), or control (e.g., "It is clearly honest"). On control and presented self trials, colour naming latency was slower to negative (vs. positive) statements. On authentic self trials, colour naming latency was faster to negative (vs. positive) statements consistent with self-accuracy and self-consistency views of authenticity. Event-related potentials indicated that at both early (e.g., P100) and later (e.g., P300) stages, attentional processing did not differ for positive and negative statements on trials that primed the authentic self. Behaviourally and neurally, these results suggest that authenticity strengthens the regulatory capacity of the self.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.19 Motivation, 4.24 Social factors, 4.25 Cognitive control/executive functions

POSTER SESSION I-082 | FUNCTIONAL CONNECTIVITY OF THE ANTERIOR INSULA DURING ANTICIPATION OF INSTRUCTIVE AND FEEDBACK STIMULI WITH REWARD INFORMATION

Yoshimi Ohgami[1], Yasunori Kotani[1], Hajime Kageyama[2,3], Nobukiyo Yoshida[4], Hiroyuki Akai[2], Akira Kunimatsu[5], Shigeru Kiryu[5], Yusuke Inoue[6]
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The Stimulus-Preceding Negativity (SPN) is a brain potential associated with anticipatory attention, originating from the anterior insula (aINS). SPN is observed before feedback stimuli that assess response accuracy but not before instructional stimuli, likely due to their lower salience. In our fMRI study, we explored the functional connectivity of the aINS by manipulating the saliency (reward or no-reward) and type (instruction or feedback) of anticipated stimuli. Participants (N=25) engaged in a time estimation task in four conditions: instruction/reward (Inst/RW), instruction/no-reward (Inst/NR), feedback/reward (FB/RW), and feedback/no-reward (FB/NR). We conducted generalized psychophysiological interaction (gPPI) analyses with the left and right aINS as seed regions. Our results indicated significant connectivity from the left aINS to the posterior cingulate cortex, a primary part of the default mode network (DMN), in the Inst/NR. In the FB/RW, the right aINS linked significantly to the anterior cingulate cortex (ACC). Additionally, the left aINS in the FB/RW demonstrated stronger connectivity to the frontal pole, which is associated with long-term rewards, compared to the FB/NR. These findings suggest that the aINS maintains connections with the DMN during instructional phases, while connections to the ACC and frontal pole become more pronounced during feedback phases. This variation in aINS connectivity supports the idea that the lesser salience of instructional stimuli, compared to feedback stimuli, could explain the absence of SPN before instructional cues.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.20 Attention

POSTER SESSION I-083 | RESPIRATORY SINUS ARRHYTHMIA AND HIERARCHICAL DIMENSIONS OF PSYCHOPATHOLOGY

Clare Beatty, Elise Adams, Sarah Barkley, Brady Nelson
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Reduced respiratory sinus arrhythmia (RSA), an index of vagal/parasympathetic nervous system functioning, has been linked to multiple forms of psychopathology. It is possible that RSA is actually associated with higher-order dimensions of psychopathology. In a sample of 222 18-35 year-olds, the present study examined RSA and modeled its relationships with multiple hierarchical dimensions of psychopathology. Hierarchical mediation modeling was used to estimate direct effects of RSA on each hierarchical dimension (e.g., spectra, p-factor), as well as indirect effects via the higher-order p-factor. Results indicated that RSA was negatively associated with the p-factor, suggesting reduced RSA is linked to greater overall psychopathology liability. For most spectra (e.g., antagonism/disinhibition, negative emotionality, psychoticism), RSA showed non-significant direct effects and significant negative indirect effects via the p-factor. However, for

detachment, RSA had a significant negative direct effect, as well as a negative indirect effect via the p-factor. While reduced RSA relates more broadly to general psychopathology liability captured by the p-factor, it also shows a specific association with detachment above and beyond this general effect. Reduced RSA may index a transdiagnostic vulnerability factor particularly relevant to the development of detachment psychopathology.

FUNDING: Funding was provided by Stony Brook University.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/ Interviews, 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.23 Emotion/affect

POSTER SESSION I-084 | EEG MIGHT BE BETTER LEFT ALONE, BUT ERPS DEMAND ATTENTION: OPTIMIZING THE LPP PREPROCESSING PIPELINE

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How do different preprocessing pipelines impact ERP data quality and statistical power? ERPs usually undergo extended preprocessing pipelines to identify and discard noisy trials. However, it has been suggested that minimal EEG preprocessing may improve statistical power. We compared the effects of minimal preprocessing and extended preprocessing pipelines on the late positive potential (LPP), a widely used neuromarker of motivational relevance. We collected EEG from 158 adults as they viewed emotional (high and low arousing, pleasant and unpleasant) and neutral images (30 trials per condition). For each pipeline, we quantified the LPP for each picture condition. We calculated the standardized measurement error (SME), a measure of noise, across all trials, and the power to detect a significant difference ($p \leq 0.05$) between emotional and neutral conditions. To compute power, we simulated 10,000 experiments with 10 subjects per condition. Minimal preprocessing yielded the highest SME and the lowest power (approximately 10% for low arousal and approximately 40% for high arousal conditions vs. neutral), whereas the extended preprocessing pipeline reduced SME and increased statistical power (to over 60% for low arousal and over 90% for high arousal conditions vs. neutral). Further parameter optimization in the extended pipeline increased power for low arousal conditions to approximately 80%. These findings underscore the need for ERP preprocessing to eliminate noisy trials and enhance statistical power for the LPP.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.15 Computational / Simulation, 3.5 Secondary Analysis, 4.23 Emotion/affect, 4.26 Other

POSTER SESSION I-085 | CAN WE ELICIT AN ARTIFICIAL OTHER-"RACE"-EFFECT? A PCA-BASED BEHAVIORAL AND ERP STUDY

Tim Jesgarzewsky[1], Jürgen Kaufmann[1], Clara Breier[2], Aline Schönenberg[3], Mila Mileva[4], Mike Burton[5], Stefan Schweinberger[6]
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Humans are worse at recognizing faces of other racialized (OR) groups vs. faces of their own group. It remains debated if this other-"race"-effect (ORE) is mainly driven by socio-cognitive and motivational factors or by norm-deviating facial characteristics associated with OR faces. We suggest that a specific "culture-free" manipulation of facial characteristics may suffice to simulate an ORE. We derived norm-based facial characteristics for a set of White female (Veridical) faces using PCAs of shape and texture information. Based on these PCAs, we "shifted" a set of Veridical faces in multidimensional space unidirectionally, resulting in a same-"race" (SR) face that simulates homogeneous deviation properties of OR faces from an SR norm in face space. Subjects experienced with White faces ($N = 22$) performed an old/new learning and recognition task for female Shifted SR, Veridical SR, and Asian OR faces while we recorded accuracies, RTs, and EEG. As predicted, subjects showed higher recognition performance, faster responses, and a more conservative response bias to Veridical compared to Shifted SR and Asian OR faces. Surprisingly, Shifted SR faces differed significantly from Veridical SR and OR faces in early ERPs related to attention (smaller P100) and processing of norm-deviations (larger P200). OR

faces elicited larger N250 amplitudes (Face Identity) than Shifted SR and Veridical SR faces. Discrepancies between behavioral and neural results raise questions about how different perceptually distinctive faces are integrated into norm-based multidimensional face space.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.6 Racism/prejudice, 4.12 Sensation/perception/interoception, 4.18 Memory

POSTER SESSION I-086 | THE RELATIONSHIP BETWEEN PRO-ENVIRONMENTAL ATTITUDES AND GRAY MATTER MORPHOLOGY

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The planet is facing a wide range of environmental challenges including climate change, pollution, and resource depletion. Increased attention to these environmental challenges has led to recent efforts to understand the neural correlates of pro-environmental behavior and sustainable decision making. For example, structural variability in prefrontal cortex subregions has been linked to pro-environmental behavior. Yet, there is limited research exploring the neural correlates of pro-environmental concerns and attitudes. The aim of this study was to explore the relationship between gray matter morphology and pro-environmental attitudes. 42 participants completed the New Ecological Paradigm questionnaire to measure general environmental attitudes and underwent structural MRI scans. MRIs were segmented into different tissues classes. Gray matter volumes were calculated for each region based on the neuromorphometrics atlas. A regression analysis was performed on gray matter volumes using pro-environmental attitude scores as the predictor variable as well as age, climate anxiety, and intracranial volume as nuisance covariates. The results identified a number of brain regions indicating an association between gray matter volume and pro-environmental attitudes. Specific regions include the ventral medial prefrontal cortex, lateral prefrontal cortex, and posterior regions such as the posterior cingulate gyrus and precuneus. These findings suggest that individual differences in pro-environmental attitudes are represented differently in the structural organization of the brain.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.1 Observational Study: Cross-Sectional, 4.11 Personality, 4.26 Other

POSTER SESSION I-087 | THE RELIABILITY OF THE ERN UNDER VARIABLE COGNITIVE CONTROL CONDITIONS

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Obtaining "good" internal consistency of the error-related negativity (ERN) is a complex issue. Olvet and Hajcak (2009) first demonstrated that reliability can be achieved with 6 or more error trials. However, it is also sensitive to task features (Clayson, 2020). To date, analyses have been limited to canonical paradigms (e.g., arrowhead flankers), and are seldom measured within the same study. We examined the psychometrics of the ERN in a university sample ($71 < n < 124$, 44.2 to 53.9% male). Participants completed a mixed-task EEG procedure. Cognitive control conditions included a letter-based inhibitory control task, reactive control trials from the AX Continuous Performance task, and response conflict trials to Navon letters. Split-half reliability and an SME-derived estimate (Luck et al., 2021) were calculated at Fz for each task condition. Eligible participants committed 12 or more errors on a given task. Internal consistencies were uniformly acceptable to excellent under an odd-even scoring approach (Spearman-Brown *r*s: 0.79 – 0.95). However, estimates of ERN reliability for reactive control suggested opposing interpretations (Spearman-Brown r = .84, SME Reliability = .68). At the participant level, more error trials were associated with less noisy aSME values. This is an important consideration, as participants averaged the least number of errors to reactive control trials. However, task type did *not* statistically moderate the strength of this association ($\Delta R^2 = 0.015$, $F(2,198) = 1.94$, $p = .147$). These results should guide decision-making around task development.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.5 Secondary Analysis, 4.22 Learning/conditioning, 4.25 Cognitive control/executive functions, 4.26 Other

POSTER SESSION I-088 | DEVELOPMENT OF FACE-SPECIFIC ERP PROCESSING IN INFANTS FROM 3 TO 12 MONTHS OF AGE

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The ERP face inversion effect is considered the marker for expert perceptual processing The face inversion effect occurs in infants at 12 months of age on the N290 ERP component, but this has not been studied in infants at younger ages. The present study investigated the effect of face inversion on face-selective ERP components and their neural source in infants from 3 to 12 months of age. Infants were tested at ages 3, 4.5, 6, 7.5, 9 or 12 months of age. Upright and inverted faces and houses were presented while EEG was recorded. The ERP to the stimulus onset was quantified for P1, N290, and P400 ERP components. Cortical source analysis estimated the cortical areas generating the ERPs. The N290 in response to upright or inverted faces increased in amplitude from 3 to 12 months. The N290 in response to inverted faces was smaller at 3 mo. than to upright faces, but by 12 months the N290 to inverted faces was slightly larger than the N290 to upright faces. The source activity of the N290 in the right middle fusiform gyrus showed a linear increase across age for upright faces, but not inverted faces. The changes over age in the ERP responses to inverted faces was different than the changes to upright faces, whereas the changes in the ERP to upright and inverted houses did not differ. These results do not unambiguously support the ERP to inverted faces as an indicator of expert face perceptual processing in infants. However, they show that infants distinguish between upright and inverted faces and that source generators by 12 months are similar to adult generators.

FUNDING: NICHD, NIH, R01 HD18942 NICHD, NIH, K99 HD102566.

Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.2 Development, 4.12 Sensation/perception/interoception, 4.20 Attention

POSTER SESSION I-089 | COMPARISON OF INTEROCEPTIVE ACCURACY ACROSS ORGAN DOMAINS: A PILOT STUDY

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Interoception – the perception of bodily signals - is thought to regulate a wide range of psychological and somatic functions. Interoceptive accuracy, the objective performance in detecting internal bodily sensations, is often regarded as a unitary construct, assuming that humans have a general ability to perceive signals originating from different organ domains. Yet, recent studies provide contradictory evidence regarding the comparability of interoceptive accuracy, prompting reconsideration of interoception as a general ability. Moreover, tasks used to compare interoceptive accuracy across organ domains often present differences in terms of stimulation characteristics, intensity levels and response requirements, further complicating comparisons. Therefore, the aim of this pilot study was to develop a new set of largely comparable tasks across the respiratory, esophageal and cardiac domain in order to assess the generalizability versus organ specificity of interoceptive accuracy. Healthy participants (n=33) took part in a behavioral experiment with inspiratory resistive loads, esophageal balloon distensions and a cardiovascular arousal task. In each task, participants were asked to provide intensity ratings to different levels of individually calibrated stimulus intensities. Accuracy scores, calculated as the change in ratings over change in objective intensity, showed that interoceptive accuracy was not correlated across organ domains (r values < .21, p values > .242). These findings suggest that interoceptive accuracy is a domain-specific ability.

FUNDING: This study was supported by a Lead Agency grant from the Research Foundation Flanders (FWO), Belgium (G0C1921N), by an FWO PhD fellowship (11PLQ24N), by an infrastructure grant from the FWO and the Research Fund KU Leuven (I011320N; AKUL/19/06) and a project grant of the Research Fund KU Leuven (C16/23/002).

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception

POSTER SESSION I-090 | LANGUAGE-SPECIFIC ERP CHARACTERISTICS IN BILINGUALS

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Correct switching of native and non-native languages is one of the major stumbling blocks of communication. The current study aimed to identify the patterns of ERP for native and non-native/foreign words in bilinguals. 54 healthy volunteers, aged 17 to 32 years were divided into two equal groups according to their mother tongue (Russian and Ukrainian). They listened to a set of 2-3 syllable emotion-laden words in Russian and Ukrainian (100 words each). Native Russian speakers demonstrated a higher P100 in the right frontal zone in response to the

stimuli in Ukrainian compared to Ukrainian speakers. The amplitude of P200 was significantly higher in the left anterior frontal, right frontal, and left frontal temporal areas for the native Ukrainian group. The stimuli in the Russian language in the group of native Ukrainian speakers elicited greater amplitude of the N200 component in the right visual associative zone and the right angular gyrus. In native Russian speakers listening to the stimuli in Russian did not elicit similar changes in N200. We did not reveal any significant differences in P300 amplitude in bilinguals. The higher amplitude of the N400 component in Ukrainian speakers while listening to Russian words indicates the more pronounced activation of lexico-semantic memory in the last. We assume that bilinguals who acquire both languages at an early age, regardless of the primacy of one of the languages, use the same brain areas for associative perception and understanding of verbal information.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.11 Personality, 4.13 Speech/language, 4.23 Emotion/affect

POSTER SESSION I-091 | CAUSAL RELATIONSHIP BETWEEN FRONTAL BETA OSCILLATION PHASE AND COGNITIVE FUNCTIONING

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Neural oscillations at different frequencies have been related to a variety of cognitive functions. For instance, frontal beta oscillations are associated with performance on several cognitive tasks, including reinforcement learning, response inhibition, and working memory. Currently, it is unknown how such different functions are encoded within the same neural oscillation. Interestingly, for other oscillations in different brain regions, it has been demonstrated that the oscillation phase reflects functional properties. Therefore, we hypothesized that different phases of the frontal beta oscillation reflect different cognitive processes. To test this idea, we applied repetitive transcranial magnetic stimulation (rTMS) to the dorsolateral prefrontal cortex, with pulses either synchronized to the peak or the trough of the individual theta oscillation. This was compared to a condition in which unsynchronized rTMS was delivered. We were able to couple the pulses to the oscillation phases using a closed-loop system, which reads out and analyzes electroencephalogram (EEG) data in real-time. Before, during, and after rTMS participants performed a battery of cognitive tasks: A reversal learning task, an N-back task, and a go/no-go task. Results (N = 66) show significant improvement in go/nogo performance with peak-rTMS, while trough-rTMS improved N-back performance. These results suggest that different cognitive functions are governed by different phases of the same neural oscillation, providing a novel insight into how frontal cortex rhythms are causally related to behavior.

FUNDING: This work was supported by the Brain and Behavior Research Foundation - Young Investigator grant.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.25 Cognitive control/ executive functions

POSTER SESSION I-092 | THE REWARD POSITIVITY AND PATHOLOGICAL PERSONALITY DIMENSIONS IN ADOLESCENT GIRLS

Rachel Ferry[1], Kelly Gair[2], Brady Nelson[1]
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The reward positivity (RewP) is an event-related component that indexes reinforcement learning and reward sensitivity. A blunted reward RewP has been associated with depression. However, most studies examining the RewP and depression have focused on the broader syndrome or total symptoms. Depression is a heterogeneous construct that is highly comorbid with other forms of psychopathology (e.g., anxiety), and it is unclear whether the RewP is associated with particular aspects of depression (e.g., negative affect vs. anhedonia). Depression has been linked with several pathological personality dimensions (e.g., negative emotionality, detachment), which might improve the ability to understand the relationship between the RewP and psychopathology. In a sample of 156 15–24 year-old girls, the present study examined the RewP elicited by the doors guessing task and the self-report Comprehensive Assessment of Traits relevant to Personality Disorder. Results indicated that a more blunted RewP was associated with greater emotional detachment. In contrast, a larger RewP was associated with greater negative emotionality. The present study suggests that the RewP demonstrates distinct and opposite relationships with two core features of depression and related psychopathology. The results also highlight the importance of examining purported neurobiological mechanisms in relation to empirically-derived psychopathology dimensions

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Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.11 Personality, 4.23 Emotion/affect

POSTER SESSION I-093 | EARLY PERFORMANCE MONITORING, AS REFLECTED BY ERROR-RELATED HUMAN BRAIN RESPONSES, INVOLVES AN EVALUATION OF ERROR INEVITABILITY

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In everyday life, we usually correctly differentiate between errors that are inevitable and therefore less significant, and those that could be prevented and are thus more important. However, the question arises whether the error-related negativity (ERN), which is an electrophysiological marker of subjective evaluation of error significance, also differentiates between these failures. We hypothesized that the more the control over a motor action is limited by situational constraints, the more reduced the ERN amplitude and the longer the ERN latency should be. In addition, we focused on post-error slowing, which is a post-error behavioral adjustment. We predicted that the more inevitable the error, the smaller the post-error slowing should be. To test these hypotheses, we used the stop signal task, which can be employed to elicit a variety of errors that are avoidable to a greater or lesser extent. As the index of error inevitability, we used the stop-response interval, i.e. the time between the presentation of the stop signal and the execution of the response. The analysis was performed on 55 participants (38 females, mean age 21.5 years) using linear mixed-effects models. Consistent with our hypotheses, we found that the more inevitable the error, the more reduced and delayed the ERN. Moreover, more inevitable errors led to smaller adjustments in subsequent behavior. These results indicate that the elementary basis for distinguishing between avoidable and unavoidable errors may occur in the brain several dozen milliseconds after error commission.

FUNDING: This work was supported by a Sonata Bis grant (2020/38/E/HS6/00490) from the National Science Centre of Poland.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.25 Cognitive control/executive functions

POSTER SESSION I-094 | RESTING STATE EEG CORRELATES OF SMARTPHONE SENTIMENT EXPRESSION AMONG ADOLESCENTS

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Although "what you say reflects how you feel" appears self-evident, past research has yielded mixed results on whether the positive/negative sentiment of one's language expressed on smartphones relates to mood. To explore the validity of smartphone sentiment expression, the present study examined its association with interview-based depression symptoms and resting state EEG power in 148 adolescents (74.3% female, M_{age}=16.54) with a wide range of depression severity (67.6% with lifetime major depression). Over a 90-day period, ~1.4 million messages were passively collected from the smartphone, with each message classified as positive, negative, or neutral using a transformer-based language model. Multilevel models showed that greater daily proportion of negative messages was associated with (a) greater depression symptoms at baseline (b=0.093, p=.010) and 6-month follow-up (b=0.086, p=.029) and (b) lower delta and theta power across regions (all p_{FDR}<.033). Greater daily proportion of positive messages was only associated with greater right > left frontal alpha asymmetry (FAA; b=0.10, p=.019). Given resting state delta and theta power's role in inhibitory control, the associations with negative sentiment may indicate lower ability to down-regulate negative emotions. Additionally, the result on positive sentiment is consistent with the literature on right-sided FAA underlying approach behaviors. Overall, findings highlight the biomarkers of smartphone sentiment expression and demonstrate the validity of language-based tools to track socio-affective dynamics in daily life.

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Topics: 1.5 Human Studies: Clinical Samples- Children / Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.19 Other, 3.2 Observational Study: Longitudinal, 4.7 Psychopathology, 4.13 Speech/language, 4.23 Emotion/affect

POSTER SESSION I-095 | THE LONGITUDINAL EFFECTS OF HARSH PARENTING ON MULTICOMPONENT, BIOBEHAVIORAL SELF REGULATION IN CHILDREN

Sohee Park, Erika Lunkenheimer
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Children's self-regulation is a critical transdiagnostic factor for developmental psychopathology. Although links between harsh parenting and children's compromised self-regulation are well established, few studies have explored the longitudinal and differential impacts of harsh parenting on multiple components of self-regulation. This study examined how change in harsh parenting across early childhood predicted various biobehavioral indicators of self-regulation. Harsh parenting and children's self-regulation were assessed in 149 mother-child dyads at ages 2.5, 3, and 4 via questionnaires and observed laboratory tasks. Self-regulation components included children's observed negative behavior and effortful control, mother-reported externalizing behaviors and emotion dysregulation, and respiratory sinus arrhythmia (RSA) reactivity and recovery. Harsh parenting was stable from age 2.5 to 4, but there were significant individual differences in slopes. Higher initial levels were associated with decreasing harshness over time. Harsh parenting intercept predicted children's higher negative behaviors, externalizing behaviors, and emotion dysregulation, but change in harsh parenting over time did not predict self-regulation. Self-regulation components were interrelated: RSA reactivity was correlated with observed negative behavior during dyadic tasks, and RSA recovery was correlated with reported externalizing behavior. Overall, findings suggest harsh parenting may have more direct impacts on children's later emotional and behavioral than biological subcomponents of self-regulation.

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Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.4 Respiratory, 3.2 Observational Study: Longitudinal, 4.2 Development, 4.10 Stress, 4.23 Emotion/affect

POSTER SESSION I-096 | ELUCIDATING NEUROCOGNITIVE MECHANISMS UNDERLYING DEPRESSION-RELATED DIFFERENCES IN EXECUTIVE CONTROL UNDER STRESS

Ben Swanson, Matt Judah, Grant Shields
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Assessing executive control under acute stress is thought to be a more robust predictor of psychopathology over assessing executive control in the absence of stress. Executive control is dependent on both executive-related affective (i.e., motivation) and executive-related control (i.e., the implementation of control) processes. However, how executive-related affective and executive-related control processes contribute to depression related deficits in executive control under stress are not well understood. The current study addresses this gap through examining neural processes associated with both affective-related (e.g., striatum, amygdala) and control-related (DLPFC, dACC) regions supporting executive control performance under stress. A community sample of participants (N = 56) with a history of psychopathology (N = 27), and no history of psychopathology (N = 29) completed a stress induction followed by a modified Stroop task administered under fMRI. All participants with a history of psychopathology had a DSM diagnosis of major depressive disorder, while some also had DSM diagnoses of generalized anxiety disorder, social anxiety disorder, or both. At the neural level, preliminary analyses indicated a depression diagnosis was associated with altered BOLD signal during the Stroop task in executive-related affective regions (amygdala and striatum), but not executive-related control regions (DLPFC and dACC). Together, the results suggest that the relation between depressive symptoms and impairments in executive control under stress may be underpinned by affective processes.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION I-097 | A PSYCHONEUROMETRIC APPROACH TO INDEXING REWARD RESPONSIVENESS: THE CHALLENGES OF CREATING MULTIMETHOD COMPOSITES

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The psychoneurometric approach integrates data across methods into composites to index latent traits relevant to psychopathology like reward responsiveness (RR). RR involves anticipating and responding to rewards. RR is clinically relevant for mood disorders, as anhedonia is a key symptom of MDD. The current study aimed to develop a psychoneurometric composite of RR, which could be used as a predictor of depressive symptoms. 110 adults (M=34.59 yrs., 63.64% female) completed a guessing task while undergoing EEG and questionnaires of mood and RR. EEG

indices included the Reward Positivity (RewP) and gain-related P300 amplitudes. Bivariate correlations were used to assess the relationships between total MDD symptoms, two measures of RR (Behavioral Activation System – Reward Responsiveness; Sensitivity to Punishment and Sensitivity to Reward – Reward), RewP, and P300. Only RewP/P300 (r=.45) and SPSRQ/BAS (r=.21) were significantly related (all others r<.20). An Exploratory Factor Analysis (EFA) was used to determine whether the RR and EEG measures could be reduced into a sole factor. The EFA revealed one factor, but a parallel analysis of simulated data rejected all factors. Thus, a sole RR factor could not be extracted. Results highlight key issues with the psychoneurometric approach. The included measures are regularly used to index RR, but they seem to track largely unrelated facets of RR. Future work should aim to refine the RR operationalization and develop measures of specific RR aspects which could be incorporated into data reduction techniques and predict MDD symptoms.

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Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.11 Personality, 4.23 Emotion/affect

POSTER SESSION I-098 | INVESTIGATING ETHNIC DIFFERENCES IN NITRIC OXIDE LEVELS AND THEIR POTENTIAL IMPACT ON CARDIOVASCULAR HEALTH DISPARITIES

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African Americans (AAs) may have a less effective baroreflex—a blood pressure (BP) adjustment system—compared to European Americans (EAs), potentially due to lower nitric oxide (NO) levels. NO regulates the cardiovascular system and influences the baroreflex. No studies have explored resting NO level differences between AAs and EAs, which could explain the baroreflex disparity and higher cardiovascular risk in AAs. Our lab found that AAs had higher BP, total peripheral resistance (TPR), and heart rate variability (HRV) at rest. High BP/TPR usually indicates blood vessel constriction, while high HRV is cardioprotective, a contradiction called the Cardiovascular Conundrum. Lower NO levels in AAs might explain this, as NO relaxes blood vessels and regulates BP. We investigated ethnic differences in NO levels among 399 participants (154 AAs, mean age=23.18, SD=2.87) during a 5-minute resting period with BP and ECG monitoring. EAs had significantly higher NO levels than AAs (t(304)=1.683, p=0.047). AAs had higher SBP (t(389.692)=-4.536, p<0.001), DBP (t(397)=-5.922, p<0.001), TPR (t(393)=-2.636, p=0.009), TPR-I (t(393)=-3.725, p<0.001), and MAP (t(397)=-5.929, p<0.001), but no significant difference in HRV (p=0.535). NO deficiencies may contribute to cardiovascular health disparities in AAs, but further research is needed to understand the complex physiological and environmental factors involved.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.5 Hemodynamic (BP), 2.10 Blood markers, 3.1 Observational Study: Cross-Sectional, 4.5 Population-specific health, 4.10 Stress, 4.12 Sensation/perception/interoception

POSTER SESSION I-099 | FLUCTUATIONS IN AUTONOMIC NERVOUS ACTIVITY AND THOUGHT TRANSITIONS MEDIATED BY INTEROCEPTIVE ACCURACY

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The content of our thoughts and the intensity of concentration vary unconsciously. In healthy adults and patients with major depressive and anxiety disorders, this variability in thought state is associated with fluctuations in autonomic nervous activity. However, it is unclear how the variability of these two factors corresponds. In this study, we calculated the fluctuations in thought and pulse rate using time series data of them and examined the influence of the interoceptive accuracy on the relationship between these two indices. Participants (N=100, 70 women) completed the heartbeat counting task (HCT) and the vigilance task (VT). We assessed the participants' interoceptive accuracy using the HCT. During the VT, thought probes were presented periodically, and participants reported the content and level of contemplation of their thoughts just

before. Using a Hidden Markov Model, we estimated four thought states based on the time series data of thought content and contemplation. The results showed that participants with higher parasympathetic activity during the VT and interoceptive accuracy were more likely to transit to different thought states between the trials. However, when sympathetic activity was elevated during highly contemplative task-irrelevant thoughts, participants with higher interoceptive accuracy were more likely to continue in the same state in the following trial. These results indicate that the balance of autonomic nervous activities is related to the variability of thought states and that the interaction is mediated by interoceptive accuracy.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.26 Other

POSTER SESSION I-100 | INTERNALIZING SYMPTOM SEVERITY AND FUNCTIONAL IMPAIRMENT: OPPOSING EFFECTS ON EMOTIONAL PICTURE PROCESSING

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The internalizing disorders may lie along a spectrum, ranging from a single disorder to more severe symptoms/comorbidities and increasing functional impairment. Across this continuum, negative emotionality has been identified as a possible transdiagnostic mechanism. Increased attention to negative stimuli might be expected as symptoms increase across the spectrum. Nonetheless, functional impairment, which is not synonymous with symptom severity, might be associated with blunted reactivity to negative stimuli (e.g., to conserve resources during times of chronic adversity or due to avoidance). Knowledge of how negative stimulus processing varies uniquely with internalizing symptoms versus functioning may contribute to a more precise understanding of affective mechanisms in internalizing psychopathology. Here, participants ($N = 88$) from a mixed, internalizing sample viewed negative, positive, and neutral pictures while EEG was recorded. We examined internalizing symptoms and functional impairment as simultaneous predictors of the late positive potential (LPP). Results showed that higher internalizing symptoms were associated with larger negative > neutral LPPs, $\beta = .382$, $p = .019$, and that increased functional impairment was associated with smaller negative > neutral LPPs, $\beta = -.343$, $p = .034$. Associations were not observed for positive pictures. Therefore, internalizing symptoms and functional impairment may have opposing effects on the electrocortical processing of negative stimuli, with implications for treatments aimed at modulating negative emotionality.

FUNDING: This work was supported by NIMH R01MH125083 (MacNamara).

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.23 Emotion/affect

POSTER SESSION I-101 | TASK-RELEVANT WORRY AND THE ERROR-RELATED NEGATIVITY

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An enhanced error-related negativity (ERN) has been associated with anxiety phenomenology and trait worry. However, there is little research investigating the impact of state worry on the ERN. Further, existing models of the ERN make opposing predictions regarding associations between the ERN and worry. In one previous study, a state worry induction resulted in an attenuated ERN. However, it is unclear whether the ERN shows a similar pattern to task-relevant worry induction. This study included 302 young adults (M age=20.0, SD age=2.15, 57.6% female) who completed a flanker task while electroencephalography was recorded during three different within-subject conditions: pre-worry, worry, and post-worry. Before the worry condition, electrodes were placed on the participants' non-dominant wrist and they were told that they might receive an electric shock after incorrect responses. After the worry condition, the sensors were removed from participants' wrist. Participants also completed self-report measures of anxiety and state worry after each condition. Self-report anxiety and worry were enhanced following the worry induction. The ERN was enhanced in the worry condition compared to post-worry, but not compared to pre-worry, but only in females. The present study suggests that the focus of worry (e.g., task-relevant vs. task-irrelevant) is an important characteristic that might impact whether it enhances or attenuates error-related brain activity.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.3 Sex differences, 4.23 Emotion/affect

POSTER SESSION I-102 | THE INFLUENCE OF OTHERS' PERSPECTIVE ON INFANTS' OBJECT MEMORY: A PUPILLOMETRY STUDY

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Infants can predict how an agent with a false belief will act, however, and in light of mixed empirical evidence, the underlying mechanism remain a matter of debate. The altercentric theory posits that infants' memory may be biased by what others' have seen, allowing them to predict how others will act. Here, we tested whether infants' object memory is modulated by an agent's belief. We showed infants aged 9 to 18 months (younger age group: *N*=97, older age group: *N*=79) videos in which an agent observed an object moving to one of two locations. Subsequently, she witnessed (True Belief) or did not witness (False Belief) the object's change in location. The object then reappeared from the reality congruent or incongruent location. In line with the altercentric theory, younger infants expected the object in its actual location, as indicated by greater pupil dilation to reality congruent outcomes (BF_{10} between 3-44.2). In contrast, older infants remembered the correct location and showed greater pupil dilation to incongruent outcomes (BF_{10} between 3-291.2). However, infants' memory bias did not predict correct expectations of the agent's actions. These findings support the notion that infants show altercentric memory errors early in life, which vanish in the second year of life as they become more capable of acting on the world and their own perspective gains importance over that of others.

Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.6 Eye Tracking (blink, movement, size), 3.3 Lab Based Experiment, 4.2 Development, 4.18 Memory, 4.24 Social factors

POSTER SESSION I-103 | MAGNOCELULLAR CONTRIBUTIONS TO FEAR LEARNING IN FACE PROCESSING

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Numerous studies have consistently demonstrated fast attentional biases towards fearful faces. This phenomenon is believed to arise from the rapid extraction of fear relevance from low-spatial frequency (LSF) visual information originating from subcortical magnocellular signals. Yet, it remains unclear whether this mechanism operates comparably for newly acquired threat cues without well-established perceptual markers commonly associated with fearful faces, such as open mouths and wide eyes. Additionally, how such attentional shifts align with peripheral orienting responses, like the galvanic skin response (GSR), remains largely unexplored. In this study, we tested whether rapid attentional shifts towards fear-relevant faces prioritize LSF information of newly learned threat cues. Employing a differential fear conditioning paradigm, we paired two out of four neutral faces with a white noise burst. After this acquisition phase, faces were shown in either low-or high spatial frequencies. Central and peripheral electrophysiological signals of 32 healthy participants were recorded. Preliminary data show selective enhancement of the left-hemispheric P1 event-related potential in response to LSF conditioned faces. First GSR exploration shows a similar pattern as the P1. Data suggest that rudimentary magnocellular information facilitate rapid fear retrieval for newly learned threat cues. As the amygdala is assumed to be crucial for fear acquisition, these data might confirm fear-specific pathways from the amygdala to the visual cortex innervated by magnocellular signals.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.7 Skin responses, 3.3 Lab Based Experiment, 4.22 Learning/conditioning, 4.23 Emotion/affect

POSTER SESSION I-104 | A TEST OF THE ALLOSTATIC MODEL OF ADDICTION: EXAMINING STARTLE REACTIVITY BETWEEN FEMALES WITH CANNABIS USE DISORDER VS. NON-USER CONTROLS MATCHED TO PSYCHODIAGNOSTIC STATUS

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Cannabis Use Disorder (CUD) in the United States is expected to rise as a result of greater cannabis accessibility and low stigma associated with use. Allostatic models of addiction suggest that sensitization to stress-related neurobiological systems inform maintenance of harmful substance use. One such marker of stress reactivity is EMG-derived startle magnitude, which appears to be amplified during contexts of unpredictable threat in alcohol-using samples; however, findings in samples of cannabis users are mixed. Mixed results in CUD samples may be

due to substantial individual variance in CUD severity and psychopathological differences when compared to non-using controls. Therefore, the current study compared EMG-derived startle magnitude during a No-Shock, Predictable, and Unpredictable (NPU) shock task between women with severe CUD (n=26) and non-using controls (n=33) matched on psychodiagnostic status. Results revealed a significant condition*cue type*group interaction ($F[2,117]=4.47$, $p=.01$, $\eta p^2=.08$); further examination showed that the CUD group demonstrated greater startle blink potentiation during threat (i.e., predictable and unpredictable) conditions relative to controls during the countdown block of the task. Results suggest that severe CUD is associated with stress-related sensitivity during periods of generalized threat, as opposed to specific potentiation to unpredictable threat often found in alcohol-using samples. Treatment implications may include targeting sensitivity to future-oriented threat as a mechanism to reduce disordered cannabis use.

FUNDING: Funded by the Auburn University (AU) Intramural Grant Program (IGP).

Topics: 1.1 Human Studies: General Population - Adults, 2.2 Myography (EMG etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.5 Population-specific health, 4.7 Psychopathology, 4.10 Stress

POSTER SESSION I-105 | ATTENUATED N2 AMPLITUDE DURING FLANKER INTERFERENCE TASK IN OLDER INDIVIDUALS AT HIGH RISK FOR ALZHEIMER'S DISEASE

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Alzheimer's disease (AD) pathology begins 20-30 years prior to clinical symptom onset, and frontal control network dysfunction occurs in the preclinical course of the disease. Given its sensitivity to synaptic dysfunction, EEG may provide sensitive, non-invasive markers of AD risk and resilience. The objective of this project was to compare differences in event-related potentials (ERPs) between younger adults (YA; N=30) and older adults (OA) at high genetic risk for AD (positive family history and 1+ APOE ε4 alleles; N=30) versus low genetic risk (negative family history and non-ε4; N=21). Participants completed an Eriksen flanker interference task during collection of 64-channel EEG data. As expected, YA showed a significantly larger N2 ERP amplitude for incongruent compared to congruent trials across frontal midline electrodes (Fz, FCz, Cz), consistent with top-down attentional control of conflict resolution. In contrast, neither the high nor the low risk OA group displayed a significant difference in N2 amplitude between the incongruent and congruent conditions. However, the high risk OA demonstrated lower N2 amplitudes than the low risk OA for both the congruent and incongruent conditions, suggesting generalized disruption to top-down attentional control processes. This provides evidence of EEG differences in frontal control network functioning in older adults at high genetic risk for AD.

FUNDING: National Institute on Aging K23AG065382.

Topics: 1.3 Human Studies: General Population - Elderly/Geriatric, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.8 Genetics, 2.14 Computerized Tasks (e.g. neuropsychology), 3.1 Observational Study: Cross-Sectional, 4.1 Aging, 4.16 Neurological disorders / Neuropathology, 4.25 Cognitive control/executive functions

POSTER SESSION I-106 | STRUCTURAL CONNECTIVITY OF THE DEFAULT MODE NETWORK IN YOUNG PATIENTS WITH TYPE 1 DIABETES MELLITUS: A DIFFUSION TENSOR IMAGING STUDY

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Recent neuroimaging studies suggest that patients with type-1 diabetes (T1D) develop functional adaptations that prevent or limit the impact of the illness on cognitive processing. Thus, the prolonged action of these mechanisms may induce adaptive modifications on different neural substrates, such as the Default Mode Network (DMN). This study aimed to compare the structural connectivity patterns of the DMN between young patients with T1D and matched healthy subjects and evaluate the relationship between the strength of structural connections and clinical variables. Eighteen T1D patients, free from diabetes complications and with sustained clinical metabolic stability, and eighteen healthy subjects participated. A multisession temporal concatenated independent component analysis was used to identify the functional areas of DMN, which served as a region of interest for subsequent probabilistic tractography analysis. Graph theory metrics were obtained from individual structural connectivity matrices and compared between groups. Linear correlations

between the strength of structural connections and clinical variables were also evaluated. The results showed that the DMNs of T1D patients and controls were equivalent in general topology and strength of the structural connections. No relationship was detected between the strength of structural connections and illness evolution reflected by clinical indicators. These results suggest that the compensatory brain mechanisms are primarily functional in young, clinically well-controlled T1D patients without cognitive disturbances.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.26 Other (Structural connectivity in clinical populations (type 1 diabetes))

POSTER SESSION I-107 | TEMPORAL UNCERTAINTY MAY INFLUENCE MOTOR PREPARATION

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As the foreperiod (FP) increases in a blocked design, temporal uncertainty is enhanced and, consequently, reaction time (RT) is lengthened. A non-motoric locus for this effect is well established in the ERP literature, but a few studies have also implicated an influence on motoric processes. To assess this in more detail, we manipulated response complexity (RC) by requiring either 1- or 3-keypress responses (*simple* & *complex*, respectively) in separate blocks. FP was also manipulated across blocks (300 vs. 1200 ms in Exp. 1; 600 vs. 3000 ms in Exp. 2). The warning signal was a plus sign and the imperative in this choice RT task, the kanji character for *left* or *right*. P300 and stimulus-locked lateralized readiness potential (S-LRP) latencies indexed the duration of perceptual and other premotor processes; the interval from onset of the response-locked LRP until first keypress (LRP-R) indexed the duration of motoric processes. In Expt. 1, RT and the LRP-R interval were both lengthened in the long FP and complex conditions. P300 latency was prolonged in the long FP condition. Surprisingly, neither manipulation influenced the S-LRP interval. Results for Expt. 2 were similar in that RT increases were observed in both the long FP and complex conditions. No ERP effect reached significance except for an increase in LRP-R in the complex condition. Although an interaction of FP and RC was found in neither study, the FP main effect for LRP-R in Expt. 1 constitutes at least modest evidence for an effect of temporal uncertainty on motoric processes.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.12 Sensation/perception/interoception

POSTER SESSION I-108 | THE CEREBELLUM CONTRIBUTES TO REWARD PREDICTION ERROR PROCESSING – EVIDENCE FROM PATIENTS WITH CEREBELLAR STROKE

Dana Huvermann[1,2], Adam Berlijn[2,3], Andreas Thieme[1], Friedrich Erdlenbruch[1], Elke Wondzinski[4], Heike Sievers[4], Benedikt Frank[1], Sophia Göricke[1], Michael Gliem[5], Martin Köhrmann[1], Mario Siebler[4,5], Christian Bellebaum[2], Martina Minnerop[3,6,7], Dagmar Timmann[1], Jutta Peterburs[2,8]
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To survive and thrive in our ever-changing environment, we need to be able to predict the consequences of our actions by learning through trial and error from previous prediction errors (PEs). Recent rodent data suggest that the cerebellum – a region typically associated with processing sensory PEs in supervised error-based learning – also processes reward PEs in reinforcement learning (RPEs; i.e., learning from action outcomes). A proxy of action outcome processing in regions traditionally associated with RPE coding, such as striatum and anterior cingulate cortex, can be measured in the event-related potential (ERP), i.e., the feedback-related negativity (FRN). We tested the hypothesis that cerebellar output is necessary for this RPE coding in patients with chronic

cerebellar stroke who performed a probabilistic feedback learning task. Altered cerebellar output should result in changes in the FRN. RPE processing was reflected in the FRN in controls but not patients with cerebellar stroke. Overall learning success was not affected, although minor deficits in behavioural flexibility were present, possibly due to compensation by other brain areas within the reinforcement learning network. Findings show that RPE processing as measured in FRN depends on cerebellar output, providing evidence for an involvement of the cerebellum in RPE processing in humans and extending previous findings in rodents.

FUNDING: This work was funded by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG; project number: 437661157).

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.22 Learning/conditioning, 4.25 Cognitive control/executive functions

POSTER SESSION I-109 | DISENTANGLING THE EFFECT OF VALENCE AND MAGNITUDE ON FEEDBACK PROCESSING IN A FLANKER TASK

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Performance monitoring evaluates if consequences of an action fit with the intended goals and therefore interacts with cognitive control to enable adaptation of behavioral strategies according to changing contextual demands. Past work has shown the feedback-related negativity (FRN), an event-related potential component linked to prediction errors (PE), was higher for gain compared to loss avoidance contexts in trials with negative feedback. Yet, it is unclear whether this amplitude difference is driven by the context vs. magnitude of the incentive feedback. In the current study (n = 35; M_{age} = 24.7; 60% female), we developed a multi-incentive flanker task that manipulated both the valence context (gain vs. loss) and magnitude (low vs. high) of incentive feedback to disentangle their effects on the FRN and cognitive control. Participants were faster for gain than loss ($p < .01$, $\eta_p^2 = .17$). Within gain trials, RT was faster for high incentive magnitude ($p < .01$, $\eta_p^2 = .19$). Conversely, participants were more accurate in loss compared to gain trials ($p < .01$, $\eta_p^2 = .47$), and for low relative to high magnitude ($p < .01$, $\eta_p^2 = .25$). Consistent with prior work, the FRN for negative feedback was larger for gain than loss ($p < .01$, $\eta_p^2 = .20$), and feedback valence context also interacted with the PE magnitude ($p < .01$, $\eta_p^2 = .25$). Interestingly, the FRN parametrically scaled across all four conditions, with the smallest amplitude for high losses and the largest for high gain omission. The FRN therefore reflects a motivational value signal based on the expected value of the outcome.

FUNDING: This work was funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation), grant number SFB 940, project C6.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.19 Motivation, 4.25 Cognitive control/executive functions

POSTER SESSION I-110 | A NETWORK ANALYSIS OF AFFECTIVE AND MOTIVATIONAL INDIVIDUAL DIFFERENCES AND ERROR MONITORING

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Error monitoring is influenced by a complex interplay of motivational and affective factors. Numerous studies investigating these associations have yielded inconsistent results, which may be due to differences in symptoms studied and covariates accounted for. To address these inconsistencies and methodological gaps, we utilized network analysis.. We employed four regularized Gaussian Graphical Models on a non-clinical population (N=260, aged 18-40) to examine the conditional dependence between the amplitude of response-related potentials (error-related negativity, ERN; correct-related negativity, CRN) and 29 self-report measures related to anxiety, depression, obsessive thoughts, compulsive behavior, reward, and punishment, while adjusting for covariates: age, handedness, and latency of ERN and CRN. We then validated our results on an independent sample of 112 healthy participants. ERN amplitude was uniquely associated with rumination, avoidance of ambiguity, thought suppression, reward sensitivity, and guilt sensitivity. Upon covariate adjustment, ERN remained uniquely linked to rumination, avoidance of ambiguity, and reward sensitivity. ERN was not directly associated with trait anxiety. Trait anxiety and behavioral inhibition were the most central nodes in all networks. These results underscore the nuanced effects of affective and motivational traits on error processing. Additionally, they suggest that some apparent links between ERN amplitude and individual differences may be spurious and potentially result from shared common causes.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.15 Computational / Simulation, 3.1 Observational Study: Cross-Sectional, 4.19 Motivation, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION I-111 | IMPACT OF NON-INVASIVE VAGUS STIMULATION ON AUTONOMOUS BALANCE

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The mechanisms involved in positive outcomes of non-invasive vagus nerve stimulation (VNS) for mental and stress-related disorders are not fully understood. We aimed to assess the influence of a novel VNS stimulation protocol on mental and physical health and Heart Rate Variability (HRV) metrics in the workplace environment. 62 healthy volunteers 18-49 years old were recruited for the study. Vagus nerve stimulation (BrainPatch platform for non-invasive stimulation) was arranged as a 4-day course of 6-minute stimulation sessions with monitoring of Heart Rate Variability. Psychological testing (State Anxiety (STAI), psychological stress level (PSM-25), severity of emotional burnout (MBI), and depression (IDS)) was carried out. We detected beneficial changes in the psychoemotional state of the respondents: improvement of mood, reduction of work stress (PSM-25), emotional exhaustion and professional reduction (MBI), and depression symptoms (IDS). HRV effects of VNS turned out to be short-term and reflected the activation of the parasympathetic nervous system (the increase of vagally mediated parameter RMSSD and decrease of LF/HF ratio). This reflects a shift towards parasympathetic nervous system dominance. An increase in the spectrum of high-frequency waves indicates a high degree of recovery and readiness for stress. Obtained data suggests that the novel vagus nerve stimulation protocol attenuated the work-related stress impacts shifting "sympatho-vagal balance" to the functional optimum.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.10 Stress, 4.23 Emotion/affect, 4.26 Other

POSTER SESSION I-112 | THE INTERPLAY BETWEEN NEURAL CORRELATES OF PROTOTYPICAL PERSONALITY FACES, SOCIAL PREFERENCES, AND PERSONALITY TRAITS

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Recent studies suggest that self-reported Big Five personality traits correlate with preferences for faces representing these traits. In a registered report, we extended this research by examining if individuals' Big Five traits influence their preference for interacting with people represented by prototypical personality faces and how these preferences relate to neural processing. We focused on the traits extraversion, agreeableness and neuroticism, analyzing participants' responses to faces deemed as prototypical for each trait. 85 participants classified prototypical faces as above or below average representative of a certain trait and provided an interaction preference rating while face-sensitive event-related potentials, N170 and late positive potential (LPP), were measured. As hypothesized, faces that were perceived as high (vs. low) extraverted and agreeable and low (vs. high) neurotic were preferred. The preference for agreeable faces correlated with personality characteristics of the perceiver. The higher a persons' score on trait agreeableness, the higher the preference ratings for prototypical and perceived high agreeable faces, as well as for any prototypical neuroticism face. An increase in preference ratings for prototypical agreeable faces was paralleled by an increase of the LPP. Higher scores on trait neuroticism were related to decreasing preferences for faces perceived as extraverted. Together, these results highlight the importance of considering perceiver characteristics and perceived features of interaction partners when it comes to social preferences.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.11 Personality, 4.24 Social factors

POSTER SESSION I-113 | ELEVATED PHYSIOLOGICAL STRESS REACTIVITY AS A BARRIER TO CANNABIS USE CHANGE

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Rates of cannabis use have continued to grow alongside state legalization, with current rates estimated to be around 17% in the United States. Many cannabis users continue to use regularly despite negative consequences, making it important to understand potential barriers to change. Elevated stress reactivity is commonly associated with substance misuse as substances may serve as a coping method to mitigate anxiety-related symptoms. The current study explored the relationship between physiological stress reactivity and willingness to change in regular cannabis users. 68 cannabis users evaluated their readiness to change, using the Marijuana Use Ladder, at baseline and 3 months post a 1-day study visit where they completed a resting task and the Mannheim Multicomponent Stress Test (MMST) task. During the MMST, participants were tasked with completing mental arithmetic while being displayed white noise bursts and a series of emotional images. Skin conductance response (SCR) and heart rate (HR) were recorded throughout. Results show a significant relationship between SCR reactivity to the MMST and reductions in motivation to change from baseline to the 3-month follow-up, $F(1, 62) = 7.412$, $p = 0.008$. The same relationship was found for HR reactivity, $F(1, 67) = 5.237$, $p = 0.025$. This significant relationship holds even with the removal of individuals at higher levels of change (i.e., action, maintenance) at baseline. Greater stress reactivity is associated with less willingness to change cannabis use, suggesting that elevated stress reactivity may serve as a barrier to change.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.10 Stress, 4.19 Motivation

POSTER SESSION I-114 | EMOTION REGULATION CHANGES THE OBJECTIVE AND SUBJECTIVE EXPERIENCE OF NEGATIVE STIMULI IN AUTISTIC AND NON-AUTISTIC ADULTS

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Emotion regulation (ER) in autistic adults (AA) has not been previously studied at multiple measurement levels. Research has shown reduced heart rate variability (HRV) and increased skin conductance level (SCL) at rest in AA, yet no studies have measured HRV and SCL during an ER task. The Self-Assessment Manikin (SAM) is a self-report measure of arousal and valence used in emotion studies in AA. The current study measured HRV (i.e., RSA and rMSSD), SCL, SAM-arousal, and SAM-valence in AA and non-autistic adults (NA) as they watched negative videos and engaged in ER via reappraisal and suppression. The sample included 62 adults (31 AA, 31 NA) matched on age (18-46 years), sex (32% male), and IQ. Separate 2 (group) x 2 (block: negative, reappraisal or suppression) ANOVAs explored changes in objective (RSA, rMSSD, SCL) and subjective (SAM-arousal, SAM-valence) experiences when engaging in reappraisal and suppression during negative videos. Results showed 1) main effects of reappraisal for reducing SCL and self-reported arousal and increasing self-reported positivity ($ps < .001$), and 2) main effects of suppression for reducing SCL and self-reported arousal ($ps < .001$) and increasing RSA ($p = .013$) and self-reported positivity ($p < .001$). In addition, AA reported lower arousal during the reappraisal ($p = .007$) and suppression ($p = .010$) blocks compared to during the negative block. Results suggest that ER reappraisal and suppression strategies change the objective and subjective experiences of negative stimuli in AA and NA, which supports interventions that target ER skill development.

FUNDING: Virginia Tech Alliance for Neurodevelopment Research Doctoral Seed Funding.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.23 Emotion/affect

POSTER SESSION I-115 | EXERCISING SELF-CONTROL INCREASES RESPONSIVITY TO HEDONIC AND EUDAEMONIC REWARDS: EVIDENCE FROM THE REWARD POSITIVITY

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A reward responsivity hypothesis of self-control proposes that, irrespective of self-control success, exercising self-control is aversive and engenders negative affect. In order to countermand this negative affect, reward seeking behaviour may be amplified after bouts of self-control to bring individuals back to a mildly positive baseline state. We sought to test and expand upon this hypothesis by asking if exercising self-control increases reward responsivity

differentially for rewards for the self (i.e., hedonic rewards) or a personally relevant charity (i.e., eudaemonic rewards). We asked participants ($N=114$) to complete a speeded reaction time task where participants exercised self-control (by responding to incongruent Stroop trials) or not (by responding to congruent Stroop trials) and then had the opportunity to win money themselves (a hedonic reward) or a personally relevant charity (a eudaemonic reward). Consistent with a reward responsivity hypothesis of self-control, participants showed a larger Reward Positivity after exercising self-control compared to after not exercising self-control. Additionally, participants exhibited a larger Reward Positivity for hedonic compared to eudaimonic rewards. However, reward type did not moderate the effect of self-control exertion on the Reward Positivity, suggesting that self-control increases reward responsivity independently of the reward recipient. Overall, these findings provide evidence supporting the reward responsivity hypothesis of self-control.

FUNDING: The research for this article was funded by the Economic and Social Research Council South Coast Doctoral Training Partnership (Grant Number ES/P000673/1) of Chengli Huang.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.21 Decision making, 4.25 Cognitive control/executive functions

POSTER SESSION I-116 | CHILDHOOD DEPRESSION SYMPTOMS PREDICT THE DEVELOPMENT OF THE REWARD POSITIVITY IN ADOLESCENT GIRLS

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A blunted reward positivity (RewP), an event-related potential measure of reinforcement learning and reward system activation, has been associated with risk for the development of adolescent-onset depression. The RewP has been shown to increase across adolescence and recent evidence suggests that childhood risk factors (e.g., childhood depression symptoms) predict a more blunted linear trajectory of the RewP across mid-adolescence. However, no studies have examined nonlinear trajectories of the RewP across adolescence into young adulthood. In a sample of 609 children (45.3% girls), the present study examined whether childhood depression symptoms predicted the development of the RewP across adolescence. Parents completed the parent-report version of the Children's Depression Inventory at age 9 and participants completed the doors task to assess the RewP at ages 9, 12, 15, and 18. Multilevel modeling indicated that, across all participants, the ΔRewP showed a nonlinear, quadratic increase across adolescence into young adulthood. However, childhood depression symptoms in girls, but not boys, moderated within-person changes in the ΔRewP, such that those with higher depression symptoms demonstrated a more blunted developmental trajectory of the RewP across adolescence into young adulthood. The present study suggests that childhood-onset depression impacts the development of reward-related brain activity in adolescent girls.

FUNDING: National Institute of Mental Health grant RO1-MH-069942 awarded to Dr. Daniel N. Klein.

Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.2 Observational Study: Longitudinal, 4.2 Development, 4.3 Sex differences, 4.7 Psychopathology

POSTER SESSION I-117 | EVIDENCE FOR DEVELOPMENTAL TRENDS IN ATTENTION MECHANISMS FOUND IN MEASURES OF EARLY GAMMA AND BETA DURING A NOVELTY ODDBALL PARADIGM

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Previous research has revealed developmental changes in theta and delta power in the N2/P3 time frame in novelty oddball paradigms. Wienke et al. (2018) found increased theta power related to N2 (210-310ms) and P3 (400-500ms) in a visual novelty oddball task in ages 8-28. Morales et al. (2023) reported significant increases in delta and theta power (100-400ms) in novel sounds in ages 4-11. Our study focused on the earlier oscillations also related to attention, the P1/N1. Evoked power (EPO) and phase-locking factor (PLF) were measured in 204 individuals, ages 7 to 25 years, for two regions of interest (ROI) in frequent, target, and novel tones of an auditory novelty oddball task. The ROIs were gamma related to P1 (34-64 ms/35-47 Hz) and beta related to N1 (92-124 ms/17-20 Hz). Multiple regression analyses tested if Age, Sex or AgexSex significantly predicted the early gamma and beta ROIs after controlling for PLF. For the gamma ROI, in frequent tones Age and AgexSex were the significant predictors ($p<.001$) accounting for 80% of the variance. In target tones, only Age was a significant predictor ($p<.001$), accounting for 59% of the variance. In novel tones, none of the predictors were significant. For the beta ROI, only Age was a significant predictor ($p<.001$) accounting for

82% of the variance in frequent tones, 72% in target tones, and 71% in novel tones. These results demonstrate that in the P1/N1 time frame for this paradigm, gamma power increases and beta power decreases with age, indicating developmental changes in attention occur in the ERPs components prior to N2/P3.

FUNDING: NIH/NCMRR (K01 HD001201) to PLD.

Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.2 Development

POSTER SESSION I-118 | DISTINCT PATTERNS OF CARDIAC AND ELECTRODERMAL INDICATORS DURING RESTING BASELINE CHARACTERIZE INTRA-INDIVIDUAL VARIATION

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The conceptualization of resting baseline as a stable indicator of low physiological activity is challenged by the readily observed and often considerable variation in an individual's time series data. The variations are caused by dynamic shifts in the activity of the parasympathetic and sympathetic branches of the autonomic nervous system (ANS). Resting baseline physiology is thus more accurately conceptualized as a series of changing configurations of parasympathetic-sympathetic activity. This study introduces a novel data analysis approach that reveals distinct configurations of ANS states within time series data, as inferred from cardiac and electrodermal indicators. Using within-person z-scored measures, segmentation of resting baseline data, and a finite mixture model cluster analysis, three distinct patterns of heart rate (HR), heart rate variability (HRV), and electrodermal activity (EDA) were identified in 353 cases. The three patterns were labelled “relaxed vigilance”, “stress”, and “non-vigilance”. The labels describe inner experiences that are exemplars of the three primary behavioral classes proposed by the polyvagal theory: calm connection, mobilization/stress, and immobilization/disconnection. The levels of HR, HRV and EDA observed in each pattern were consistent with data associated with stress, and related constructs such as sustained attention, and state dissociation and syncope. The study provides preliminary evidence that intra-individual variations in resting baseline data are physiological correlates of changing momentary inner experience.

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Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 2.17 Machine Learning/ Deep Learning, 3.5 Secondary Analysis, 4.20 Attention, 4.26 Other

POSTER SESSION I-119 | TWENTY-FOUR HOUR AMBULATORY BLOOD PRESSURE MONITORING IN CHILDREN AND ADOLESCENTS: POOLED COHORT DATA

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Pediatric hypertension is a global public health concern, with prevalence of 9.7% in 2019. Diagnosis relies on repeated office blood pressure recordings above the 95th percentile for age, sex, and height for children and adolescents. In 2022, the American Heart Association endorsed Ambulatory Blood Pressure Monitoring (ABPM) for confirming hypertension diagnosis in youth. Yet, normative data for pediatric ABPM are notably lacking. Only two cohorts are commonly cited, one in German youth from 3 decades ago and another with Chinese youth in Hong Kong, which lack diversity and have limited sampling characteristics (e.g., tall stature, healthy students). This study aimed to compile pediatric ABPM data to create aggregated reference data. An electronic database search yielded 41 cohorts (N=9535) of children and adolescents with 24-hr ABPM. Sample demographics, anthropometrics, and blood pressure values were extracted. Pooled data yielded 24-hr (systolic: 114.96 mmHg, diastolic: 66.20), daytime (systolic: 117.46, diastolic: 69.93), and night-time values (systolic: 105.03, diastolic: 57.83). North American cohorts had higher 24hr systolic blood pressure than those in Europe and Asia. Experts have called for larger, population-representative pediatric cohort studies. Establishing a pediatric data repository by curating existing ABPM datasets to yield normative age-, sex-, and height-specific percentile curves would be an important and more timely contribution that could fundamentally transform how ABPM data are used and interpreted in both research and clinical contexts.

FUNDING: This work was partly supported by the Canadian Institutes of Health Research (CIHR), Fonds de Recherche du Québec - Santé (FRQS), and Social Sciences and Humanities Research Council (SSHRC).

Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.5 Hemodynamic (BP), 3.5 Secondary Analysis, 4.2 Development, 4.5 Population-specific health

LATE-BREAKING POSTER SESSION I-120 | IMPACT OF AGING ON THETA-PHASE GAMMA-AMPLITUDE COUPLING DURING LEARNING: A MULTIVARIATE ANALYSIS

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Aging is associated with cognitive decline and memory impairment, but the underlying neural mechanisms remain unclear. Phase-amplitude coupling (PAC) between theta (5 Hz) and gamma (>50 Hz) oscillations is a proposed marker for parallel storage of multiple items in working memory. However, research has mainly focused on young individuals and epilepsy patients, with only a few studies on aging populations. Moreover, these studies have relied on univariate PAC methods, which can be flawed by potential spurious or biased PAC estimates due to non-stationarity of EEG signal. To address these gaps, we employed multivariate PAC (mPAC) through generalized eigendecomposition (GED) analysis, which avoids the pitfalls of non-sinusoidal oscillations. Over 100 young and 100 older healthy participants engaged in a sequence learning paradigm, in which they learned a fixed sequence of visual stimuli over repeated observations, allowing us to track the mPAC during the incremental process of learning. Behavioral results revealed that younger participants learned significantly faster than older participants. Neurophysiological data showed that mPAC increased over the course of learning in both age groups and could significantly predict fast and slow learners. However, older participants exhibited lower mPAC compared to younger counterparts, which suggest compromised parallel storage of items in working memory in older age. These findings shed light on the age-related differences in memory formation processes and may guide interventions to enhance memory performance in older adults.

Topics: 1.3 Human Studies: General Population - Elderly/ Geriatric, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.1 Aging, 4.18 Memory

LATE-BREAKING POSTER SESSION I-121 | THE BRAIN-BODY DYNAMICS OF SUPRA-SENSORY PERCEPTION

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Is our conscious perception of seeing a flash, hearing a sound or feeling a touch connected to one common core brain activity pattern or a specific brain-body interactive state? Here, I present novel magnetoencephalography (MEG), cardiac and respiratory data that investigate such supra-sensory neural correlates of conscious perception and its relationships to ongoing dynamics in the body. On each trial, different visual, auditory or tactile stimuli were shown at individual perceptual thresholds, such that about half of the stimuli were consciously detected, while the other half were missed. Four different stimuli per modality were used (i.e. different Gabor patches, sound-frequencies, stimulated fingers), in order to subsequently leverage representational similarity analysis (RSA) for differentiating modality-specific, sensory processes from supra-sensory processes, which are similar across the senses. The RSA was capable of distinguishing brain activity patterns related to sensory processes shortly after stimulus onset (<0.5 s) in the respective sensory cortices from later supra-sensory processes (>0.5 s) in sensory association areas. Both sensory and supra-sensory processes correlated with alpha-frequency band (8-13 Hz) activity changes before stimulus onset. Subsequent analyses investigate the co-modulation of this temporal processing cascade underlying sensory-specific and conscious supra-sensory experiences in the brain with ongoing state changes in the participants' heart rates and respiration.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception

LATE-BREAKING POSTER SESSION I-122 |

EFFECTS OF MULTIMODAL INTERVENTION ON PLASMA BRAIN-DERIVED NEUROTROPHIC FACTOR (BDNF) AND ELECTROPHYSIOLOGICAL RESPONSES IN OLDER ADULTS WITH SUBJECTIVE COGNITIVE DECLINE (SCD)

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A multimodal intervention shows promise in delaying cognitive decline in older adults at risk of dementia. Yet, there is no study on changes of plasma brain-derived neurotrophic factor (BDNF) in cognitively normal older adults with subjective cognitive decline (SCD) and their associations with neural activities undergoing this intervention. Fifty older adults with SCD were divided into either intervention group which received physical and cognitive training, or control group which received treatment as usual. Blood samples, event-related potentials (ERPs), and cognitive tests were administered at baseline (T1), the intervention's end (T2), and 6 months after T2 (T3). While no significant intervention effects on cognitive tests, the intervention group showed immediate (T2-T1) and sustained (T3-T1) increases of BDNF level compared to the control group ($p < 0.001$). We previously found that multimodal intervention led to an immediate effect (T2-T1) on mismatch negativity (MMN), which was derived from an oddball paradigm, and a sustained effect (T3-T1) on memory-P3, which was derived from a 1-back task. Thus, we further examined whether the heightened BDNF level in the intervention group would be associated with changes in MMN and memory-P3. Interestingly, the improvement in BDNF level (T3-T1) was significantly associated with the shortening of memory-P3 latency (T3-T1) ($p = 0.015$). In summary, while not directly impacting cognitive tests, the multimodal intervention enhanced plasma BDNF level, which further selectively correlated with ERPs linked with memory function.

FUNDING: Ministry of Science and Technology (MOST-108-2628-B-182-002, MOST-109-2628-B-182-012, MOST-110-2628-B-182-010), Taiwan.

Topics: 1.3 Human Studies: General Population - Elderly/Geriatric, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.10 Blood markers, 3.4 Clinical Trial (RCT etc.), 4.1 Aging, 4.5 Population-specific health, 4.18 Memory

LATE-BREAKING POSTER SESSION I-123 |

SOCIAL ANXIETY AND VARIABILITY OF EYE MOVEMENT STRATEGIES IN FACIAL EXPRESSION RECOGNITION

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Can we learn more about a person by studying the way they look at a human face? The aim of the eye-tracking research was to differentiate eye movement patterns in early stages of face perception process during facial expression recognition and to determine their statistical relationship with social anxiety. A hypothesis about the existence of individual cyclic and repeatable patterns of eye movements associated with the level of social anxiety was put forward. 70 subjects were presented pictures of people's faces expressing 7 emotions. 210 stimuli were presented, stimulus exposure duration was 1000 ms, participants were asked to recognize each expression. Eye movements were recorded using SMI iViewX RED-500. Afterwards, participants completed questionnaires to detect the level of social and personal anxiety. Smart Visualizations SMI BeGaze and SPSS Statistics were used to analyze the data. The dependent variables were facial viewing routes among first 3 fixations ("eye movement strategy") and the level of social anxiety. To differentiate individual strategies, the zone of first fixation and strategy invariance were examined. The results of the study showed that the zone of first fixation and the variability of the used viewing routes across facial zones can be used to characterize individual eye movement strategies. Groups with low (using 1-2 viewing routes for the whole set of expressions) and high (3-5 routes) variability were distinguished. Low variability in individual strategies as well as the avoidance of the eye zone were found to correlate with high social anxiety.

Topics: 1.1 Human Studies: General Population - Adults, 2.6 Eye Tracking (blink, movement, size), 2.11 Questionnaires/Interviews, 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.23 Emotion/affect, 4.24 Social factors

LATE-BREAKING POSTER SESSION I-124 | DECREASED SPATIAL ORIENTING TOWARDS FEARFUL FACES AS A FUNCTION OF GOAL RELEVANCE

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Although threat-related stimuli can capture attention automatically, recent findings and theoretical models assume that this capture is not automatic because it can be modulated by the goal relevance of emotion. In a recent EEG study performed in healthy adult participants (n=40), we used a standard dot probe task in combination with induction trials to make emotion goal relevant in some blocks. Eye-tracking was used to ascertain that the emotional faces and the subsequent target were processed with peripheral vision. Results showed that in the absence of induction trials, fear and happiness both captured attention equally strongly during the dot probe task, as revealed by an amplitude modulation of the early lateralized occipito-temporal P1pc component. Interestingly, this neurophysiological effect was altered for fear selectively when emotion was goal relevant. Further analyses of the behavioral and cue-locked EEG data showed that when emotion was goal relevant, uncertainty about target location increased, likely as a result of a stronger competition created between fearful and neutral faces, compared to the control condition where emotion was not goal relevant. This interpretation was reinforced by a control behavioral experiment (n=40) where we found that the automatic orienting to fearful faces was jeopardized by the use of interleaved induction trials. Altogether, these results suggest that goal relevance can influence emotional attention and this modulation can be traced at an early stage of visual processing following target onset in the occipital cortex.

FUNDING: Guangzhou Elite Scholarship Council (GESC)

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.6 Eye Tracking (blink, movement, size), 3.3 Lab Based Experiment, 4.20 Attention, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION I-125 | A STUDY ON THE RELATIONSHIP BETWEEN ATHLETES' TRAIT ANXIETY AND CENTRAL INFORMATION PROCESSING DURING TASK SWITCHING

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Eysenck et al. (2007) propose that high trait anxiety inhibits the shifting function necessary for reallocating attentional resources in cognitive processing, leading to decreased performance. Even though this shifting function is critical in various sports, this line of research has been scant in sports psychology. Therefore, the present study investigated the relationship between athletes' trait anxiety and shifting functions using event-related potentials. In the present study 12 athletes participated in two blocks. One is a task-switching block, where participants switched between two tasks (pressing a button when a displayed number was more than 5 or less than 5) 18 times. The other was a non-task-switching block, where participants performed only one of the tasks based on whether the number displayed was more than 5 or less than 5. During the task, EEG was recorded from three scalp locations (Fz,Cz,Pz) following the international 10-20 system, referenced to linked mastoid electrodes using Ag/AgCl disc electrodes. These indices before switching tasks in the task switching(repeat trials),during switching tasks in the task switching (switch trials),and during the non-task switching(simple trials) were averaged. Results indicated a significant positive correlation between mixed cost Pz amplitude (subtracting simple trial Pz amplitude from repeat trial Pz amplitude) and trait anxiety. This suggests that athletes with higher trait anxiety may expend more resources to process various information.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 3.3 Lab Based Experiment, 4.11 Personality, 4.20 Attention, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION I-126 |

THE RELATIONSHIP BETWEEN PUPIL DILATION AND THE ACTIVATION OF THE LOCUS COERULEUS AND SUPERIOR COLLICULUS IN RESPONSE TO TARGET AND NOVEL SOUNDS

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The pupil is affected by a variety of cognitive processes, for example by rare novel or target stimuli in an oddball paradigm (pupil dilation response; PDR). The Locus Coeruleus (LC) and Superior Colliculus (SC) are brainstem nuclei thought to play a central role in mediating these effects on pupil dilation. However, a previous fMRI study using a visual oddball paradigm surprisingly reported no enhanced activity in the LC in response to targets, but only to novelty, and no effects of stimulus type in the SC (Krebs et al., 2018). Here, we conceptually replicated the study using an active auditory oddball paradigm and co-registered PDR. We observed enhanced PDRs and LC as well as SC activity in response to novel and target sounds. An additional Bayesian LMM analysis revealed novel- and target-evoked activation related to phasic PDR amplitude for both the LC and the SC at the trial level. In contrast, we found pre-stimulus activation level related to pre-stimulus pupil diameter, which is thought to reflect tonic arousal, only for the LC but not for the SC at the trial level. An interpretation consistent with a recently proposed model (Strauch et al., 2022) is that the orienting attention network mediated by the SC is reflected by phasic pupil dilation, whereas the arousal and alerting attention network mediated by the LC is reflected by both tonic and phasic pupil dilation. The results specify the relationship between attention-related pupil responses and the brain networks involved, strengthening the utility of pupillometry in developmental and patient populations.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.6 Eye Tracking (blink, movement, size), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.20 Attention

LATE-BREAKING POSTER SESSION I-127 |

THE INFLUENCE OF VAGAL TONE, BIOLOGICAL, AND PSYCHOLOGICAL FACTORS ON CONDITIONED PAIN MODULATION

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Background. Conditioned pain modulation (CPM) tests the 'pain inhibits pain' phenomenon. Psychological and biological factors influence individual differences in CPM, yet large variability remains unexplained. Recent studies highlight the role of vagal tone in pain modulation, thus this study aimed to examine the vagus-CPM association, considering psychological factors and biological factors in healthy females. Methods. Eighty-six healthy females completed questionnaires measuring mood and fears of pain after a 5-minute rest ECG recording. Then, participants rated a 60-second tonic heat pain alone and during a conditioning stimulus. ECG was recorded 60 seconds before, during, and after pain alone and during conditioning, and was analyzed in time and frequency domains of heart rate variability (HRV). Results. Higher sympathetic activation at rest, pain temperature, and pain unpleasantness predicted lower tonic pain adaptation. Resting rMSSD was the sole predictor of CPM magnitude, but only in early menstrual phases. Psychological factors did not mediate this association. During both tonic pain and CPM, rMSSD decreased compared to baseline, but remained low only during CPM recovery. Conclusions. Our findings underscore the significant influence of vagal activity on CPM efficiency. Only during the follicular menstrual phase, higher baseline vagal tone is associated with greater CPM efficiency. Vagal tone decreased during pain, with prolonged recovery from CPM. Our approach provides evidence of the complex regulatory mechanism of the vagus during pain inhibition in healthy females

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Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/ Interviews, 2.19 Other, 3.3 Lab Based Experiment, 4.4 Gender, 4.9 Pain, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION I-128 | CHILD MALTREATMENT AND INTEROCEPTION: A META-ANALYTIC REVIEW

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Growing evidence suggests that interoception, our internal sense of bodily signals, is a key transdiagnostic risk factor psychopathology and somatic diseases. Given its clinical significance, there is a growing interest in unraveling the etiology of interoceptive processes. The present study employs meta-analytic methods to summarize findings on the role of one hypothesized determinant of interoception: child maltreatment. In addition, we investigate potential differences in the relation of different types of child maltreatment and interoceptive facets. The present meta-analytic review was conducted strictly adhering to the PRISMA guidelines. In August 2023, a systematic search of relevant studies was undertaken. Our final selection criteria include (1) empirical studies on human subjects and (2) studies that report or provide data to calculate correlations of child maltreatment (≤18 years) and interoception. 17 studies were included. We found that emotional abuse, but no other form of maltreatment, was negatively related to interoceptive accuracy (r = .15). In addition, child maltreatment – most notably emotional maltreatment - was negatively correlated to body trust (r = -.24–.19). The importance of investigating the relationship of child maltreatment and interoception lies in its potential to shed light on the mechanisms underlying long-term effects of child maltreatment on mental and physical health. Additionally, insights from this analysis could inform the development of targeted interventions to reduce the adverse consequences of early life stressors.
Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/ Interviews, 3.6 Other (Meta-analysis), 4.2 Development, 4.7 Psychopathology, 4.10 Stress

LATE-BREAKING POSTER SESSION I-130 | INVESTIGATING THE INTERACTION OF BODY AND MIND: THE RELATIONSHIP BETWEEN AUTONOMIC NERVOUS SYSTEM FUNCTIONING, RUMINATION, AND PHYSICAL FITNESS

Zefeng Li, Emmanuelle Schoonjans, Jens Allaert, Stefanie De Smet, Erik Witvrouw, Evi Wezenbeek, Pieter Van den Berghe, Jan Boone, Rudi De Raedt, Matias Miguel Pulópulos Tripiana, Marie-Anne Vanderhasselt
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Rumination is a maladaptive self-reflection and is considered a transdiagnostic factor for stress-related disorders. Trait rumination is associated with an imbalance of the automatic nervous system (ANS, i.e., lower vagally-mediated heart rate variability (vmHRV), higher heart rate (HR)), hindering ANS recovery from a stressor (HRR). Meanwhile, higher physical fitness, indexed by the maximal oxygen uptake (VO2max), is associated with a more balanced ANS functioning and hastens ANS recovery from a stressor. To date, there is limited research on the relationship between trait rumination, and 1) physical fitness measured by the VO2max, as well as 2) the change in ANS functioning following intense physical activity (considered as a physical stressor). Therefore, we recruited 77 healthy non-athletic individuals with a wide range of trait rumination scores. Physiological measurements were assessed before as a baseline and after an incremental cycling test (determine VO2max). Results showed that higher VO2max is associated with higher vmHRV and lower HR, but these were not associated with trait rumination. Following the incremental cycling test, a decrease in HRV and an increase in HR and skin conductance levels were observed. The change in HRV and HRR were both positively associated with VO2max, but not with rumination. To conclude, the physical fitness of healthy individuals was associated with better ANS functioning, but trait rumination – an index of cognitive flexibility and importantly related to resilience - was not associated with physical fitness and ANS functioning.
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Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.5 Hemodynamic (BP), 2.7 Skin responses, 3.1 Observational Study: Cross-Sectional, 4.5 Population-specific health, 4.10 Stress, 4.26 Other

LATE-BREAKING POSTER SESSION I-131 | NEUROCOGNITIVE CORRELATES OF INHIBITORY CONTROL WITHIN A STOP SIGNAL TASK: AN ERP STUDY EXPLORING THE IMPACT OF COMORBIDITY, BIOLOGICAL SEX, AND MEDICATION IN MAJOR DEPRESSION

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Previous studies have employed event-related potentials (ERPs) to study cognitive disruptions characteristic to major depressive disorder (MDD). The literature, however, remains unclear about the influence of comorbidity with anxiety disorders (MDD+A), sex, and medication. One cognitive function known to be altered in MDD is inhibitory control. The current study evaluated the relationship between inhibitory control – indexed by the N2 and P3 ERPs during a stop-signal task (SST) – and diagnosis, sex, and medication. Participants (N=248, 66.1% female, n=53 HCs) completed the SST in the T1000 study. Two separate two-way ANOVAs were performed to analyze the effect of diagnosis (MDD, MDD+A, HC) and sex on the N2 and P3 amplitudes. There were significant main effects of diagnosis, $F(2,242) = 11.713$, $p<.001$, $\eta^2=0.085$, and sex, $F(1,242) = 4.986$, $p = 0.013$, $\eta^2 = 0.018$, and their interaction in the P3, $F(2,242) = 3.510$, $p = 0.031$, $\eta^2= 0.025$. Post-hoc tests revealed healthy females had more positive P3 amplitudes (all ps<.001). To evaluate the potential role of medication, a three-way ANOVA was performed to analyze the effect of comorbidity (MDD, MDD+A), sex, and serotonergic medication on the N2 and P3 amplitudes among individuals with MDD. This analysis revealed a main effect of medication on N2 amplitudes, $F(1,187) = 6.361$, $p = 0.013$, $\eta^2 = 0.032$, such that medicated patients with MDD had more positive N2 amplitudes. These data suggest that studies employing ERPs may be useful in evaluating the influences of sex and medication on MDD-related cognitive functions.

FUNDING: This study is deriving from the T1000 dataset (Victor et al., 2018) and was funded by The William K Warren Foundation.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 2.16 Pharmacology, 3.1 Observational Study: Cross-Sectional, 4.3 Sex differences, 4.25 Cognitive control/executive functions, 4.26 Other

LATE-BREAKING POSTER SESSION I-132 | THE ASSOCIATION BETWEEN PSYCHOPATHIC TRAITS AND NONLINEAR INDICES OF CARDIAC COMPLEXITY

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Atypical parasympathetic functioning, indicating emotion dysregulation, has been found to be a broader manifestation of psychopathology, although its association with psychopathic traits is unclear. One caveat is that the common measures of parasympathetic processes, such as respiratory sinus arrhythmia, fails to catch the complex cross-system dynamics of the interactions among autonomic nervous system, cortical, and subcortical neural regions. In the current study, nonlinear cardiac indices, reflecting the multisystem, multiscale, and highly interactive nature of cardiac activity, were examined in 95 male and female undergraduate students while they were contemplating moral dilemmas. It was found that the affective-interpersonal dimension of psychopathic personality, in particular the Machiavellian egocentricity traits (a ruthless and self-centered willingness to exploit others), were associated with higher heart rate during the task, as well as higher levels of cardiac irregularity, as indicated by multiple complexity measures, including approximate entropy (ApEn), measures from detrended fluctuation analysis (e.g., DFA a1, short-term scaling exponent), and recurrence quantification analysis (RPmax, RPrec, RPdet, and RPshen). No such effects were found for other psychopathic traits or heart rate indices. Findings are the first to demonstrate a relationship between psychopathic traits and cardiac complexity and suggest that nonlinear heart rate measures may serve as novel tools to capture the physiological instantiation of affective-interpersonal deficits in psychopathy.

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Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 3.1 Observational Study: Cross-Sectional, 4.11 Personality, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION I-133 | OXYNAV: ACUTE HYPOXIA IMPAIRS NAVIGATIONAL PERFORMANCE AND REDUCES PERIODIC AND APERIODIC EEG ACTIVITY

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Cognitive function is predominantly displayed through our ability to interact with and navigate our surroundings. Low-oxygen (high-altitude) environments affect cognitive function, but their impact on navigational ability and the underlying changes in neural activity remain poorly understood. Twenty participants (18-40 years old) were exposed to a sham stimulus (21% FiO2) and a hypoxic stimulus (13% FiO2) for an hour across two sessions. Baseline resting eyes-closed and eyes-open EEG was collected for 5 minutes at frontal (AF7 & AF8) and temporal (TP9 & TP10) sites using a MUSE2. Participants then completed a novel gamified task – the Spatial Performance Assessment for Cognitive Evaluation (SPACE) - to assess their navigational ability. EEG and SPACE measures were repeated following 1 hour of exposure to the sham/hypoxic stimulus. Paired-sample *t*-tests revealed that participants had greater distance ($t = 4.14$, $p = .0005$) and angle ($t = 3.28$, $p = .003$) errors during the Path Integration component of SPACE following 1 hour of hypoxia compared to sham. Frontal beta ($t = 2.48$, $p = .002$) and gamma ($t = 2.13$, $p = .045$), and temporal alpha ($t = 2.16$, $p = .043$) and gamma ($t = 2.17$, $p = .042$) power were lower in the hypoxia condition compared to sham. In addition, the temporal aperiodic offset ($t = 2.28$, $p = .034$) was lower in the hypoxia condition compared to the sham condition. Together, these results suggest that acute hypoxia impairs the ability to keep track of changes in position and orientation during navigation and reduces both oscillatory and non-oscillatory activity.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.5 Population-specific health, 4.20 Attention, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION I-134 | THE IMPACT OF ERP RELIABILITY ON BETWEEN-GROUP AND BETWEEN-PERSON ANALYSES IN PATIENTS WITH PSYCHOTIC DISORDERS

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When using physiological methods to study clinical populations, the impact of score reliability on data attrition and statistical inferences is not well understood. The psychometric characteristics of event-related brain potentials (ERPs) are often overlooked, particularly the potential for differential effects on healthy vs. clinical populations. This study aimed to identify the effect of varying levels of ERP score internal consistency on between-group and between-person effect sizes for the error related negativity (ERN) and error positivity (Pe) in healthy participants and patients with broad psychotic disorders. ERN, Pe, and neuropsychological data from 97 patients and 104 healthy comparison participants were examined. The impact of different ERP reliability cutoffs was systematically evaluated. Between-group (Cohen's *d*; controls vs. patients) and between-person (correlations; ERPs and cognition) effect sizes were calculated across a range of cutoffs. Results showed that the higher levels of ERN/Pe score reliability related to larger effect sizes and decreased effect size variability for between-group and between-person comparisons. These findings highlight the importance of using data with high score reliability to reduce the risk of erroneous inferences in ERP research. There is a critical need to optimize and standardize experimental paradigms for recording high quality data in both healthy and clinical populations, providing the necessary foundation for examining relationships between and across groups.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.5 Secondary Analysis, 4.7 Psychopathology, 4.21 Decision making, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION I-135 | EXPLORING THE INVERTED-U RELATIONSHIP BETWEEN STRESS AND COGNITIVE CONTROL IN A NEW STROOP-LIKE STRESS TASK

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The relationship between stress and cognitive functions is often described as an inverted U-shaped curve, but this has not been thoroughly examined within subjects. To address this, we developed a Stroop-like stress task designed to progressively increase stress through escalating difficulty, while being combined with social-evaluative threat. In the laboratory, fifty-four healthy adults completed this task and then rested for 10 minutes to measure recovery. Preliminary results showed a gradual increase in subjective stress levels across the four blocks. Cardiovascular responses indicated no significant change in cardiac output (CO), but total peripheral resistance (TPR) increased, and the pre-ejection period (PEP) decreased. Reaction time analysis revealed a quadratic effect of subjective stress on cognitive control and a linear effect on conflict adaptation. In conclusion, the new Stroop-like task effectively induces increasing subjective stress and threat-related cardiovascular responses. The behavioral findings preliminarily support the notion of an inverted U-shaped relationship between stress and cognitive control.

FUNDING: This work was supported by a CSC scholarship and the interdisciplinary research program 'Social Resilience and Security' of Leiden University.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.10 Stress, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION I-136 | RESILIENCE BEYOND PREMATURE BIRTH: EXPLORING STRESS PHYSIOLOGY IN PRESCHOOLERS BORN PREMATURELY THROUGH DYADIC INTERACTIONS

Lisa Gistelinck[1], Rowena Van den Broeck[1], Maarten De Vos[2], Roy Hessels[3], Bieke Bollen[4], Gunnar Naulaers[4], Sam Wass[5], Bart Boets[1]
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Annually, 15 million infants are born prematurely worldwide. Advances in neonatal care have reduced mortality but increased morbidity, leading to socio-emotional and neurological issues. Evidence shows dysregulation of the autonomic nervous system (ANS) in preterm infants, linked to early stress and brain alterations. Adequate physiological regulation is crucial for future cognitive and socio-emotional skills. This study investigated physiological regulatory capacities in 70 prematurely born preschool children (5.5 years), compared to 35 matched full-term healthy controls. Autonomic functioning was assessed by measuring heart rate during rest and various interaction paradigms. The study aimed to explore correlations between (1) physiological regulation at 5 years, (2) early prematurity parameters such as kangaroo care, and (3) subsequent socio-emotional functioning at 5 years. Results showed similar values for mean heart rate, RMSSD, and HF-HRV between preterm and full-term children, suggesting normalization in autonomic functioning during childhood. The amount of skin-breaking procedures was negatively correlated with mean heart rate and positively correlated with RMSSD and HF-HRV, indicating accelerated ANS development following early-life stress and pain. A positive correlation was found between mean heart rate and kangaroo care. Additionally, there was a positive association between vagal tone in preterm infants and autism spectrum scores. In conclusion, this study improves understanding of physiological regulation and socio-emotional functioning in preterm children.

Topics: 1.5 Human Studies: Clinical Samples- Children / Adolescents, 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.2 Development, 4.10 Stress, 4.17 Couples/family research

LATE-BREAKING POSTER SESSION I-137 | UNDERSTANDING STRESS RECOVERY IN NATURE WITHIN LGBTQ+ POPULATIONS

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This study addresses gaps in inclusivity within nature and health literature by examining physiological and subjective stress recovery in natural versus urban settings among LGBTQ+ individuals. Research on stress recovery resulting from nature has predominantly neglected minoritized groups. Although Stress Recovery Theory states that nature does promote stress recovery, heteronormative outdoor recreation cultures may impact LGBTQ+ individuals' experiences and affect stress recovery outcomes. Using a randomized experimental design, young adult LGBTQ+ participants were assigned to either urban or natural settings. Stress was measured using psychometrically validated questionnaires and physiological markers (Heart Rate Variability, Heart Rate, and Respiratory Sinus Arrhythmia) at baseline, post-stress induction, and post-environmental exposure. The protocol included a baseline, a post-validated-stress-task, and a post 20-minute environmental exposure assessment. Data analysis employed 2x3 (Environment x Assessment) repeated measures ANOVAs to compare stress recovery between conditions. Results indicate a time by condition interaction, with both groups showing equivalent stress responses to the task. However, the nature group exhibited greater stress recovery compared to the urban group in the post-intervention assessment. This research may provide evidence for an effective tool to combat stress-related illness in LGBTQ+ individuals and informs inclusive practices in psychophysiological research.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 2.11 Questionnaires/Interviews, 3.4 Clinical Trial (RCT etc.), 4.5 Population-specific health, 4.10 Stress, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION I-138 | ERRORS ALTER MID-FRONTAL APERIODIC ACTIVITY

Douglas Angus, Zara Bauman, Jodie Kelly, Sam Kelly-Knowles, Jacinta Bywater
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There are robust, highly reliable patterns of neural activity surrounding behavioural responses in both the time domain (e.g., the Error-Related Negativity) and the time/frequency domain (e.g., mid-frontal theta). Variation in this activity as a function of task performance is particularly relevant for theories of cognitive control and performance monitoring. However, this activity cooccurs with an underlying aperiodic signal, which may reflect task-relevant adjustments in excitatory inhibitory balance. In this study, we examined response-locked frequency and time-domain activity in a Flanker task. Aperiodic activity was extracted from pre- and post-response segments for correct and error trials over a composite of Fz, FC1, FC2, and Cz. We also extracted ERN amplitudes over the same mid-frontal sites. Consistent with previous studies, response times were faster, and ERN amplitudes were larger for error trials than correct trials. There were significant response-induced changes in the aperiodic exponent. For error trials, the post-response exponent was significantly larger than the pre-response exponent. For correct trials, the post-response exponent was significantly smaller than the pre-response exponent. After adjusting for pre-response activity, error trials showed significantly greater aperiodic exponents when compared to correct trials. These results suggest that performance monitoring systems may involve substantial alterations in E:I balance, with errors producing a relative shift towards inhibition and correct response producing a relative shift towards excitation.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION I-139 | VOLUNTARY MOVEMENT ENHANCES ACTION-OUTCOME PREDICTION AND FACILITATES NEURAL PROCESSING OF ASSOCIATED STIMULI

Edward Ody, Tilo Kircher, Benjamin Straube, Yifei He
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Self- and externally generated sensations differ in sensory responses and motor preparation. However, evidence linking motor prediction to sensory processing is scarce. We leveraged ERPs and EEG-based MVPA to examine the action-perception relationship. Participants made active (self-initiated) or passive (finger moved by electromagnet) button presses that triggered a simultaneous auditory and visual stimulus. This was followed, in a block-wise manner, by a unimodal auditory/visual stimulus and participants judged which stimulus was brighter or louder. ERP results suggested that the readiness potential encoded task modality, showing specific preparation for the upcoming task-relevant stimulus. Sensory ERPs showed lower peak

amplitudes (N1) and reduced task differences (N1-P2) for active, demonstrating sensory suppression. Using MVPA, we decoded task modality within active and passive conditions, based on the broadband EEG time-locked to the button press. During motor preparation, the active condition showed higher decoding accuracy, presumably reflecting enhanced predictive processes. Conversely, in the sensory perception period decoding accuracy was higher in the passive condition. Temporal generalization showed that the neural pattern of the alpha band amplitude within the motor preparation and the stimulus perception windows were cross-decodable. This finding suggests that alpha oscillations may encode sensory predictions that were generated during motor preparation. Our findings provide novel mechanistic evidence for sensory-outcome predictions during voluntary actions.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.20 Attention, 4.25 Cognitive control/executive functions, 4.26 Other

LATE-BREAKING POSTER SESSION I-140 | AFFECTIVE PROCESSING IN ANHEDONIA: INSIGHTS FROM EVENT-RELATED POTENTIALS

Roza Mejza[1], Valentina Mologni[1,2], Carola Dell'Acqua[1], Simone Messerotti Benvenuti[1,2,3]
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Anhedonia, defined as a loss of pleasure towards appetitive stimuli, is a core symptom of depression and a vulnerability factor for its development. Studies have established that anhedonia is associated with blunted emotional processing of appetitive stimuli. Yet, emotional processing encompasses multiple stages (cue engagement, affective anticipation and elaboration), and how each stage relates to anhedonia remains unclear. This study aimed to disentangle the influence of anhedonia on distinct stages of emotional processing in a sample of 45 participants (females = 31) with varying anhedonia levels and no current depression diagnosis. Electroencephalography was recorded during an S1-S2 paradigm, in which an image (S2) is preceded by a cue (S1) anticipating its valence (pleasant, neutral, unpleasant). Three Event-related Potentials (ERPs) were assessed: the Cue-P300 (reflecting cue engagement), the Stimulus Preceding Negativity (SPN; reflecting affective anticipation), and the Late Positive Potential (LPP; reflecting affective elaboration). While the LPP was larger for emotional vs. neutral images, the Cue-P300 and the SPN were more pronounced for pleasant stimuli vs. neutral and unpleasant ones. Moreover, higher levels of anhedonia, but not non-anhedonic depressive symptoms, were specifically associated with an increased SPN and a blunted LPP to pleasant stimuli. These findings suggest a complex pattern of affective processing in non-clinical individuals with anhedonia, marked by a rapid transition from increased anticipation to reduced elaboration of appetitive stimuli.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION I-141 | OPPOSING TRAJECTORIES OF RSA AND RMSSD DURING SUPER-SLOW-PACED AND SLOW-PACED BREATHING: DOES MINDFULNESS PLAY A ROLE?

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Super-slow-paced 0.05 Hz breathing (SSPB) could induce unique psychophysiological states compared to slow-paced 0.1 Hz breathing (SPB) via distinct respiratory-cardiac entrainment. Mindfulness may moderate such effects through its link to self-regulation and respiratory interoception, pivotal in modulating one's breathing pattern. Thus, this pre-registered study expected differences in heart rate variability (HRV) during SSPB compared to SPB, moderated by mindfulness. 53 participants performed 5 minutes of SSPB and SPB in randomized order. Measures included peak-valley respiratory sinus arrhythmia (RSA), LF-HRV, RMSSD, state positive/negative affect, relaxation, and dispositional mindfulness (DM). SSPB induced larger RSA (d = .58) and lower RMSSD (d = 1.06) compared to SPB, with no differences in LF-HRV. SPB, relative to SSPB, decreased positive (d = .40) and negative affect (d = .30) while yielding stronger relaxation (d = .34). Higher mindfulness in the non-reactivity domain predicted higher RMSSD (i.e., less decrease) from SPB to SSPB (β = .271). Thus, SSPB generated larger RSA, not captured by LF-HRV or RMSSD, while SPB reduced psychological arousal. Non-reactivity affecting RMSSD

trajectories indicates mindfulness could moderate the effect of different breathing techniques on HRV. Our results emphasize choosing super-/slow-paced breathing patterns based on desired psychophysiological states, including nuanced HRV parameter selection to accurately gauge cardiac effects. Long-term studies should explore whether such refined approaches translate to clinical benefits.

FUNDING: The university of Graz provided funding for this poster.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 3.3 Lab Based Experiment, 4.15 Biofeedback, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION I-142 | THE EFFECTS OF ACUTE STRESS ON BIASED FACE PROCESSING IN SOCIAL ANXIETY

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Stress can affect selective attention in paradoxical ways, either enhancing or diminishing it, with its disruptive effects often leading to poorer social and cognitive performance. Previous studies found that high social anxiety individuals exhibit abnormal face processing mechanisms, showing a bias towards negative emotional faces and higher sensitivity to emotional expressions. However, how their responses differ after a socially stressful context remains unclear. We tested the influence of a social stressor on event-related potentials (ERPs; P1, N170, EPN, and LPP components) and behavioral measures of emotion processing. 80 socially anxious subjects were assigned to a virtual reality Trier Social Stress Test (stress group, n=40) or a no-stress condition (control group, n=40), followed by a passive face viewing and rating task. The ERP results showed that the stress group had significantly smaller face-evoked P1 and LPP amplitudes compared to the control group. No significant between-group differences were observed for N170 and EPN amplitudes. As expected, behavioral results showed that angry facial expressions evoked higher arousal and lower valence compared to happy and neutral expressions. A significant interaction between group and emotion was found in valence ratings, with the stress group rating angry faces as more negative. Our outcomes suggest that acute stress suppresses early and sustained attention to social stimuli on the electrocortical level, and reduced attention resources potentially correlate with impaired face processing in socially anxious individuals.

FUNDING: This study is funded by the Chinese Scholarship Council.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.10 Stress, 4.20 Attention, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION I-143 | DEFICTS IN PREPULSE INHIBITION AND BASELINE STARTLE PREDICT DEPRESSIVE SYMPTOMOLOGY ONE YEAR LATER IN A MIXED, INTERNALIZING SAMPLE

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Prepulse inhibition (PPI) is the reduced response to an intense stimulus that is preceded by a weaker stimulus and is typically measured using startle eyeblink. PPI deficits have been observed for various neuropsychiatric disorders, suggesting difficulty filtering out unnecessary information (poor sensorimotor gating). Inconsistent findings for heterogeneous diagnostic categories suggest sensorimotor gating deficits vary across internalizing psychopathology. Deficits in filtering information may serve a risk factor for internalizing psychopathology and might aid in understanding mechanisms underlying their progression. Here, a community sample with mixed internalizing psychopathology ($N=44$) completed self-report measures of internalizing psychopathology and performed a PPI task while startle eyeblink was recorded. Approximately one year later, participants completed the same symptom measures again. Worse sensorimotor gating at baseline predicted increases in a variety of internalizing symptom dimensions one-year later (e.g., post-traumatic stress; generalized anxiety), controlling for baseline symptoms. Critically, when multiple symptom dimensions were included in the same model, findings were uniquely explained by increases in depression, which was predicted by reduced sensorimotor gating at baseline, b = .701, $p < .001$, as well as blunted startle response on non-prepulse trials, b = -.566, $p = .002$. Therefore, deficient sensorimotor gating appears to be a broad risk factor for internalizing psychopathology that is more parsimoniously explained by risk for depression.

FUNDING: This work was supported by NIMH R01MH125083 (MacNamara).

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.2 Myography (EMG etc.), 3.2 Observational Study: Longitudinal, 4.7 Psychopathology, 4.25 Cognitive control/ executive functions

LATE-BREAKING POSTER SESSION I-144 |

WITHDRAWAL-MOTIVATED ANGER: ANGER IN A SOCIAL CONTEXT IS ASSOCIATED WITH REDUCED RELATIVE FRONTAL ALPHA ASYMMETRY AND GREATER MOTOR CORTICAL BETA ACTIVITY

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Few studies have examined anger in the context of withdrawal motivation. Social contexts which prompt personal attacks may provoke withdrawal anger. Relative left frontal alpha asymmetry (FA) and motor cortical beta activity (BA) are indexes of motivational states. In the first of two studies, participants (N= 34) wrote an essay, received insulting feedback, and rated their anger in response to the feedback. EEG was recorded at rest before and after the insult. Less FA and more BA were used as neural indexes of withdrawal motivation. T-tests indicated less FA ($t = 3.93$, $p < .001$) and more BA ($t = -3.56$, $p = .001$) post-insult compared to baseline. To verify that this social manipulation provoked withdrawal-motivated anger, a second study (N = 64) with additional measures was conducted. Participants completed the Behavioral Inhibition Scale (BIS) and rated how important and personal the essay topic was. As before, FA ($t = 2.03$, $p = .04$) decreased and BA ($t = -2.62$, $p = 0.01$) increased pre to post-insult. Additionally, the BIS Fight Flight Freeze System (FFFS) sub-scale correlated positively with anger ratings ($r = .30$, $p = .02$). BIS FFFS also correlated positively with how important ($r = .30$, $p = .02$) and personal ($r = .29$, $p = .02$) the topic was. An interaction between pre-post BS and anger revealed that anger related to more BA after insult ($F(1,60) = 12.2$, $p < 0.001$). These results suggest that social contexts which prompt anger can evoke neural responses associated with withdrawal motivation.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.19 Motivation, 4.23 Emotion/affect, 4.24 Social factors

LATE-BREAKING POSTER SESSION I-145 |

INSULTING THE NARCISSIST: VULNERABLE, BUT NOT GRANDIOSE NARCISSISTS, RESPOND WITH GREATER APPROACH-MOTIVATION AFTER INSULT

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The current pair of studies investigated whether individual differences in narcissistic personality predict individual's responses to ego threats. Prior work suggests that ego threats are experienced differently between vulnerable (VN) and grandiose (GN) narcissists because VN's have a more fragile ego. It was predicted that VN's would be more motivated to act in revenge, reflected by suppressed cortical beta activity (study 1) and frontal asymmetry (study 2), when a revenge opportunity is present (vs. not present). Across both studies, participants varying in trait narcissism received ego-threat through a personal insult, and possible ego-repair, through a revenge opportunity task. In study 1 ($N = 34$), beta band activity over the motor cortex served as a neural index of approach motivation. In study 2 ($N = 43$), relative frontal alpha asymmetry served as a neural index of approach motivation. EEG activity was assessed before insult (baseline), after insult, and after learning of the revenge opportunity. In study 1, VN's, opposed to GN's, were associated with enhanced anger after insult. More importantly, VN's, but not GN's, displayed greater approach motivation (reduced beta activity) after learning about the revenge opportunity, $sr = .39$, $p = .02$, relative to baseline or after insult. In study 2, VN's, but not GN's, displayed higher approach motivation after insult, $r = .32$, $p = .03$. These results suggest that VN's display increased approach motivation after ego-threat and after learning about a revenge-seeking task.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.11 Personality, 4.19 Motivation, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION I-147 | NEURAL MECHANISMS OF EMOTION-COGNITION INTERACTION IN LONELINESS: INVESTIGATION WITH EEG-ERP AND TDCS-EEG METHODS

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Theoretical accounts suggest that the ability to overcome emotional responses to salient environmental stimuli using inhibitory control may be disrupted in lonely individuals due to an increased bottom-up threat response, limiting their ability to employ top-down control mechanisms. To examine the neural underpinnings of emotion-cognition interaction in lonely individuals, we employed the Emotional Go/No-Go task based on neutral and angry facial stimuli (EmoGNG). In our first study, we investigated event-related potentials associated with attentional control and response inhibition (anterior N2, posterior P3) in a group of 101 young adults (18-35 y.o., 52F) recruited based on their UCLA-R Loneliness scores to form high-lonely (HL, UCLA-R≥49, n=50) or low-lonely (LL, UCLA-R≤32, n=51) groups. Consistent with previous research, we observed more negative N2 and less positive P3 amplitudes for No-Go compared to Go trials. However, the N2 modulation effects were found only in LL, suggesting reduced conflict monitoring capacity in HL. To further investigate the causal role of the dlPFC in the reduced N2 observed in HL, a subsequent study involved independent groups of 60 LL and 60 HL subjected to 20-minute HD-tDCS stimulation (anodal vs. sham, double-blind order) of either the left (F3) or right (F4) prefrontal region before completing EmoGNG. Contrary to our predictions, we found that stimulation affected only LL, reducing the go vs. no-go effect in response to angry displays. This suggests that decreased cognitive control in HL may not be directly linked to prefrontal activity.
FUNDING: National Science Centre, Poland grants: 2018/31/B/HS6/02848 (PI: Łukasz Okruszek) & 2019/35/B/HS6/00517 (PI: Łukasz Okruszek).
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 2.18 Brain stimulation, 3.1 Observational Study: Cross-Sectional, 4.20 Attention, 4.24 Social factors

LATE-BREAKING POSTER SESSION I-148 | EFFECT OF PRE-PROCESSING FILTERING ON RESTING-STATE EEG MICROSTATE

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Resting-state electroencephalogram (rs-EEG) microstate (MS) analysis represent quasi-stable "microstates" with unique topographies from multi-channel EEG, reflecting temporal shifts in large-scale brain networks. MS analysis is a promising tool for elucidating the pathophysiology of neuropsychiatric disorders, but optimal analysis methods are yet to be established. A recent study indicated that EEG preprocessing filtering affects MS analysis outcomes. Thus, we investigated differences in rs-EEG MS analysis outcomes between individuals with bipolar disorder (BD) and healthy controls (HCs) using two preprocessing filters (1–40 Hz and 1–20 Hz). Rs-EEG was measured from the BD and age- and sex-matched HC groups (N = 36 for each), and MS analysis with the two filters calculated the duration, occurrence, and coverage of MS (A−E) transitions. These MS indices were compared between the groups for each filter. With the 1–40 Hz bandpass filter, the BD group showed significantly shorter MS-D duration, longer MS-C and MS-E duration, and lower MS-D occurrence and coverage (all p-values <0.05) compared to HCs. However, no significant group differences were observed with the 1–20 Hz filter. These discrepancies suggest that MS analysis with a wide-range bandpass filter is more sensitive for detecting network abnormalities in BD, likely due to not only the signal processing effects of the different bandwidths of the bandpass filter in the MS analysis, but also the potential involvement of high frequency bands such as the gamma band in the pathophysiology of neuropsychiatric disorders.
FUNDING: This study was supported by Tateishi Science and Technology Foundation and Nakatani Foundation for Advancement of Measuring Technologies in Biomedical Engineering to N.K.
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.16 Neurological disorders / Neuropathology

LATE-BREAKING POSTER SESSION I-149 |

BRAIN NETWORKS INVOLVED IN REAPPRAISING NEGATIVE EMOTION IDENTIFIED USING CONSTRAINED PRINCIPAL COMPONENT ANALYSIS FOR FMRI (FMRI-CPCA)

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Over the last 10+ years, various meta-analyses of fMRI studies have identified distributed networks of brain regions supporting emotion regulation, particularly reappraisal. The resulting networks are widely interpreted to reflect top-down (cognitive) control processes, but the evidence of functional network contributions presented thus far is largely indirect and inferred. Constrained Principal Component Analysis for FMRI (fMRI-CPCA) can help separate brain networks and their temporal profiles associated with performing reappraisal. We employed fMRI-CPCA on a dataset obtained from 84 younger and older-aged participants (51% female) who increased or decreased their affective response to a set of affective images. Spatial maps and their estimated temporal event-related BOLD signal changes of four components with the highest loadings were extracted and were classified by mapping each onto templates of existing task-based brain networks This analysis yielded best matches with 1) "initiation", 2) "response", 3) "re-evaluation", and 4) "default mode" networks. The analysis of the temporal patterns of each component revealed significant differences across all task conditions, with the active regulation conditions ("increase" and "decrease") showing particularly prominent temporal patterns for "initiation" (component 1) and "re-evaluation" (component 3) respectively. These findings highlight which distributed brain networks previously identified are crucial in instantiating emotion regulation.

FUNDING: Funded by the Biotechnology and Biological Sciences Research Council (BB/J009539/1 and BB/L02697X/1) awarded to the last author.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION I-150 |

WHEN SOCIAL ISOLATION SPEEDS UP THE HEART: A MATTER OF SADNESS

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The mental health challenges posed by quarantine are well-recognized, yet its physiological impacts are not as well-understood. In this study, we investigated heart rate (HR) patterns over a 6-day quarantine period following a common cold infection, using data from the Pittsburgh Cold Study 3 (n=213), collected between 2007-2011. Additionally, we examined the link between reported sadness and HR trends to determine if those more prone to sadness experience different changes in arousal during quarantine. Our analysis revealed that HR generally increased during the quarantine. Individuals who reported higher levels of sadness usually had lower HR at the outset but showed a steeper rise in HR over the quarantine period. This suggests that midterm social isolation leads to an increase in HR, with sadness significantly shaping HR trajectories. Hence, social isolation appears to impact those with higher sadness levels more intensely, despite their initial lower arousal. Understanding these physiological responses is vital for comprehending the overall effects of social isolation and distancing on human health and well-being. Furthermore, this insight is critical for creating strategies to support people undergoing social isolation during pandemics, various health conditions, or in circumstances of limited social networks.

FUNDING: There was no direct funding for this poster. However, the Laboratory for the Study of Stress, Immunity, and Disease at Carnegie Mellon University, directed by Sheldon Cohen, PhD, collected the data used in this poster. The data were accessed through the Common Cold Project (CCP) website (www.commoncoldproject.com). Funding from the National Center for Complementary and Integrative Health (AT006694) enables the CCP to make its data publicly available. The studies were conducted with grants from the National Institute of Allergy and Infectious Diseases Center for Complementary and Integrative Health (R01 AT006694) and the National Institute of Allergy and Infectious Disease (R01 AI066367). Additional support came from a grant from the National Institutes of Health (UL1 RR024153 and UL1 TR000005).

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/Interviews, 3.2 Observational Study: Longitudinal, 4.10 Stress, 4.23 Emotion/affect, 4.24 Social factors

LATE-BREAKING POSTER SESSION I-151 | LINKING INSULA STRUCTURE TO GUT_MICROBIOME FEATURES IN CHILDREN

Julia Ditzer[1], Paul Savoca[2], Naomi Gancz[2], Desiree Delgadillo[2], Desiree Solis[3], Anna-Lena Zietlow[1], Bridget Callaghan[2]
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Interoception is the process by which the brain perceives, integrates, and models sensory information generated within our bodies. The microorganisms living in the gastrointestinal tract (gut microbiome) are one unexplored system likely tracked via interoception. They are associated with breaking down dietary nutrients and energy metabolism, and psychopathology. Critically, interoception and energy regulation are also linked to psychopathology, suggesting the microbiome's link to mental health may operate via interoception and energy regulation. However, there is currently a lack of knowledge regarding which information about the gut microbiome influences brain development. The insula is a brain region critical for interoceptive processing, as it is where interoceptive information first reaches the cerebral cortex. The insula can be divided into sub-regions, based on neuronal organization (i.e., laminar organization). Sub-regions differ in their information processing with posterior regions primarily involved in processing lower-level information and anterior regions primarily involved in integrated and abstract information processing. In this study we examine cortical thickness differences in seven regions of the insula as they relate to features of the gut-microbiome. Data is from a sample of typically developing children (n = ~60). This research can provide insight into how features of the microbiome are associated with interoceptive brain circuity in children, which could prompt novel hypotheses in understanding developmental psychopathology.

Topics: 1.2 Human Studies: General Population - Children/Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.19 Other, 3.1 Observational Study: Cross-Sectional, 4.12 Sensation/perception/interoception, 4.26 Other

LATE-BREAKING POSTER SESSION I-152 | EEGMANYPIPELINES: A MULTI-ANALYST PROJECT ON THE VARIABILITY OF EEG ANALYSIS APPROACHES

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Researchers analyzing electroencephalographic (EEG) data are faced with a choice between countless alternative and plausible analysis approaches. The variability of these analytical approaches in real-life practices and the extent to which they affect the results is unknown. The EEGManyPipelines project is a many-analyst project that aims to investigate the robustness of EEG findings across different analytical approaches. With this aim, a single EEG dataset and a set of hypotheses were sent to expert teams. In total, 168 teams completed the task, analyzed the data, and returned their results, including preprocessed EEG data, processing scripts, analysis questionnaire, and outcome of hypotheses testing. We examined the results of one of the hypotheses concerning the N100 event-related potential differences between two conditions. Our findings suggest that while EEG data processing pipelines are highly variable, two data processing steps, the baseline window length, and correction for multiple comparisons, could be linked to whether or not a significant effect is found between the conditions. Subsequently, we analyzed the preprocessed EEG data and the difference wave between the two conditions. Our analysis revealed that the choice of reference and the use of plugins for bad component selection may impact the magnitude of the difference wave within the N100 component time window.

FUNDING: The project is funded by the DFG priority program "META-REP: A Meta-scientific Programme to Analyse and Optimise Replicability in the Behavioural, Social, and Cognitive Sciences".

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.1 Observational Study: Cross-Sectional, 4.26 Other (Replicability)

LATE-BREAKING POSTER SESSION I-153 | BRAIN-HEART INTERACTION UNDERLYING IMPLICIT EMOTIONAL PROCESSING: UNDERSTANDING THE CEREBELLAR ROLE IN SOCIAL DOMAIN

Giusy Olivito[1,2], Eleonora Picerni[2], Libera Siciliano[1,2], Nicole Urbini[1,2], Martina Tanieli[1,2], Michele Maiella[3], Maria Leggio[1,2]
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The proven implication of the cerebellum in emotional processing has been the crucial starting point for broadening its role in affective and social fields. Due to its connections with the limbic and autonomic system, the cerebellum, has been implicated in the modulation of autonomic reactions and in the automatic component of emotional processing, i.e the emotion recognition (ER). According to existing research, the cerebellum may have a role in social domain by mediating the autonomic reactivity to stimuli during implicit emotional processing. In order to test this hypothesis, the assessment of ER abilities and psychophysiological recordings, i.e. heart rate variability (HRV), has been performed before and after an anodal or sham (placebo) cerebellar transcranial direct current stimulation (tDCS) in 30 healthy volunteers randomly assigned to one or the other condition. Unexpectedly, we found a significant effect in the group undergoing sham, but not anodal, cerebellar tDCS for both behavioural and psychophysiological measures, suggesting that the anodal tDCS may interfere with the functional interaction between core cerebello-cerebral regions related to autonomic regulation impeding the implicit and automatic emotional processing operated by the cerebellum. Conversely, in the sham condition, the concomitant improvement of ER performances and reduction of HRV has been observed, thus suggesting that the cerebellum may be responsible for the emotional phenomena that are executed automatically by normalizing the autonomic arousal when processing automatic emotional stimuli.

FUNDING: Italian Ministry of Health, project code GR-2021-12374877 to Giusy Olivito Sapienza University of Rome, project code RM12218168058941 to Giusy Olivito.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 2.18 Brain stimulation, 3.4 Clinical Trial (RCT etc.), 4.23 Emotion/affect

Poster Session II

POSTER SESSION II-001 | THE FIRST INDEPENDENT STUDY ON ERP-BASED FEEDBACK CONCEALED INFORMATION TEST (FCIT)

Jerzy Wojciechowski, Zofia Kosowska, Alicja Leśniewska, Katarzyna Włodarczyk
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Sai et al. (2016) introduced a novel Concealed Information Test (CIT) based on Event-Related Potentials (ERPs), merging recognition-based and feedback-based ERPs, termed the feedback Concealed Information Test (fCIT). Although subsequent experiments by the authors demonstrated its efficacy, these findings have not been independently verified until now. In this first independent study, we aimed to verify the accuracy of the fCIT. Participants engaged in an experiment where they were instructed to simulate a mock-crime (stealing a piece of jewelry) and underwent a P300-fCIT protocol. They were randomly assigned to either a guilty or innocent group. As of now, data from 20 participants have been analyzed. Consistent with Sai et al. (2016) and subsequent studies, our results demonstrate that both recognition-based ERPs and feedback-based ERPs can effectively classify participants as guilty or innocent.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.18 Memory, 4.20 Attention, 4.26 Other

POSTER SESSION II-002 | DIMINISHED BAROREFLEX SENSITIVITY PREDICTS IMPULSIVITY AND BLACKOUT RISK IN YOUNG ADULTS

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Lower baroreflex sensitivity is associated with risk for cardiovascular disease (Hesse et al., 2007) and has also been implicated as a potential vulnerability factor in the initiation and maintenance of substance use behaviors (Bates

et al., 2013). One potential mechanism in which baroreflex sensitivity could impact substance use is through its ties to emotion regulation. Trait impulsivity suggests difficulties in emotion regulation and is also a predictor of substance use initiation (Kozak et al., 2019). The current cross-sectional study examined the relationship between baroreflex sensitivity, impulsivity (lack of perseverance), and blackouts from alcohol use in the past year in a sample of 124 young adults (mean age: 20, 69% female). Average baroreflex sensitivity was derived from a 10-minute supine recording of non-invasive continuous blood pressure. Participants completed self-report surveys and interviews to assess their impulsivity and substance use. PROCESS mediation model results suggested indirect-only mediation of baroreflex sensitivity on blackouts through impulsivity (direct effect: B=.01, p=.50), with reduced baroreflex sensitivity significantly predicting higher lack of perseverance (B=-.62, p=.02) and this higher impulsivity subsequently significantly predicting number of blackouts (B=.61, p=.03). Future work should examine this mechanism longitudinally and assess potential biopsychological interventions to improve baroreflex functioning and feedback.

FUNDING: NIAAA-R15AA028633 & NIGMS-P20GM10 3436.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.5 Hemodynamic (BP), 2.11 Questionnaires/Interviews, 3.1 Observational Study: Cross-Sectional, 4.5 Population-specific health, 4.25 Cognitive control/executive functions, 4.26 Other

POSTER SESSION II-003 | ARE YOU STRESSED OR JUST EXCITED? WHAT THE GARMIN STRESS SCORE TELLS ABOUT YOUR MOOD

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Stress, a prevalent global issue, significantly impacts society and health. Over the last two decades, technological progress has led to the development of innovative methods for evaluating physiological stress in real-world settings. Nonetheless, research outcomes have been inconsistent. This study investigates the association between emotional states and the stress scores provided by Garmin watches in university students. Over four weeks, participants wore Garmin smartwatches continuously and reported on various emotional states via Ecological Momentary Assessment (EMA). Results indicate significant differences in emotional states across examination, anticipation, and recovery periods. The Garmin stress score predicted positive emotions but failed to predict negative emotions. This coherence is likely attributable to Garmin's assessment of Parasympathetic Nervous System (PNS) activity, associated with the 'rest and digest' response, contrasting with the 'fight or flight' reactions measured by the sympathetic nervous system (SNS). Additionally, emotional predictability appears to be context-dependent, evident in the fluctuating emotional states observed across different weeks in our study population. In conclusion, the Garmin stress score seems to accurately represent PNS activity. These results have a major impact on the interpretation of the "stress" score provided by Garmin. Future studies should include more than PNS measurements to achieve more reliable assessments of negative emotions.

FUNDING: European Research Council of Prof. Dr. Lydia Krabbendam.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.12 Ecological Momentary Assessment (EMA), 2.19 Other, 3.2 Observational Study: Longitudinal, 4.10 Stress, 4.23 Emotion/affect

POSTER SESSION II-004 | CO-VARYING EYE MOVEMENTS AND POWER MODULATIONS OF ALPHA OSCILLATIONS DURING WORKING MEMORY: A PILOT STUDY

Arne D. Hansen[1,2], Dawid Strzelczyk[1,2], Nicolas Langer[1,2], Tzvetan Popov[1,2]
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It is commonly agreed that power modulations in alpha oscillatory activity serve as an inhibitory neural mechanism, selectively routing information within cerebral circuits. In visuo-spatial attention, alpha oscillations enhance the processing of relevant targets and suppress potential distractors. However, there are inconsistencies regarding alpha power modulations with increasing load in common working memory (WM) tasks. Particularly, high WM load is associated with either decreased or increased alpha power, depending on the type of WM task deployed. This pilot study (N = 10) utilized simultaneous EEG and eye tracking to examine the relationship between alpha power modulation and oculomotor action in the context of an N-back and two variations of Sternberg tasks. The study aimed to explore whether different gaze patterns during these tasks offer explanatory value in addressing the variations in alpha power with WM load. Preliminary results confirmed a decrease in posterior alpha power with increasing WM load in the N-back task. However, for the Sternberg tasks, this relationship was not clearly evident.

The three tasks exhibited distinct gaze variability depending on the WM load condition. Statistical power prohibits conclusions regarding the presence of a clear relationship between alpha power and gaze variability. However, these exploratory results highlight a novel research avenue linking alpha oscillations, eye movements, and working memory, providing valuable insights for understanding the neural mechanisms underlying the brain's control of eye movements.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.6 Eye Tracking (blink, movement, size), 3.3 Lab Based Experiment, 4.20 Attention, 4.26 Other

POSTER SESSION II-005 | IMPROVING EXECUTIVE FUNCTIONS: ASSESSING THE IMPACT OF A THREE-WEEK AT-HOME COGNITIVE TRAINING ON MEDIOFRONTAL NEGATIVITIES IN OCD PATIENTS

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Individuals with obsessive-compulsive disorder (OCD) often exhibit deficits in executive functions, such as interference control and action monitoring. Importantly, impaired executive functions are associated with a reduced response to cognitive behavioral therapy in OCD. Many studies show that cognitive trainings can improve deficient cognitive functions. Therefore, a specific cognitive training was developed to address the diminished interference control and overactive action monitoring in OCD patients, aiming to offer a viable augmentation therapy option. The three-week training was conducted at home by OCD patients and involved a flanker and a n-back task. Task difficulty was dynamically adjusted based on individual performance, thus aiming to promote enhanced neurocognitive adaptability. In addition to behavioral measures, stimulus-locked and response-locked mediofrontal negativities (N2; correct-related negativity, CRN; error-related negativity, ERN) associated with cognitive control served as outcome measures. The adaptive training resulted in significant changes in the mediofrontal negativities of OCD patients: The N2 amplitude increased, while the CRN amplitude decreased in incompatible trials. Taken together, this pattern implies improved interference control and reduced action monitoring in OCD patients after training. Thus, the current study shows that deficient executive control in OCD can be improved with specifically tailored interventions thereby opening up clinical applications in preparation for or in addition to cognitive-behavioral therapy.

FUNDING: Deutsche Forschungsgemeinschaft (DFG). Grant: GR 4901/2-1.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 3.4 Clinical Trial (RCT etc.), 4.25 Cognitive control/executive functions

POSTER SESSION II-006 | DOES FICTION READING INFLUENCE THEORY OF MIND? AN EEG STUDY BASED ON TIME-DOMAIN AND TIME-FREQUENCY-DOMAIN APPROACHES

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The understanding of false belief- others' beliefs can differ from reality-is essential in Theory of Mind. This has been shown to correlate with reading experiences, especially reading literary fiction, yet limited research has investigated the neural basis of this relationship. Using electroencephalography (EEG), this study explored whether reading fiction predicts false belief understanding from time-domain amplitude and time-frequency-domain power. Participants were 26 university students (M_{age}=21 years, 14 males). Their general reading experiences were evaluated using Reading Interest and Comparative Reading Habits (CRH) and fiction reading experiences were assessed using a Hong Kong Author Recognition Test (HKART). Participants underwent EEG recordings while viewing belief-related cartoon stories. Results showed increased left frontal-central event-related potentials (ERPs) around 330-370 ms and central ERPs around 850-950 ms in false- versus true-belief conditions. Differential central ERPs were positively correlated with Reading Interest and CRH but not with fiction HKART scores, after controlling for age, gender, family SES, and intelligence. In addition, right temporo-parietal beta (13-20Hz) power around 500-2000 ms and left frontal-central beta power around 2000-3800 ms were enhanced in false- versus true-belief conditions. However, nonsignificant correlations were observed between differential power and reading experiences. The findings imply an association between false belief understanding and general reading rather than fiction reading at the neural level.

FUNDING: Supported by Temasek Labs, NTU.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.26 Other (False Belief and theory of mind)

POSTER SESSION II-007 | ARE THE PE AND PHASIC PUPIL RESPONSE BETTER PREDICTORS OF POST-ERROR BEHAVIOR ADJUSTMENT THAN THE ERN?

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The amplitude of the error-related negativity (ERN) is known to be correlated with attention to task and general cognitive control abilities. Yet, previous research has struggled to consistently link ERN amplitude with behavioral accuracy or reaction time in the task from which the ERN is being measured. This lack of relationship could be a result of many factors that are difficult to control for, so explorations of other converging measures to understand error processing and subsequent behavior adjustment are warranted. The current study examines how two other physiological markers of error processing—the phasic pupillary response (PDR) and the positivity following an error (Pe)— relate to post-error behavior. Additionally, we also examine relationships between the three physiological indices of error-processing. In the study, EEG and pupillometry were simultaneously recorded while participants completed 12 blocks (50 trials each) of an Erickson Flanker task. We found that on a single trial level, the amplitude of the Pe and PDR for error trials predicted whether participants made a correct response on the following trials. While single-trial EEG amplitude within the ERN window predicted post-error accuracy, it did so equally for correct and incorrect trials. This suggests that the PDR and Pe might represent better predictors of post-error behavior adjustment, specifically. There were no relationships between any of the physiological variables and post-error slowing. We also found that both the ERN and Pe strongly correlated with PDR amplitude. Results are discussed.

FUNDING: This material is based upon work supported by the National Science Foundation Graduate Research Fellowship under Grant No. 1650114 to Sara LoTemplio.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.6 Eye Tracking (blink, movement, size), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.25 Cognitive control/executive functions

POSTER SESSION II-008 | SOCIAL BALL AND PHYSIOLOGICAL AND EMOTIONAL REACTIVITY: HEART RATE (VARIABILITY), SKIN CONDUCTANCE, BLOOD PRESSURE, AND AFFECTIVE RESPONSES TO SOCIAL EXCLUSION

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Addressing inconsistent evidence regarding the immediate physiological and emotional impact of social exclusion, this study tests the extent to which excluded (versus included) participants experience heightened physiological and emotional reactivity in response to the social exclusion paradigm, Social Ball (SB). A sample of psychology students was recruited (n=140; mean (SD) age=20.5 (3.2); 78% female) and randomly assigned to either the inclusion (n=70) or exclusion (n=70) condition. Two Mann-Whitney U tests indicated that excluded participants showed increased negative emotion reactivity compared to included participants (z=3.27), yet there was no difference between conditions in positive emotion reactivity (z = -1.04). An independent samples t-test revealed no significant differences in inter-beat interval (heart rate) reactivity following the task between the exclusion and inclusion conditions (F=1.26, p = .282). Moreover, five additional Mann-Whitney U tests showed no significant differences between conditions in skin conductance level (z = -0.64) or response (z=0.51), RMSSD (i.e., indicator of heart rate variability; z = -0.02), or systolic (z = -0.78) and diastolic blood pressure (z = -0.85, all p's > .05). These findings suggest that social exclusion, as manipulated by SB, does not significantly impact physiological responses. This raises questions about the effectiveness of SB in exploring physiological aspects of social exclusion and indicates the potential need for more detailed multilevel analyses to understand these dynamics.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.5 Hemodynamic (BP), 2.7 Skin responses, 3.3 Lab Based Experiment, 4.10 Stress, 4.23 Emotion/affect, 4.24 Social factors

POSTER SESSION II-009 | MY MONEY, YOUR CHOICE: THE INTERSECT OF AGENCY AND SELF-RELATEDNESS IN REWARD PROCESSING

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Humans preferentially process information related to themselves compared to others. Interestingly, this

self-reference effect is highly related to reward processing, evidenced by overlapping neural generators and self-related advantages in gambling tasks. However, what remains unclear is how agency over our actions, a factor that is essential to our sense of self, impacts this self-related reward effect. Specifically, will reward processing remain preferential to self-related outcomes without agency over the preceding decision? To test this, we had participants complete a modified form of Blackjack, where players compete against the dealer to earn money, while electroencephalography (EEG) data were recorded. Participants were instructed that in some trials they would risk money from their pot, but that other trials would risk the prior participant's money. Likewise, they were told that some trials would be simulated based on the prior participant's behaviour and that these trials would similarly risk their money or the prior participant's money. We found that the amplitude of the reward positivity, an event-related potential of EEG data representing reward processing, was largest for trials that were self-played and self-rewarded. Further, and more importantly, we found that this self-related reward advantage was reliant on control over the preceding decision. These results indicate that self-related biases are related to reward outcomes but still reliant on the decisions that lead to them, emphasizing the necessity of agency in self-related reward processing.

FUNDING: Natural Sciences and Engineering Research Council of Canada (RGPIN 2016-094).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.21 Decision making, 4.22 Learning/conditioning, 4.24 Social factors

POSTER SESSION II-010 | THE EFFECTS OF POSITIVE MOOD ON NUMERICAL STROOP TASK WITH LINEAR MIXED-EFFECTS MODELS: AN EVENT-RELATED POTENTIALS STUDY

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Emerging evidence indicates that positive mood significantly impacts cognitive control, yet the neural mechanism underlying positive mood regulation on information processing remains unclear. Therefore, this study used ERP experiment to examine how temporal dynamics are modulated in response to positive mood. In the current study, the effects of transient mood states on cognitive control were investigated using numerical Stroop task with event-related potentials (ERPs). Positive and neutral moods were induced by emojis, symbols considered as an effective medium for emotion sharing in digital communication. In the numerical task, numerical value and physical size were varied in levels of congruity (congruent, neutral, incongruent). Single-trial behavioral and ERPs data were analyzed using linear mixed-effects models with fixed effects of mood, congruity, and their interaction. Mood main effects were observed in the behavioral results, with subjects responding slower and less accurately under positive mood. ERP results showed congruity effects (congruent-incongruent) on N200, N450 and late positive component (LPC), an interference effect (incongruent-neutral) on N450, and a facilitation effect (congruent-neutral) on LPC. Positive mood seemed to specifically hinder the response execution but not attentional processing or conflict monitoring. Our findings suggest that mood induced by emojis might be too mild to modulate the automatic processes of number and physical size at the earlier stage of processing.

FUNDING: This work was supported by Hong Kong Institute for Advanced Study, City University of Hong Kong (9360157), and by National Health Research Institute (CG-113-GP-15).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.20 Attention, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION II-011 | ATTENTION TO SOCIAL AND NON-SOCIAL STIMULI IN A CONTINUOUS PERFORMANCE TEST IN AUTISTIC AND NEUROTYPICAL PARTICIPANTS

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Autism spectrum disorders (ASD) are a range of disordered characteristics with restrictive behaviors and a lack of social skills. This study, utilizing a 64-electroencephalogram device, investigates the confluence of social attention and attention as a domain of executive functions, along with face perception. Participants were asked to take part in two identically designed continuous performance tests (CPTs) with two distinct stimulus types: alphabetical letters and neutral human faces. Event-related potential components, including P100, N170, P200, N250, P300, and continuous negative variation (CNV), were analyzed in 19

young adults with ASD and 19 IQ-, age-, and gender-and handedness-matched neurotypical controls. No differences were discovered between the two groups during the continuous performance tests with the alphabetical letter stimuli set. However, autistic individuals elicited lower amplitudes of P300 and CNV during face CPT, indicating a diminished allocation of attentional resources and response preparation toward facial stimuli.

FUNDING: Samanehsadat dastgheib was funded by a Ph.D. fellowship from the Landesgraduiertenförderung Thuringia, administered via the Graduate Academy of Friedrich Schiller University.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.16 Neurological disorders / Neuropathology, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION II-012 | DECODING THE NARCISSISTIC BRAIN

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There is a substantial knowledge gap in the narcissism literature. Less than 1% of the over 5,000 empirical articles on narcissism have addressed its neural basis. To help fill this gap, we asked whether the polyhedric complexity of narcissism could be decoded from spontaneous neural oscillations. We attempted to do so by applying a machine learning approach (multivariate pattern analysis) to the resting-state EEG data of 162 participants who also completed a comprehensive battery of narcissism scales assessing agentic, admirative, rivalrous, communal, and vulnerable forms. Consistent with the agency-communion model of narcissism, agentic and communal forms of grandiose narcissism were reflected in distinct, non-overlapping patterns of spontaneous neural oscillations. Furthermore, consistent with a process model of narcissism, we observed largely non-overlapping patterns of spontaneous neural oscillations for admirative and rivalrous forms of narcissism. Vulnerable narcissism was negatively correlated with power across fast and slow wave frequency bands. Taken together, the results suggest that the diverse forms of narcissism can be reliably predicted from spontaneous neural oscillations. The findings contribute to the burgeoning field of personality neuroscience.

FUNDING: Mayflower Scholarship of the University of Southampton.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 3.3 Lab Based Experiment, 4.11 Personality

POSTER SESSION II-013 | GENETICS OF THE PROBLEMATIC USE OF COMPUTER VIDEO GAMES IN ADOLESCENTS: THE ROLE OF THE DRD2 GENE POLYMORPHISM (RS6277)

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Problematic video game use (PVGU) among teenagers may lead to negative consequences in various spheres of life, including social, educational, physical and psychological. The studies in the context of PVGU focuses on search of candidate genes, which can participate in pathogenesis of addictions. One of them is neurotransmitter dopamine, gene polymorphism in the its receptors can cause mental and behavioral disorders. The aim was to study the genetic variants of the dopamine receptor gene (rs6277) in adolescents with problematic use of computer video games. We performed psychological (Game Addiction Scale for Adolescents, GASA) and genetic testing (PCR-RT) of 481 adolescents aged 12 to 18 years (average 14.6±2.1 years). Boys has the average scores on the GASA scale were statistically significantly higher than in the group of girls ($p<0.001$). According to the results obtained, a genetic study using a dominant model of inheritance in the group of adolescents with PVGU was statistically significantly frequence of the T* allele (genotypes CT+TT) compared to the control group ($p=0.04$). The positive association of carriage of the T allele and the presence of PVGU is confirmed by the odds ratio (OR=1.98). Conclusion. We detected a prognostic marker of PVGU: CT and TT genotypes of rs6277 of *DRD2* gene are predispose to problematic video game use among adolescents.

Topics: 1.5 Human Studies: Clinical Samples- Children / Adolescents, 2.8 Genetics, 2.11 Questionnaires/Interviews, 3.4 Clinical Trial (RCT etc.), 4.7 Psychopathology, 4.24 Social factors

POSTER SESSION II-014 | POSTERIOR CINGULATE CORTEX. AN EARLY TARGET IN TYPE 1 DIABETES DEVELOPMENT? A RESTING STATE CONNECTIVITY STUDY.

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Cognitive impairments have been reported during the development of type-1 diabetes (T1D) depending upon the occurrence of hypoglycemia episodes, microvascular complications, depressive symptoms, and polyneuropathies, among other complications, as associated with the integrity status of resting-state functional brain networks. We aimed to comparatively evaluate the resting-state connectivity in Default Mode and Salience networks (DMN, SN) in eighteen clinically well-controlled young T1D patients with typical cognitive performance versus healthy paired controls. A multisession temporal concatenated independent component analysis was used to identify the functional areas of DMN and SN, which served as regions of interest. Graph theory metrics were obtained from individual functional connectivity umbralized matrices and compared between groups. The results showed that the bilateral posterior cingulate region (DMN) had a higher degree centrality score for T1D patients, without any other significant difference between the groups in DMN and SN structures. The results suggest that the posterior cingulate, a key player in regulating the focus of attention and conscious awareness, can early be affected by T1D progression as part of an adaptive functional developing mechanism.
FUNDING: Funded by Universidad de Guadalajara.
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.16 Neurological disorders / Neuropathology, 4.25 Cognitive control/executive functions

POSTER SESSION II-015 | TRANSITIONAL PROBABILITIES SHAPE THE LEARNING BRAIN: ELECTROPHYSIOLOGICAL EVIDENCE OF NONLINGUISTIC STATISTICAL LEARNING

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Statistical learning (SL) is a capacity to extract statistical regularities within and between of adjacent elements, driven by transitional probabilities (TPs) across time and/or space. Despite an increasing number of neuroimaging studies investigating SL, it has been primarily studied using behavioral tasks, and thus the neural mechanisms underlying SL remain unclear. This study investigates the neural dynamics of SL using triplets with TP of 1.00 and 0.2 in a visual SL task. Event-related potentials (ERPs) were recorded while participants exposed to a continuous stream of nonsense shapes in the familiarization phase. After the familiarization phase, a recognition task was performed. The behavioural performance showed a higher accuracy for targets than for foils, with no differences between TPs. ERPs were sensitive to the effect of TPs during the familiarization period, showing larger N400 amplitudes for high TPs than low TPs for the second and third shapes. Interestingly, the N400 TP effect on the second shape is more pronounced at the fronto-central regions, while the effect on the third shape is more toward the centro-parietal sites. In the test phase, foils elicited larger N400 than targets on the third shape. These results suggest that TPs impact the learning of statistical structure, which may then be followed by the gradual emergence of knowledge that can be expressed explicitly.
FUNDING: National Health Research Institute (grant number: CG-113-GP-15).
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.18 Memory, 4.22 Learning/conditioning

POSTER SESSION II-016 | NON-LINEAR IMPACT OF REWARD SIZE ON PIANISTS' PERFORMANCE AND ANXIETY-RELATED PHYSIOLOGICAL RESPONSES

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Pianists demonstrate remarkable skill in executing and recalling intricate motor sequences. However, despite their expertise, errors can occur during performances in scenarios with rewards, such as exams and competitions. Therefore, in this study, we examined how reward size influences pianists' performance and anxiety-related physiological responses in a simulated exam setting. Thirty expert pianists participated in a virtual concert hall via VR headset. Four conditions with different reward sizes were implemented: small, medium, large, and jackpot. Pianists were tasked with achieving the highest possible score in playing a designated melody on the piano. Physiological measures including heart rate and skin conductance, as well as behavior including performance initiation and errors were recorded. At the group level, heart rate increased significantly specifically in the jackpot condition before playing, and pianists took longer to initiate their performance, indicating a cautious approach. However, while no significant trends in performance errors were observed across groups due to large individual variations, we found a positive correlation between pre-performance skin conductance and performance errors in the jackpot condition for individuals with high anxiety tendencies and a borderline negative correlation for those with low anxiety tendencies. These findings suggest that high-stakes rewards--combined with individual trait variability--elicit differential physiological responses in pianists that impact fine motor sequence performance.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.6 Eye Tracking (blink, movement, size), 2.7 Skin responses, 3.1 Observational Study: Cross-Sectional, 4.10 Stress, 4.11 Personality

POSTER SESSION II-017 | ASSOCIATION BETWEEN DIFFERENT ORGAN-SPECIFIC DOMAINS OF INTEROCEPTION AND OTHER HEALTH-RELATED VARIABLES

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Interoception is defined as the ability to detect and interpret sensations arising within the body. It's connected to physical and mental health variables and also emotion processing. The majority of investigations of interoceptive accuracy focus on cardiac signals, typically using heartbeat detection tests and self-report measures. Consequently, little is known about how different organ-specific domains of interoception relate to each other or to mental health disorders. We assessed interoceptive processes by using a heartbeat perception task and a respiratory load estimation task in context with health-related variables (e.g. TAS, ERQ) in 137 participants. In addition, interoceptive sensibility was assessed using the Interoceptive Perception subscale of the EDI-2 and the MAIA-2. While former research regarding the relationship between different organ-specific domains of interoception showed ambivalent results, our data suggest that the accurate detection of bodily sensations across different sensory modalities isn't related; thus performance accuracy isn't associated across the respiratory and the cardiac domain. However, the organ-specific domains of interoception were associated with health-related values, e.g. alexithymia ($p < .03$) or emotion regulation ($p < .01$). With our multimodal, multifaceted approach, we provide insight into the interconnectivity of different interoceptive modalities and the understanding of interoceptive processes in mental health contexts. The presented projects thus pave the way for valuable insights guiding future clinical research and practice.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.12 Sensation/perception/interoception, 4.23 Emotion/affect

POSTER SESSION II-018 | NEURAL PROCESSING OF SEXUAL IMAGES AND RISK FACTORS FOR COMPULSIVE SEXUAL BEHAVIORS: A MAGNETOENCEPHALOGRAPHIC STUDY

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Pornography consumption is very popular, and can sometimes be associated with addiction-like sexual behavior with negative emotional consequences. Neurobiological studies indicate that compulsive sexual behaviors (CSB) are associated with altered neural processing of pornographic stimuli. This study investigated neuroaffective mechanisms underlying exposure to sexual images and the relationship to CSB risk factors. High-density magnetoencephalography (MEG) assessed brain activity during a passive picture viewing task (opposite- and same-sex erotic and pornographic images) in healthy hetero- and homosexual women and men ($N = 50$). Correlations to indicators of CSB (hypersexuality, sexual sensation seeking, problematic pornography use, time spent on pornography use) and hedonic valence and emotional arousal were analyzed. Source-estimations of event-related fields showed strong associations between neural responses to the sexual stimuli and indicators of CSB. More hypersexuality and time spent on pornography led to less activation in temporal-parietal brain regions while responses of prefrontal brain regions to pornography revealed positive associations with perceived subjective arousal and problematic pornography consumption. The found associations suggest an involvement of prefrontal and temporo-parietal cortex regions in a divergent reward processing of pornography, supporting the idea of addiction-like mechanisms. Insight into neurobiological factors underlying CSB may promote the development of more effective therapeutic interventions.

FUNDING: University of Münster, Germany Erasmus+ from Universitat Jaume I, Castellón, Spain.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 3.1 Observational Study: Cross-Sectional, 4.4 Gender, 4.7 Psychopathology, 4.23 Emotion/affect

POSTER SESSION II-019 | HEIGHTENED VISUOCORTICAL ENGAGEMENT FOR AFFECTIVELY RELEVANT CUES UNDER UNPREDICTABILITY

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Studies suggest that uncertainty manipulated via reinforcement rates does not widen fear generalization gradients. Nevertheless, people with clinical anxiety often struggle to discriminate threat and safety signals potentially contributing to their experience of anxiety as unpredictable. While numerous studies highlight heightened defensive responses to unpredictable threat, its impact on fear generalization remains unclear. To this end, we implemented a single-cue fear conditioning protocol in two groups that differed in threat unpredictability. In the predictable group, an aversive sound (US) appeared immediately after a cue (CS+) whereas in the unpredictable group the US could appear anytime during acquisition. Participants received instructions about the US (un) predictability. During generalization, participants saw six additional faces resembling the CS+ to different degrees. Defensive responses were measured with valence, arousal, and US-expectancy ratings, skin conductance responses and steady-state visual evoked potentials. Preliminary results demonstrate successful fear conditioning indicated by increased affective ratings for the CS+ before and after acquisition. In generalization, the CS+ differed from similarly looking generalized stimuli only in the unpredictable group, specifically in ssVEPs, suggesting heightened visuocortical engagement potentially to decipher the affective relevance of the test stimuli. However, unpredictability did not seem to influence the width of generalization in the other measures.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.7 Skin responses, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.10 Stress, 4.20 Attention, 4.23 Emotion/affect

POSTER SESSION II-020 | THE RELATIONSHIP BETWEEN ERROR-RELATED NEGATIVITY AND HEMISPHERIC ASYMMETRY

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Asymmetrical activations between right and left hemispheres are associated with tasks involving affect and motor performance. We investigated the relationship between error-related negativity (ERN) and hemispheric asymmetry actively induced by unilateral ball grasping. Participants (N=25, F=6) repeatedly grasped a rubber ball at 85 bpm with the instructed hand (L or R) for 90 seconds. We compared 3 counterbalanced conditions, right-hand contraction, left-hand contraction, and no contraction. After contractions, participants evaluated their emotional states (e.g., relaxed, tense, motivated) and then executed a spatial Stroop task where they were instructed to respond to the pointing direction of an arrow (up/down), but not the location (above/below fixation cross) by briskly lifting their middle finger off a microswitch. Both speed and accuracy were emphasized. Our manipulation to induce alpha symmetry was confirmed (preponderance of right hemisphere activation after left gasping and vice versa) in the pre-test. Among the 3 conditions, reaction time and accuracy did not differ on the spatial Stroop task; however, ERN amplitude was smaller in the right contraction condition than the no contraction condition (p=.047). Also, less relaxed states tended to be induced by left contraction compared to no contraction. The same hemispheric asymmetries observed pre-experiment appeared to occur in corresponding conditions during the spatial Stroop task. Our results suggest that induced left hemisphere activation by grasping a ball with the right hand might attenuate error monitoring.

FUNDING: JSPS KAKENHI Grant Number 22K11507.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.25 Cognitive control/executive functions

POSTER SESSION II-021 | SEX DIFFERENCES DURING A SEMANTIC DECISION TASK IN A TRANSPARENT LANGUAGE. AN ERP STUDY

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Sex differences in the amplitude of P300 and N400 event-related components have been reported in non-transparent languages, suggesting that females probably increase the allocation of attentional resources to distracting stimuli. Spanish is a transparent language with a high degree of consistency of print-speech correspondences, thus facilitating written word recognition. However, the neural substrates underlying N400 in Spanish may vary depending on the task-related cognitive strategy employed. We aimed to explore the influence of sex differences on a lexical decision task in which 40 native (20 females) Spanish-speaking young adults read 68 six-word sentences with congruent or incongruent closing words with simultaneous EEG recording. There were no significant behavioral differences between the groups. However, electrophysiological results showed a higher and more extensively distributed P300 in males for the congruent condition, with a more significant parietal N400 component in females, slightly lateralized to the right for semantic incongruency. Incongruency also determines a consistent P600 component in both sexes. The results confirm the influence of sex in reading in a transparent language, probably leading to the development of distinct sex-related cognitive strategies involving potentially different neural substrates.

FUNDING: Neuroscience Institute, University of Guadalajara.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.3 Sex differences, 4.13 Speech/language, 4.21 Decision making

POSTER SESSION II-022 | ATTENTIONAL SHIFTS IN VISUAL 3D SPACE. EXPLORATIVE STUDY TO MEASURE TEMPORAL NEURAL DYNAMICS IN EEG AND BEHAVIOR

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The aim of this explorative study was to measure temporal (neural) dynamics of attentional shifts in three-dimensional (3D) space in electroencephalogram (EEG) recordings and behavior. To this end, a stereoscopic laboratory setup was used to simulate 3D stimuli, presented to 23 adult, non-stereoblind humans. They observed two retinotopically-congruent white random-dot kinematograms (RDKs) at different spatial depths and were cued to shift attention to the foreground or background plane to perform a visual detection task at the to-be-attended RDK, while ignoring the other. Time courses of steady-state visual evoked potential (SSVEP) amplitudes, the P300 and the Selection Negativity (SN) of the event-related potential, and reaction times (RTs) were analyzed to quantify temporal dynamics during attentional shifts. Amplitude

enhancements for SSVEPs, the P300 and the SN, as well as faster RTs to target events for the to-be-attended plane were expected. While we found the expected pattern in RTs, the P300 and the SN, SSVEP amplitudes showed an attention-unspecific suppression of both RDKs. This surprising result suggests: while behavioral data and the P300 are suitable to measure 3D shifts of attention, SSVEPs have some limitations for the usage in in 3D experimental environments. Possible reasons are explained.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION II-023 | VR-INDUCED REPETITIVE CHECKING BEHAVIOR MODULATES THE ERROR-RELATED-NEGATIVITY

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Increased error-related negativity (ERN) – a neural correlate of error monitoring – has been reported in patients with obsessive-compulsive disorder (OCD) and patients with other internalizing disorders e.g., anxiety disorders. The majority of patients with OCD engage in repetitive checking, which might be a phenotypic expression of increased error monitoring. To test a causal link between checking behavior and the ERN, a preregistered, randomized-controlled design was employed. First, the baseline (T0) ERN of $N = 90$ university students was measured via electroencephalography during an Eriksen Flanker Task. Then, participants were randomly assigned to one of three groups: While an experimental group ($n = 30$) was instructed to repetitively check kitchen devices in a virtual reality (VR) environment, an active control group ($n = 30$) waited in the same VR environment, and a passive control group ($n = 30$) waited without a VR headset. Subsequently (T1), the ERN was assessed again. The checking induction resulted in an increased ERN after symptom induction (T1) in the experimental group compared with the active control group. This effect was specific to the ERN, as no differences in the correct-related negativity (CRN) emerged. Repetitive Checking in a virtual environment seems to impact the ERN, in line with previous cross-sectional studies. This finding implies that checking compulsions, which are highly prevalent among patients with OCD, might be a phenotypic expression of an increased ERN. Future studies could extend these findings to clinical samples with OCD.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.25 Cognitive control/executive functions

POSTER SESSION II-024 | GET READY! VISUOMOTOR OSCILLATORY ACTIVITY DURING ANTICIPATION AND MOTOR ACTION IN RESPONSE TO THREAT AND REWARDS

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Although the electrophysiological correlates of viewing emotional cues are well established, much less is known about the neural dynamics during motor action in threatening or rewarding situations. In the present study, dense-array EEG was recorded from N=43 participants (mean age of 20.06 years, SD 1.73). Participants encountered three trial types, each indicated by a visual condition cue, and each requiring speeded responses: A) a potential threat condition in which participants could avoid aversive electric shocks. B) a potential reward condition in which they could earn a monetary reward by pressing a key; and C) a control condition with only a speeded response. Conditions A and B were signaled through two distinct cues, each paired with either the right or left hand for pressing the corresponding response keys. In the control condition, only one cue was used. Time-frequency analyses of EEG data focused on alpha and mu rhythm oscillations at posterior and central regions, respectively. Posterior alpha activity initially decreased upon presentation of the reward cue, compared to threat, followed by a sustained relative decrease for threat. Motor-related (mu) activity decreased contralaterally to the response hand across all conditions, prior to the motor response. This effect was most pronounced in the threat condition. Phase-locking analyses were also conducted, highlighting visuomotor synchrony. Together, findings of this ongoing study illustrate the interplay between posterior and motor cortices during anticipation and response preparation, in threat and reward.

FUNDING: National Institute of Mental Health (R01MH125615).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.22 Learning/conditioning

POSTER SESSION II-025 | CULTURALLY ADAPTED REMOTE EEG PROTOCOL: ENHANCING ACCESS AND REPRESENTATION FOR HISPANIC/LATINE PARTICIPANTS

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Electroencephalography (EEG) is instrumental in advancing our understanding of psychopathology and improving prevention, diagnosis, and treatment outcomes. However, the underrepresentation of Hispanic/Latine individuals in EEG studies poses a significant barrier to generalizability and translation of findings. Geographic, financial, and language constraints hinder their involvement, despite high willingness to participate. In a previous study, we developed a protocol for remote, home-based EEG assessment which yielded great ratings of acceptability, excellent internal consistency, and good test-retest reliability across sessions. As a next step, we are working to reduce language barriers for Hispanic/Latine participants by culturally adapting our remote, home-based EEG protocol to facilitate participation among Spanish-speaking individuals. A team of four bilingual and bicultural researchers undertook the cultural adaptation process, drawing upon the Ecological Validity Model. This model guided the adaptation across eight domains: language, persons, metaphors, content, concepts, goals, methods, and context. The cultural adaptation was successfully completed, and validity checks confirmed appropriate similarity and interpretability among protocols. The development of a culturally adapted EEG protocol marks a significant step towards addressing ethnic disparities in EEG research. By increasing accessibility and representation of Hispanic/Latine participants, this project lays the groundwork for future EEG studies on generalizability and clinical disorders.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.19 Other, 3.6 Other (Protocol development and cultural adaptation), 4.6 Racism/prejudice, 4.7 Psychopathology, 4.26 Other

POSTER SESSION II-026 | SIMPLE CONSUMMATORY POSTAURICULAR REFLEX MODULATION, COMPLEX EMOTIONAL STARTLE BLINK MODULATION

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Across a series of three studies conducted over a decade in my lab, I present evidence that in contrast, the startle blink is a measure of multiple constructs within the Negative Valence Systems domain of the Research Domain Criteria (RDoC) initiative. The startle blink reflex's magnitude is larger during aversive than neutral or pleasant pictures and sounds, indicating it assesses the Acute Threat construct well. However, the startle blink reflex's modulation is ablated when the picture and sound anticipation task is preceded by a task that employs electric shock, suggesting that stronger acute threats generate contrast effects and bound the startle blink's utility in assessing that construct. We have also found that startle blink magnitude is greater during an anticipatory geometric cue perfectly associated with aversive stimuli than a geometric cue associated perfectly with pleasant stimuli, consistent with its assessing the Potential Threat construct, though cues must be presented for at least 5 seconds to show this anticipatory pattern of modulation. In contrast, the postauricular reflex is a marker of the Initial Response to Reward construct within the Positive Valence Systems domain. Its magnitude is larger during pleasant pictures and sounds than during neutral or emotional stimuli, irrespective of when it is measured across a battery of emotional tasks, and its magnitude is not modulated by geometrical cues that predict the valence of upcoming stimuli. Thus, these two reflexes assess various components of emotional processing in distinct ways.

Topics: 1.1 Human Studies: General Population - Adults, 2.2 Myography (EMG etc.), 3.3 Lab Based Experiment, 4.23 Emotion/affect

POSTER SESSION II-027 | WHITE MATTER MICROSTRUCTURE AND COGNITIVE SYMPTOMS IN FIRST-EPISODE SCHIZOPHRENIA

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Schizophrenia (SZ) is associated with abnormalities in cognitive functioning that are tightly linked with functional outcomes. There is accumulating evidence that heterogeneity in the clinical presentation and pathophysiology of SZ is associated with abnormal white matter (WM) connectivity. Diffusion tensor imaging (DTI) studies have revealed widespread reductions in fractional anisotropy (FA), a putative measure of WM integrity. Studies have also found relationships between FA and cognitive functioning in SZ and healthy comparison (HC) samples. However, FA is limited by its inability to differentiate discrete contributors to the signal or to account for crossing of neuronal fibers. Neurite orientation dispersion and density imaging (NODDI) offers opportunities to expand on FA findings by providing more precise quantification of WM properties, including neurite density (NDI) and orientation dispersion (ODI). The present study used FA and NODDI analyses in a sample of 51 first-episode SZ and 31 HC participants to evaluate the relationship between WM microstructure and cognitive functioning in attention and inhibition. NODDI indices were more sensitive to group differences in WM microstructure than FA alone, and a number of relationships between cognitive variables and diffusion metrics were found. ODI (fiber organization) was a more common driver of such relationships than NDI (fiber density). Results support expanded use of advanced diffusion imaging techniques and indicate an underappreciated role of fiber disorganization when evaluating cognitive functioning in SZ.

FUNDING: This work was supported by the National Institute of Mental Health (R01 MH110544 and R01 MH110544-S1) and the UCLA Division of Graduate Education.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.2 Observational Study: Longitudinal, 4.7 Psychopathology, 4.20 Attention

POSTER SESSION II-028 | THE FRAMING EFFECT AFTER THE VENTROMEDIAL CORTEX STIMULATION. INSIGHTS FROM THE MEG CONNECTIVITY ANALYSIS

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The framing effect is a bias that affects decision-making depending on whether the available options are presented with positive or negative connotations. In our gambling task, the amount of the game stake was initially presented in each trial. The risk-to-lose or chance-to-win were also provided, along with a smaller, safe amount that could optionally be kept to avoid the risk. Participants decided whether to gamble or keep the money. Eventually, the financial result was presented as trial feedback. The framing effect was relevant to the 'keep' option, as the outcome feedback could either present a known reduction or gain. 37 subjects took part in the study with two counterbalanced tDCS sessions targeted to either inhibit or excite the perigenual ventromedial cortex (VM), known to mediate reward prediction and processing. We calculated MEG-based effective connectivity with the Directed Transfer Function on the 1s epochs of the trial outcome feedback ('keep' choices only). Results revealed the effect of feedback type (framing) as increased outflows from the VM to the orbitofrontal, left insula, and left dorsolateral cortex after negative feedback. Importantly, we observed an interaction with the stimulation type; the VM to the orbitofrontal flow was specifically increased for the negative feedback after inhibitory stimulation. The results show an increased sensitivity to negative information after VM inhibition, consistent with our behavioral data showing increased susceptibility to the framing effect after inhibitory compared to excitatory stimulation.

FUNDING: The study was supported by the National Science Center UMO-2018/31/G/HS6/02490 and the Deutsche Forschungsgemeinschaft (JU 445/9-1).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.21 Decision making

POSTER SESSION II-029 | INVESTIGATING THE IMPACT OF ADVANCE TASK PREPARATION ON CROSSMODAL ATTENTION SWITCHING IN OLDER ADULTS: AN FMRI STUDY

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In this study, we investigated whether older adults benefit from advance task preparation in a cued attention-switching paradigm requiring switching between different sensory modalities. Participants identified the spatial location of relevant visual vs. auditory modality targets while ignoring spatially congruent or incongruent cross-modal distractors from the other sensory modality. We manipulated the cue-to-target interval (CTI), reflecting advanced preparation. Behavioral results showed comparable switch costs between younger and older adults, with advanced preparation reducing the switch costs independently of age. Age-related interactions emerged in the spatial congruency effect. The blood-oxygen-level-dependent (BOLD) response depicted widespread activation in the frontal-parietal cortex, related to switch costs, with no significant age-related differences in activation regions. The interaction between CTI and switching revealed specific activation of the left angular gyrus in trials with short CTI, suggesting in trials with less preparation more target-driven control is required to integrate multisensory information and reorient attention to relevant information when switching modality. Further analyses contrasting interactions between CTI and age showed activation differences in the bilateral inferior frontal gyrus, the bilateral fusiform gyrus and the left middle occipital gyrus. The results demonstrated that older adults required greater target-driven control to compensate the interference in stimulus processing.

FUNDING: NSTC 109-2923-H-006 -002 -MY3.

Topics: 1.3 Human Studies: General Population - Elderly/ Geriatric, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.1 Aging, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION II-030 | CAN PERSONALITY TRAITS BE PREDICTED FROM RESTING-STATE EEG OSCILLATIONS? A REPLICATION STUDY

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Personality neuroscience seeks to uncover the neurobiological foundations of personality. Forging links between measures of brain activity and personality traits is important in this respect. Using an entirely inductive approach, Jach et al. (2020) attempted to predict personality trait scores from resting-state spectral EEG using MVPA and found meaningful results for Agreeableness. The exploratory nature of this work and concerns about replicability require a rigorous replication, which was the aim of this study. We applied the same analytic approach to a large data set to evaluate the robustness of the previous results. Similar to Jach et al. (2020), 8 minutes of resting-state EEG before and after unrelated tasks with eyes open and closed were analyzed using SVR. A 10-fold cross-validation was used to evaluate the prediction accuracy between the spectral power of 59 EEG electrodes within 30 frequency bins ranging from 1 to 30 Hz and Big Five personality trait scores. We were not able to replicate the findings for Agreeableness. We extended the analysis by parameterizing the total EEG signal into its periodic and aperiodic signal components. However, neither component was meaningfully associated with the Big Five personality traits. Our results do not support the initial results and indicate that personality traits may at least not be substantially predictable from resting-state spectral power. Future identification of robust and replicable brain-personality associations will likely require alternative analysis methods and rigorous preregistration of all analysis steps.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.17 Machine Learning/ Deep Learning, 3.3 Lab Based Experiment, 4.11 Personality

POSTER SESSION II-031 | FEAR CONDITIONING IN DENTAL PATIENTS SUFFERING FROM TMD

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Pavlovian conditioning may serve as an etiological model of chronic pain, where innocuous movements become

associated with pain and thus evoke conditioned responses towards anticipated bodily harm, including catastrophizing, avoidance behaviour and increased arousal. Such response pattern can maintain pain even after the threat of bodily harm is no longer present (Meulders 2020). Impaired discrimination between threat- and safety-signals might be relevant, as recently shown in patients with chronic back pain (Koenig et al., 2021). Yet, it remains unclear whether this effect also applies for other chronic pain instances, e.g., temporomandibular disorder (TMD), where patients report pain around the mandibular joint (Gesch et al., 2004) and are prone to catastrophizing thoughts and increased stress (Klepzig et al., 2024). Hence, we conducted a Pavlovian fear conditioning and extinction paradigm with 24 TMD patients and 10 matched healthy controls (HC) using 2 different visual conditioned stimuli (CS+, CS-) and an unpleasant tactile stimulus (US). US expectancy ratings and skin conductance level (SCL) were compared using rmANOVAs with *Stimulus* (CS+/-) and *Block* (acquisition, extinction) as within-subjects factors and *Group* (TMD, HC) as between-subjects factor. TMD patients showed higher US expectancy ratings and SCL during CS- than HCs reflected by (trend) significant interactions between *Group* and *Stimulus* (ratings: p=.068; SCL: p=.033). Our data suggest lowered sensitivity for safety signals in TMD patients and support an interdisciplinary perspective on TMD and its therapy.

FUNDING: This work was supported by the German Research Foundation (LO 795/25–1, KO 1598/6–1; WE 5873/2–1).

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.7 Skin responses, 3.3 Lab Based Experiment, 4.9 Pain, 4.22 Learning/conditioning, 4.23 Emotion/affect

POSTER SESSION II-032 | THETA SYNCHRONIZATION TO A COMPLEX STIMULUS DURING CONFIGURAL ASSOCIATIVE LEARNING: MEG STUDY

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Configural learning is a form of associative learning, in which the conditioned stimulus is a holistic set of stimuli rather than individual stimulus elements. The aim of this magnetoencephalographic study was to analyze the topography and dynamics of the respective brain processes during configural learning. In contrast to most previous studies, we used abstract intermodal configurations rather than visual scenes. The associative learning task included presentation of elemental stimuli (visual and auditory) and complex stimuli (the same visual and auditory stimuli presented simultaneously). Some of the elemental and complex stimuli were paired with an unconditional stimulus (electrocutaneous stimulus), while others served as discrimination stimuli. We focused on theta-band oscillations (4-7 Hz). Statistical interaction between conditioned stimulus type (complex or elemental) and unconditioned stimulus (reinforced or not) was significant within the first 800 ms of stimulus presentation (FDR-corrected for the number of brain areas) in a number of brain regions, including right dorsolateral prefrontal cortex, medial frontal cortex, anterior and posterior cingulate areas, as well as in occipital visual and temporal auditory areas. In these areas, power of theta oscillations was increased for the reinforced complex stimulus, compared with the unreinforced complex stimulus. This effect may add evidence to the role of theta oscillations in the formation of a configural representation, involving cortico-cortical and cortico-hippocampal interactions.

FUNDING: This work was supported by RSF project # 23-78-00010, https://rscf.ru/project/23-78-00010/.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.22 Learning/conditioning

POSTER SESSION II-033 | LOOK AT THIS PHOTOGRAPH: STIMULUS FAMILIARITY AND SENTIMENT IN THE SELF-RELEVANT P300 EVENT-RELATED POTENTIAL

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Previous literature has suggested an apparent P300 event-related potential sensitivity to self-relevant stimuli. To further explore this relationship, we asked participants to submit 10 photos, each of a particular category (e.g., footwear, plants), to be used as either "targets" (self-relevant targets) or "distractors" (self-relevant distractors) in a given condition of an oddball task. Furthermore, we attempted to see whether the effect of self-relevance on the P300 could be induced in a participant by allowing them to study a set of unique photos which would then be used as targets (learned targets; i.e., do the memorized photos become self-relevant?). Our analysis suggested that P300 amplitude elicited in response to self-relevant targets was significantly greater than all other conditions' targets. This effect was not correlated with the participant sentiment

toward their own photos as assessed by the Revised Personal Involvement Inventory. Learned targets elicited significantly lower P300 amplitude than self-relevant targets, but were not significantly different from self-relevant distractors. In light of this data, we suggest that the effect of self-relevance on the P300 may develop over time after repeated exposure to a stimulus, regardless of sentiment.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.18 Memory, 4.20 Attention

POSTER SESSION II-034 | ALPHA ACTIVITY DURING RETENTION OF INFORMATION IN WORKING MEMORY IS SENSITIVE TO THE STIMULUS PRESENTATION MODE

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Previous research on verbal working memory has produced inconsistent results: sometimes alpha activity would increase during the retention interval, and sometimes it would decrease under seemingly identical experimental conditions and with similar levels of behavioral performance (Pavlov, Kotchoubey, 2022). Here, we explored factors potentially explaining the heterogeneity in alpha direction: the stimulus presentation mode—either sequential or simultaneous—and the encoding duration. Thirty participants performed a digit span task with a set size of seven digits presented in one of four ways: (1) simultaneously for 2800 ms; sequentially for (2) 400 ms or (3) 1000 ms; or (4) sequentially for 400 ms + 600 ms delay between digits. We found that the stimulus presentation mode affected alpha activity during a 6000 ms retention interval. The observed main effect was due to a decrease in alpha power below baseline levels during retention in the 400+600 ms presentation mode, compared to the other presentation modes where alpha showed a strong increase after switching from the encoding to the retention phase of the task. This difference was disconnected from behavioral performance - accuracy was the highest in the simultaneous mode and lowest in the fast presentation mode (400 ms), while no differences in alpha activity between conditions were observed. Based on previous studies, we hypothesize that the direction of alpha activity during the retention interval relates to the depth of memory consolidation, with more free time between items allowing for stronger consolidation.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.18 Memory

POSTER SESSION II-035 | EXPLORING INCONGRUENCY DETECTION IN A SERIAL VISUOPERCEPTUAL TASK: AN N3 ERP STUDY

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The N400 has been extensively characterized during the processing of semantic incongruencies, however, evidence of similar expectancy related neural correlates in the non-linguistic domain is scarce in comparison. Several studies have reported an earlier, more frontally distributed negativity, an N3 effect, when related to semantic aspects of object-identification tasks most involving stimulus pair comparisons. The aim of our study was to explore the topographic and functional characteristics of the N3 component using a more complex visuoperceptual task in which geometric figures in a sequence progressively integrated a higher-order pattern. We evaluated 40 young adults (20 females) while they performed this task with simultaneous EEG recording. The paradigm consisted of 68 trials (four serially-presented items) and participants were instructed to respond if the last figure in the sequence congruently completed the pattern or not. Results show longer reaction times in the incongruent condition, while also revealing a significant N3 with higher amplitudes in frontal areas, followed by a pronounced positive component which could be interpreted as an index of conflict monitoring during pattern expectancy violations. On the other hand, a robust widely distributed P300 was observed in the congruent condition. Taken together, these findings suggest that meaning is actively constructed in this serial visuoperceptual task and the ERP waveforms reflect expectancy-based processing possibly associated with a broad modality-independent semantic system.

FUNDING: Neuroscience Institute, University of Guadalajara.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.13 Speech/language, 4.21 Decision making, 4.25 Cognitive control/executive functions

POSTER SESSION II-036 | EMOTION REGULATION OF FEAR AND ANGER INDUCED BY STANDARDIZED MUSIC EXCERPTS

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While there is a growing body of research on the therapeutic effects of music, empirical literature specifically focusing on the relationship between music listening and emotion regulation is still relatively scarce. In our study, 42 unpleasant or neutral excerpts from the FIlm Music Stimulus Set (FMMS) were selected based on their normative values of valence and arousal. The emotion regulation task involved active listening to these musical excerpts, with participants receiving one of two instructions: "listen" (for both neutral and unpleasant stimuli) or "down-regulation" (specifically for unpleasant excerpts). Following each stimulus presentation, participants rated their emotional experience in terms of valence and arousal (dimensional approach), as well as discrete emotions such as Fear and Anger (categorical approach). Our findings indicate an interesting discrepancy between subjective ratings and objective physiological measures during down-regulation trials compared to passive listening ones. Although participants rated the down-regulation trials as more negative, the facial electromyography (EMG) changes and heart rate (HR) pattern did not align with these subjective ratings. Additionally, ratings of Fear and Anger were lower for the down-regulation trials. Current results suggest that there may be complexities in the relationship between subjective emotional experiences, physiological responses, and emotion regulation strategies through music listening. Further research is needed to explore the potential factors contributing to these discrepancies.

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Topics: 1.1 Human Studies: General Population - Adults, 2.2 Myography (EMG etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 3.3 Lab Based Experiment, 4.23 Emotion/affect

POSTER SESSION II-037 | ANHEDONIA, ANXIETY, AND CARDIAC PRE-EJECTION PERIOD (PEP): THE MOTIVATIONAL INTENSITY HYPOTHESIS IN A DYNAMIC CLINICAL CONTEXT

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Following the motivational intensity hypothesis, cardiac effort (e.g., as *pre-ejection period; PEP*) should depend in part on individual differences in motivation, especially anhedonia. However, relevant studies have rarely measured anhedonia specifically and have not examined clinical samples during naturalistic rewards. Moreover, none have parsed effects of anhedonia from those of anxiety, which often co-occurs in clinical samples but may have opposing effects on cardiac effort. In a clinical youth sample (M_{age} = 12.03, SD = 0.92 yrs; 47% female; 60% minoritized race/ethnicity), we characterized anhedonia and anxiety as latent factors using self-report, interview, and ecological momentary assessment. We measured adolescents' PEP during a naturalistic positive activity (a fun activity planning discussion) with their parents. We then tested effects of anhedonia and anxiety on PEP as modeled dynamically using a non-linear growth model, while accounting for task incentive value using observation of parents' behavior, with good model fit $X^2(33) = 50.16$, $p = .028$, CFI = .99, RMSEA = .06 [.02, .09]. Results showed a small but significant link between anhedonia and higher PEP (lower cardiac effort), specifically the between-person (intercept) variance in PEP during the positive activity, *beta* = .07, *SE* = .03, $p = .013$, and this effect was robust against anxiety severity as a covariate. Findings support the hypothesis that cardiac effort mobilization is related to individual differences in motivation and contribute new evidence of specificity and construct validity for this effect.

FUNDING: This research was aided by grants from the National Institute of Mental Health (R01 MH101088, K01 MH119216, K01 MH131755) and American Foundation for Suicide Prevention (YIG 1-178-19).

Topics: 1.5 Human Studies: Clinical Samples- Children/Adolescents, 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.19 Motivation, 4.23 Emotion/affect

POSTER SESSION II-038 | IN THE HEART OF TIME: AN EXPERIMENTAL STUDY ON THE LINK BETWEEN INTEROCEPTION AND TIME PERCEPTION

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Recent research suggests that our sense of time is related to activity in the primary sensory area for interoception. Thus, a better access to body signals, as objectively measured (i.e., interoceptive accuracy) and subjectively reported (i.e., interoceptive sensibility), may account for a more accurate perception of time. However, evidence on the link between interoception and time perception is still inconclusive, and little is known about any potential dissociation between implicit and explicit time processing. In this study we explored the relation between interoceptive accuracy and sensibility on one side, and implicit and explicit temporal abilities on the other. We used a heartbeat perception task to measure interoceptive accuracy, and the Porge's Body Perception Questionnaire to measure interoceptive sensibility. We then presented adults (age M=22.9, SD=2.39) with an implicit (i.e., foreperiod task, N=28, 13 M) or explicit (i.e., finger tapping task, N=23, 11 M) temporal task. Results showed that higher interoceptive accuracy and sensitivity predict an increased foreperiod effect in the implicit task, indicating that participant were more able to interiorize temporal information to prepare motor response. In the explicit timing task, we found that higher interoceptive sensitivity predicts lower temporal variability, indicating more accurate and precise temporal abilities. Taken together, our results confirmed that awareness of psychophysiological changes play a role in time perception and interiorization of temporal information to execute motor responses.

FUNDING: This work was supported by the STARS Grants program Consolidator grant (University of Padova, Italy).

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception

POSTER SESSION II-039 | THE ERROR-RELATED NEGATIVITY AND HIERARCHICAL DIMENSIONS OF INTERNALIZING PSYCHOPATHOLOGY

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The error-related negativity (ERN) has shown mixed associations with internalizing psychopathology. In particular, an enhanced ERN is associated with obsessive-compulsive disorder and some anxiety disorders, whereas an attenuated ERN is associated with depression. It is possible that the ERN is actually associated with higher-order transdiagnostic dimensions. The present study examined relationships between the ERN and internalizing psychopathology at the symptom, subfactor (distress, obsessions/compulsions), and spectrum (internalizing) levels, in accordance with the Hierarchical Taxonomy of Psychopathology (HiTOP). A sample of 818 17-37 year-olds completed a flanker task while we recorded electroencephalography and a self-report measure of internalizing symptoms. Higher-order mediation modeling was used to simultaneously estimate direct effects of the ERN on each hierarchical dimension, as well as indirect effects via higher-order dimensions. The ERN was most strongly related to internalizing psychopathology at the subfactor level. Specifically, an enhanced ERN was associated with greater obsessions/compulsions, whereas an attenuated ERN was associated with greater distress. The ERN was not related to the internalizing spectrum broadly, nor was the ERN directly related to individual symptoms. These results suggest that many observed relationships between the ERN and psychopathology can be attributed to broader subfactor dimensions of internalizing psychopathology, but discrepant relationships with the ERN exist within the broader internalizing spectrum.

FUNDING: Stony Brook University College of Arts and Sciences.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 3.5 Secondary Analysis, 4.7 Psychopathology

POSTER SESSION II-040 | PROLONGED EXERCISE AND BRAIN FUNCTION: EFFECTS ON ATTENTIONAL CAPACITY

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The positive benefits of exercise on cognitive function and long-term brain health are well recognized. However, the effects of long duration exercise sessions lasting over an hour on cognition are not as well understood. This study investigates how endurance exercise affects cognitive function and brain activity. Thirty participants (15 men and 15 women) completed a two-hour treadmill run at an moderate pace (65% VO2 max). Cognitive performance and brain activity were measured using mobile EEG before, immediately after, and at three intervals up to 24 hours post-exercise. Our findings reveal a significant decrease in the P300 event-related potential post-exercise,

corresponding to reduced attentional capacity that notably did not recover to baseline levels within 24 hours. This decrease correlated with individual body weight loss due to sweating during the run, averaging 2.2% body weight reduction across participants. This suggests that endurance exercise may temporarily impair the brain's ability to detect and respond to important environmental stimuli, thereby increasing the potential for errors. These findings are particularly important considering the implications for professionals in high-stakes environments. For example, healthcare professionals like nurses, often working shifts over 12 hours without adequate hydration, may experience similar cognitive impairments. Understanding these effects is crucial for developing strategies that balance the benefits of exercise with its cognitive costs, ensuring those in demanding roles maintain optimal performance.

FUNDING: Natural Sciences and Engineering Research Council of Canada Scholarships - Doctoral (CGS D) program.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.18 Memory, 4.20 Attention, 4.21 Decision making

POSTER SESSION II-041 | ADDING TO THE BURDEN: THE TENDENCY TO RESONATE WITH OTHER´S STRESS IS LINKED TO HIGHER PTSD SYMPTOM SEVERITY IN INDIVIDUALS FROM ARABIC-SPEAKING COUNTRIES WITH WAR-RELATED TRAUMA

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Many refugees have experienced traumatic events, setting them at increased risk for developing post-traumatic stress disorder (PTSD). To refine interventions aimed at improving refugees' mental health, a better understanding of factors modulating vulnerability to war-related trauma is needed. In the present study, we focused on stress resonance as a potential vulnerability factor, which reflects the empathic sharing of subjective and physiological stress reactions of a distressed individual. Sixty-seven participants who came from Arabic-speaking countries and had entered Germany as refugees or migrants took part in an empathic stress test, in which they observed a German native speaker undergo a laboratory stressor. Meanwhile, different stress markers (subjective stress, heart rate, heart rate variability, and cortisol release) were simultaneously captured in the stressed targets and passive observers. Moderation analyses did not support our hypothesis that the extent to which someone resonates with others' stress is a vulnerability factor in the development of PTSD symptoms after trauma. Rather, higher levels of subjective and autonomic stress resonance were main predictors of PTSD symptom severity. Our findings suggest that heightened stress resonance may constitute a malleable correlate of PTSD rather than a trait modulating health risk. In the future, efforts should be made to test whether individuals with a history of war-related trauma would benefit from trainings aimed at reducing the tendency to excessively share others' stress.

FUNDING: Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany Beyond Conflict, Boston, MA.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.5 Population-specific health, 4.10 Stress

POSTER SESSION II-042 | ATTENTIONAL AND COGNITIVE BIASES REGARDING SELF AND WORLD IN COMMUNITY TRAUMA SURVIVORS: AN EYE TRACKING STUDY

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This study explores the impacts of trauma, post-traumatic stress disorder (PTSD) and depression on attentional and cognitive biases. This study used a sample of community trauma survivors (N = 62). Using a computer task, participants were presented with sentence stems followed by pairs of words (positive/dysphoric) to choose from. Participants verbally endorsed words that best fit with their understanding of themselves and the world. Eyelink 1000® eye tracking technology was used to measure how much time participants spent looking at negative stimuli (dwell time). Results show correlations between PTSD and depression with dwell time to negative stimuli and negative verbal endorsements. Higher PTSD and depression scores were correlated to higher percentages of times looking at and saying negative versions of sentences. This study confirms attentional biases previously

seen in individuals with depression and PTSD. The study also suggests a difference between world and self-related sentences, and suggests an ability to differentiate and predict diagnoses. Interestingly, results suggested that while PTSD scores best predict variables about the world, depression scores better predict variables about the self. This suggests a difference in the symptomology or cognitive biases in PTSD and depression, and merits further research.
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.6 Eye Tracking (blink, movement, size), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.20 Attention, 4.23 Emotion/affect

POSTER SESSION II-043 | TOBACCO SMOKING IS ASSOCIATED WITH IMPAIRED ERROR MONITORING

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Addiction is associated with neurophysiological deficits in error monitoring (EM). EM refers to the continuous assessment of ongoing actions and comparing the outcomes of these actions with internal goals and standards, measured by, e.g., event-related potentials (ERPs). Yet, for tobacco smoking, despite being the largest and most lethal addictive substance globally, there is no firm conclusion on the relation with EM due to a paucity of studies. A large gender-balanced sample (N=94, of which 46 were people who smoke tobacco) was established. The Eriksen-flanker task, a widely used speeded response task known to result in error commission, was administered while recording the electroencephalogram (EEG). The error-related negativity (ERN) and the error positivity (Pe) were measured, as well as event-related oscillations (EROs) in the theta and delta frequency bands that are known to be actively involved in error monitoring. The results showed a clear and consistently blunted ERN and Pe in smoking participants compared to non-smoking participants, providing important evidence for attenuated EM at multiple levels. Reduced power in event-related theta and delta oscillations corroborated these findings. Deficient error monitoring was found for people who smoke tobacco, manifested as lower ERN and Pe, which appear to be driven by reduced theta and delta power, respectively. This shows that tobacco smoking is associated with a neurophysiological deficit in EM that has been found in other substance use disorders.
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION II-044 | NEURAL MECHANISMS OF TIMING AND ANTICIPATION IN AUDITORY PERCEPTION

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In a dynamic setting, continuously updating our understanding of current circumstances to anticipate events is crucial for optimizing behavior and resource management. Effective timing involves predicting event occurrence and moving beyond reactive responses. However, the neural mechanisms supporting this temporal learning remain unclear. We studied EEG data from 20 healthy participants engaged in an auditory detection task with predictive and unpredictable conditions. Predictive cues signaled whether a target would appear early or late. Predictive trials (80%) significantly decreased reaction times for early targets, accelerating neural responses (P2 and N2) to expected stimuli. Moreover, brain connectivity analysis revealed left-lateralized pathways mediating this effect, suggesting that connectivity changes in specific brain networks underlie enhanced reaction times due to temporal prediction.
FUNDING: Austrian Science Fund (FWF) grant I4294-B; National Research Development and Innovation Office (NKFIH) project ANN131305 and K147135.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.20 Attention

POSTER SESSION II-045 | PREDICTING NEURAL SYNCHRONY: EMOTIONAL AND SEMANTIC INSIGHTS FROM DIALOGUE AUTOMATED ANALYSIS

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In social interactions, the brain activities of individuals often synchronize. Yet the factors influencing neural synchrony are poorly understood, especially with regard to the emotional and cognitive properties of the conversation itself. This poster presents findings from a functional near-infrared spectroscopy (fNIRS) hyperscanning experiment involving 84 participants (42 dyads; 18-35 years). Twenty fNIRS channels divided into six regions of interest were used to map the activity in participants' prefrontal cortex, and synchrony among individuals was measured using wavelet transform coherence on the brain signals. Synchrony was computed for both true and surrogate (i.e., randomly matched signals from non-interacting individuals) dyads. Artificial intelligence methods (i.e., EmoAtlas and Textual Forma Mentis Networks) were employed to analyze expressed emotions and the semantic structure of transcribed dialogues. Results revealed significant differences in synchrony in the superior frontal gyrus (p=0.020) and bilateral middle frontal gyri (p<0.001; p=0.002) between real and surrogate dyads. Moreover, expressed emotions were more predictive of brain synchrony in the medial (R^2adj=14.13%) and left (R^2adj=8.25%) prefrontal cortex, whereas semantic properties of dialogues were better predictors of synchrony in the right prefrontal cortex (R^2adj=18.30%). By merging neuroimaging and artificial intelligence, these findings showed the influence of both emotional and cognitive aspects of conversation in predicting neural synchrony in interacting individuals.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.17 Machine Learning/ Deep Learning, 3.3 Lab Based Experiment, 4.13 Speech/language, 4.23 Emotion/affect, 4.24 Social factors

POSTER SESSION II-046 | EFFECTS OF LIGHT EXPOSURE ON VAGALLY-MEDIATED HEART RATE VARIABILITY: A SYSTEMATIC REVIEW

Sylvain Laborde[1], Vanessa Martins[1], Mark Allen[2], Uirassu Borges[1], Pauline Laterza[1], Marko Jackovic[1], Emma Mosley[3], Florian Javelle[1]
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Background. Therapeutic use of light is a growing strategy to address a range of clinical disorders (e.g., depression, anxiety, sleep disorders, and seasonal affective disorders). As many disorders are associated with autonomic dysfunction, one potential pathway for light to influence clinical outcomes is through cardiac parasympathetic nervous system activity, which can be indexed via vagally-mediated heart rate variability (vmHRV). Objective. The current systematic review sought to synthesize the full body of research on how ocular exposure to visible light (illuminance and color) might influence vmHRV.
Method. Findings are reported using the PRISMA-2 guidelines. Using the PICOS framework, eligible studies of visible light together with vmHRV in healthy or clinical populations were eligible for inclusion. In April 2024, an electronic search of MEDLINE (via PubMed), Web of Science, Cochrane, and ProQuest identified 17,222 studies, with 22 included. Results & Discussion: All included studies investigated the acute effects of light exposure. They were all assessed with a high risk of bias, according to the Cochrane Risk of Bias 2 tool. The analysis revealed a negative association between vmHRV and both illuminance intensity and exposure to blue light. Results regarding other colors were inconsistent. Conclusion: This review suggests that further research is necessary to explore the potential of light therapy in modulating vmHRV, particularly with an emphasis on long-term effects. Future investigations should focus on refining methodological approaches to enhance study quality.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 3.6 Other (Systematic review), 4.5 Population-specific health, 4.12 Sensation/perception/interoception, 4.23 Emotion/affect

POSTER SESSION II-047 | NEURAL EFFECTS OF FEEDBACK MAGNITUDE AND VALENCE DURING PROBABILISTIC LEARNING

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We can learn which choice has a better outcome through trial and error. A child, for example, can learn that asking dad for a cookie results in a 'yes' more often than asking mom, so they learn to ask dad. This type of probabilistic learning requires updating stimulus-reward associations in the brain using feedback information. Feedback valence (i.e. loss or gain) is known to influence neural ERP markers related to feedback processing, however, less is known about the influence of feedback magnitude. We examined the effect of feedback magnitude during probabilistic learning. The EEG recordings of 41 participants were made during the performance of a probabilistic learning task where participants chose between a picture of a face or a house in each trial. Based on their choice participants received feedback of various magnitudes (i.e. 0, 3, or 8 points). In each 20-trial learning set (30 sets), houses or faces had a higher probability of gaining feedback (60% vs. 40%). Preliminary results suggest that both feedback valence- and magnitude influence neural activity, but they do so at distinct time intervals following the feedback presentation, that is the processing of magnitude seems to precede the processing of feedback valence.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.20 Attention, 4.21 Decision making, 4.22 Learning/conditioning

POSTER SESSION II-048 | COGNITIVE MECHANISMS OF THE RELATION BETWEEN THE LATE POSITIVE POTENTIAL AND GAD

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Generalized anxiety disorder (GAD) has been linked to heightened reactivity to aversive stimuli by research showing larger late positive potential (LPP) responses. But few studies have examined whether this link is explained by cognitive processes linked to GAD. Evidence indicates that GAD is related to fear of anxiety symptoms, known as anxiety sensitivity (AS) and by intolerance of uncertainty (IU). Both are potentially relevant to processing of aversive stimuli. Aversive images may be more salient to those with concerns about the anxiety symptoms they might evoke. Aversive images also might be more salient if there is low tolerance for uncertainty. Thus, AS and IU may explain the LPP relation to GAD symptoms. This was tested using a sample of young adults ($N = 87$; 77% women) who viewed blocks of 60 negative images and 60 neutral images. Two LPP windows (400-700ms; 700-1000ms) were examined using frequentist and Bayesian approaches, revealing unique indirect effects of the LPP (both windows) on GAD symptoms through AS and IU. Neither indirect effect was stronger, and the indirect effects were present regardless of using frequentist or Bayesian analyses or quantifying the LPP using a difference wave or residuals. Consistent with models that describe emotional reactivity to negative stimuli, the findings support the LPP as a neural marker of attention to negative stimuli that is associated with GAD symptoms. Both anxiety sensitivity and intolerance of uncertainty are important risk factors that explain this association.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.20 Attention, 4.23 Emotion/affect

POSTER SESSION II-049 | ASSOCIATIONS BETWEEN SUBSTANCE USE SEVERITY AND MONETARY GAIN-VERSUS-LOSS ERPS: A TRIAL LEVEL ANALYSIS USING MLM

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Some research has reported atypical reward responsiveness in relation to substance use severity. The Reward Positivity (RewP), an ERP reflecting "liking" of non-substance rewards, has been studied as a correlate of alcohol/drug use levels, with mixed results. Examining trial-level changes in RewP along with traditional mean amplitude scoring (i.e., difference in mean ERP response to gain-versus-loss feedback), may clarify connections to substance use severity. The current study used multilevel modeling (MLM) to investigate differences in average and single-trial monetary feedback-elicited ERPs during a choice-based gain/loss task in relation to substance use in 218 adults ($M_{age} = 19.8$). No association was found between substance use and either RewP or its constituents (gain-ERP, loss-ERP), but trial-level relations emerged. Increased substance use was related to smaller RewP on early task trials, largely due to reduced gain ERP response.

Conversely, increased substance use was related to more negative loss-ERP responding over the task, leading to larger RewP on later task trials. Findings indicate a complex association between RewP and substance use severity in a monetary choice-feedback task: Early in the task, subjects high in substance use showed reduced "liking" responses, which shifted to increased sensitivity to losses later in the task. Considered within broader addiction theories, the present results align with early substance use being maintained by positive expectations for anticipated effects, compared to prolonged use facilitated by negative emotional states.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.14 Computerized Tasks (e.g. neuropsychology), 3.5 Secondary Analysis, 4.19 Motivation, 4.21 Decision making, 4.26 Other

POSTER SESSION II-050 | AMBIGUITY AND THE TIMECOURSE OF GENDER PERCEPTION: THE ROLES OF CONFLICT AND PERCEIVER GENDER

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Person construal is the process by which perceivers combine basic perceptual features with higher-order cognitive factors to assign others to social categories. It remains unclear how person construal is affected when facial features are ambiguous with respect to social categories. Here, we used ERPs to examine the extent to which early attention (face-elicited P2 ERP) and response competition (N2 ERP) are implicated in the categorization of gender-ambiguous faces. Male and female undergraduates (N=75) were asked to categorize prototypical and gender-ambiguous faces as male or female while EEG was recorded. N2 and P2 ERP components were derived, and categorization rates and response times (RTs) were analyzed with linear mixed effects models. Models using N2 amplitude as a predictor indicated that gender classification RT was predicted by an interaction, such that among female (but not male) participants, those who exhibited larger N2s to gender-ambiguous faces categorized those faces (but not prototypical faces) more slowly. Gender classifications also varied according to N2 amplitude and perceiver gender, such that gender-ambiguous faces were more likely to be classified as male as the N2 elicited by those faces increased—but only among women perceivers. Conversely, male (but not female) participants were more likely to classify ambiguous faces as male when those faces elicited larger P2 amplitudes. Findings are discussed with respect to the role of response conflict and perceiver gender in gender construal from faces.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.4 Gender, 4.21 Decision making, 4.24 Social factors

POSTER SESSION II-051 | A PSYCHOPHYSIOLOGICAL STUDY OF EVERYDAY EMOTIONS IN A VIRTUAL REALITY ENVIRONMENT

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Objectives: Automatic physiological responses to the emotional events in our everyday environments remain scarcely studied due to methodological challenges. Here, we combine virtual reality with social science methodology to create an experimental setup for studying physiological responses to everyday emotions in the laboratory. *Methods:* In this study, we recruited 35 healthy adults (30 female and 5 male, 18-65 years and above). Data was collected in Malmi (Helsinki, Finland). Participants watched a 360-degree video shot in Malmi (7 minutes + 2 minutes baseline). The video was scripted and filmed based on data gathered through urban ethnography, which employed semi-structured interviews and observations of local people to capture the affective dynamics of everyday life in the neighborhood. Participants viewed the video via a VR headset (HTC Vive Pro Eye) while their physiological and behavioral signals (ECG, facial EMG, SCR, and VR eye-tracking) were collected wirelessly. After the video, participants completed affective ratings (valence, arousal, avoidance/approach, unpredictability, discrete emotions) in response to the events in the video. *Results:* The ratings revealed a mix of unified and varied affective responses to the video events. This variation enables further analysis to investigate the association between physiological responses and self-reported emotions. *Conclusions:* Our findings show that a naturalistic virtual reality stimulus depicting events from everyday life can be used to study physiological responses to emotions in a comprehensive experimental setup.

Topics: 1.1 Human Studies: General Population - Adults, 2.2 Myography (EMG etc.), 2.6 Eye Tracking (blink, movement, size), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.14 Unconscious processes, 4.23 Emotion/affect, 4.24 Social factors

POSTER SESSION II-052 | EYES-CLOSED TO EYE-OPEN APERIODIC REACTIVITY DIFFERS BETWEEN YOUNGER AND OLDER ADULTS

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Opening and closing of the eyes result in significant changes in spectral power. These variations are most pronounced in alpha oscillations but are also observed in other bands (e.g., delta, theta, beta). Alpha reactivity has been linked to the integrity of the acetylcholine system and, along with reactivity in other bands, has been proposed as a marker of healthy aging. However, previous studies have often overlooked the influence of aperiodic neural activity, which is linked to the balance of GABAergic and glutaminergic systems and complicates the measurement of oscillatory activity in canonical frequency bands. In this study, we used data from a large open-source dataset (18-35 years old $n = 138$, 50-85 years old $n = 65$) to examine reactivity in aperiodic and periodic activity and to determine if this reactivity varied between younger and older adults. The aperiodic exponent and aperiodic offset were flatter and smaller in older adults compared to younger adults, with oscillatory power and frequencies being smaller and slower in older adults. Reactivity was consistently greater for older adults compared to younger adults: older adults exhibited greater increases in the aperiodic exponent and aperiodic offset, with these increases concentrated over fronto-central sites. Older adults also showed increased alpha power and decreased alpha frequency over fronto-central and parietal sites. These findings suggest that aging may be associated with alterations in the reactivity of both GABA/glutamate-mediated and acetylcholine-mediated systems.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.1 Aging

POSTER SESSION II-053 | VOCAL EMOTION PERCEPTION AND MUSICALITY – INSIGHTS FROM EEG DECODING

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Recently, musicality was linked to interindividual differences in vocal emotion perception, with musicians outperforming non-musicians in behavioral studies. On a neural level, this advantage was assumed to be based on an early auditory sensitivity for pitch. However, in their recent ERP study, Nussbaum, Schirmer and Schweinberger (2023) only found later effects starting from 500 ms. One potential reason is that their ERP approach may lack statistical sensitivity to reveal earlier group-differences. To address this, we performed an exploratory re-analysis of their data with a neural decoding approach. The sample consisted of 38 musicians and 39 non-musicians whose EEG was recorded while listening to vocal emotions (happiness, pleasure, anger, fear). To study the role of vocal parameters, stimuli were manipulated with parameter-specific voice morphing retaining emotional content selectively either in pitch contour (f0) or timbre only. We used a linear-discriminant classifier (LDA) in a multi-variate pattern analysis to uncover the emotional representations throughout the EEG time-course. The results converged with the previous ERP findings, revealing significant and robust emotion decoding for musicians, but not for non-musicians, between 500 and 900 ms after stimulus onset. This pattern was also present for f0-based classification but not for timbre-based stimuli. These results reinforce that the advantage of vocal emotion perception in musicians is based on superior integration of pitch information into higher-order processing rather than on earlier perceptual advantages.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.17 Machine Learning/ Deep Learning, 3.5 Secondary Analysis, 4.12 Sensation/perception/interoception, 4.23 Emotion/affect, 4.26 Other

POSTER SESSION II-054 | A MULTIMETHOD COMPARISON OF NEURAL RESPONSE TO MONETARY AND SOCIAL REWARD

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The positive valence system, as emphasized by the Research Domain Criteria initiative, has guided research on reward responsiveness. The reward positivity (RewP) is a psychophysiological biomarker of reward responsiveness, indexing individual differences in reward sensitivity. While typical experimental paradigms use monetary reward, recent work shows the presence of RewP to social reward as well. It is important to examine the relationship between monetary and social reward, and to explore the role of task-specific effects in these associations. The current study compares within-subject neural response to gain relative to loss for two social (Social Doors, Island Getaway) and one monetary reward (Monetary Doors) paradigm. Importantly, Social Doors and Monetary Doors are matched on experimental design, allowing for a separation of variance due to domain-general, domain-specific, and task-specific effects. We found that all tasks reliably elicit RewPs that are significantly correlated with one another. Using time-frequency analysis, all tasks also displayed gain-related increases in the delta band followed by loss-related increases in theta band, patterns which were correlated across tasks. Monetary Doors and Social Reward RewPs and delta activity were significantly more correlated than Social Doors was with Island Getaway. This suggests that there is neural activity related to reward sensitivity shared across reward types and specific to each reward type. The relationship between neural responses to monetary and social rewards may be strongly influenced by method factors.

Topics: 1.2 Human Studies: General Population - Children/Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.19 Motivation, 4.21 Decision making, 4.24 Social factors

POSTER SESSION II-055 | ATYPICAL PROCESSING OF VOWELS IN THE LEFT HEMISPHERE PREDICTS SPEECH IN NOISE PERCEPTION IN CHILDREN WITH AUTISM

Kirill Fadeev[1], Ilakai Romero Reyes[1], Dzerassa Goiaeva[1], Tatyana Obukhova[1], Tatyana Ovsiannikova[1], Andrey Prokofyev[1], Anna Rytikova[1], Artem Novikov[2], Tatyana Stroganova[1], Elena Orekhova[1]
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Difficulties with speech-in-noise perception in autism spectrum disorders (ASD) may be associated with impaired analysis of speech sounds, such as vowels, which are characterised by the envelope periodicity (f_0) and formant structure. Vowels elicit early (<100 ms) and sustained processing negativity (SPN) in the auditory cortex that reflects the detection of an auditory pattern based on the presence of formant structure and periodic envelope information. We used magnetoencephalography (MEG) and individual brain models to investigate whether SPN is altered in children with ASD and whether this deficit is associated with impairment in their speech-in-noise abilities. MEG was recorded while boys with ASD and typically developing boys passively listened to sounds that differed in the presence/absence of f_0 periodicity and formant structure. SPN was present in both groups with similar early onset. In children with ASD, SPN associated with processing vowel formant structure was reduced in the areas lateral to and medial to the Heschl's gyri, starting at ~150-200 ms. In the left hemisphere, this reduction correlated with impaired ability of children with ASD to recognise words in amplitude-modulated noise, but not in stationary noise. These results suggest that the automatic grouping of vowel formants into auditory patterns is impaired in children with ASD and contributes to their difficulties with speech perception in fluctuating background noise.

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Topics: 1.5 Human Studies: Clinical Samples- Children/Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.2 Development, 4.12 Sensation/perception/interoception, 4.16 Neurological disorders / Neuropathology

POSTER SESSION II-056 | EVALUATION PROCESSES WITHIN HIGHER-ORDER TASK STRUCTURES

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The ability of the performance monitoring system to evaluate the outcome of a task is important in determining the need for behavioural adjustments. In everyday behavior, this ability must be able to cope with tasks that consist of multiple distinct stages. The overall outcome of these higher-order task structures can be evaluated not until the final stage has been completed. Performance monitoring must therefore evaluate both the individual stages and the overall outcome. Here, we investigated whether the error positivity (Pe), an event-related potential related to metacognitive evaluation, reflects the overall outcome in higher-order task structures. In our experiment, we used a task with two stages in which the possibility of reaching the optimal outcome after the second stage depended on the correctness of the response given in the first stage. Our results replicated the general finding of a Pe occurring immediately after errors within each stage. Crucially, a Pe also occurred after a correctly performed second stage if an error was made in the preceding first stage. This suggests that the Pe reflects the evaluation of individual stages as well as the overall outcome in higher-order task structures.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.25 Cognitive control/executive functions

POSTER SESSION II-057 | URBAN NOISE AND WELL-BEING: INVESTIGATING OBJECTIVE NOISE LEVELS AND PHYSIOLOGICAL MARKERS OF STRESS AND SLEEP VIA APPLE WATCH DATA

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Urban noise pollution is a significant health concern, affecting sleep quality and stress globally. Psychophysiological measures can shed light on the longitudinal relationship between noise exposure and well-being, including sleep and stress, using consumer wearables like Apple Watches. To date, little research has continuously monitored physiological markers of stress and sleep alongside environmental noise levels via these wearables. This study, part of a larger citizen science project, addresses this gap by investigating individual-level noise exposure, sleep patterns, and stress (heart rate variability; HRV) through data collected from Apple Watches. Ninety participants took part in a six-week data collection through the native Health Data functionality on their Apple Watches. They also provided weekly self-reported assessments of their perceived sleep quality, stress, and noise annoyance. RM-MANOVAs, with data aggregated temporally by both day and week, revealed significant fluctuations in objective and subjective noise levels, noise annoyance, stress, and sleep. Further investigation via multivariate regression and time series analysis elucidated the impact of noise levels on stress and sleep, uncovering diverse digital phenotypes reflecting varying sleep quality and stress, depending on noise exposure and sensitivity. The findings of this study hold critical implications for both public health interventions and urban planning initiatives aimed at mitigating the adverse effects of noise pollution on individual well-being.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/ Interviews, 2.12 Ecological Momentary Assessment (EMA), 3.2 Observational Study: Longitudinal, 4.8 Sleep, 4.10 Stress, 4.24 Social factors

POSTER SESSION II-058 | EARLY SENSORY GAIN MODULATION AND VISUAL ALPHA BAND MODULATIONS REPRESENT TWO DISTINCT AND UNRELATED SIGNATURES OF ATTENTIONAL SELECTION

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Early Sensory Gain Modulation, the amplified neural representation of attended as compared to unattended stimuli, represents an important characteristic of visual selective attention. At the same time visual alpha-band activity is proposed to be a mechanism by which the attentional selection is instantiated, as across studies lower alpha amplitudes were consistently found in brain regions representing the attended as compared to the unattended stimulus. In a series of EEG experiments, we tested the relationship between visual alpha-band activity and early (attentive) visual processing depicted by flicker-induced Steady-State-Visually-Evoked-Potentials (SSVEPs). We found that (1) although SSVEPs and alpha-band activity were both modulated in a visuo-spatial attention task, their trial-by-trial modulations were unrelated. (2) Such

trial-by-trial modulations of visual alpha-band (but not SSVEP) amplitudes were behaviorally relevant when spatial attention was deployed in a Posner task. (3) For feature-based-attention alpha-band modulations did not mirror SSVEP increases for attended as compared to unattended colors. (4) Finger tap-related amplitude modulations of visual alpha-band activity did not lead to SSVEP modulations for passively viewed visual stimuli. Our findings are discussed with respect to the idea that SSVEPs and alpha-band modulations depict different levels of neural processing. The pronounced but unrelated modulations suggest that attention is multiplexed and instantiated at different neural levels.

FUNDING: Work was funded by grants to Matthias M. Müller from the Deutsche Forschungsgemeinschaft (MU 972/26-1 and MU 972/26-2).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.20 Attention

POSTER SESSION II-059 | INFLUENCE OF WORKING MEMORY TASK PERFORMANCE ON BRAIN FUNCTIONAL CONNECTIVITY DYNAMICS IN TYPE 1 DIABETES

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The brain's resting state functional connectivity, particularly the default mode and salience networks (DMN, SN), correlates with working memory performance. Working memory (WM) has been reported as crucially affected by type 1 diabetes (T1D); therefore, we aimed to evaluate the effect of a WM task's performance on resting state connectivity dynamics. Eighteen clinically well-controlled young patients with T1D and eighteen healthy paired individuals participated. Blood oxygenation level-dependent functional magnetic resonance imaging (BOLD-fMRI) was performed in a "rest-task-rest" design using a visuospatial WM protocol and faces as stimuli. Targeting DMN and SN anatomical structures, the graph theory metrics were obtained from individual functional connectivity umbralized matrices and compared (pre- and post-task) between groups. The results showed that significant differences between the groups in the pre-session were restricted to the bilateral posterior cingulate region (DMN), whereas the left insula (SN), along with right posterior angular and cingulate cortices differentiated in the post-session, all of them showing a higher degree score for T1D patients. The results suggest that T1D mainly influences WM processing by modifying multimodal integration, attentional orientation, and spatial reasoning according to the changes observed in resting-state functional connectivity.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.25 Cognitive control/executive functions, 4.26 Other

POSTER SESSION II-060 | EFFECTS OF EMOTIONAL SPEECH CONTEXT ON THE NEURAL CODING OF AMPLITUDE MODULATION

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Emotions have a strong impact on how we speak. However, the impact of emotional speech on speech processing is largely unclear. Here, we investigated the impact of emotional speech contexts on the neural tracking of amplitude modulation (<8 Hz) associated with the perception of speech constituents (e.g., syllables and words) in continuous speech signals. We collected EEGs from 15 adult native speakers of American English while they listened to 36 repetitions of 10 semantically neutral sentences spoken by an actor across three emotional speech contexts: angry, happy, and neutral speech. Sentences were presented in random order across three emotion blocks counterbalanced across participants. Participants were instructed to answer sporadic questions about the contents of the sentences to maintain attention. We calculated neural tracking of amplitude modulation as the Pearson's r correlation coefficient between the sentence amplitude envelopes and their corresponding low-frequency (<8 Hz) oscillations in the EEG. We found that amplitude modulation was more robustly tracked in neutral speech, followed by angry and then happy speech (linear mixed effects: ps <0.001). These results are consistent with the Automatic Vigilance Hypothesis, which suggests that high-arousal stimuli can disrupt speech processing by diverting attention away from the stimulus signal (Kuperman et al., 2014). We further discuss these findings with respect to acoustic differences between emotional speech contexts and subjective ratings for emotional valence and arousal.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.13 Speech/language, 4.23 Emotion/affect

POSTER SESSION II-061 | OLDER AND YOUNGER ADULTS BENEFIT FROM EMOTIONAL FEEDBACK DURING LEARNING

Nicola Ferdinand, Jana Braunwarth
University of Wuppertal, Wuppertal, Germany

With increased age, many cognitive processes become less effective. Nevertheless, there is evidence that processing of emotional information remains relatively unaffected. We therefore investigated whether older adults would benefit from emotional feedback during learning and if possible advantages are reflected in feedback-locked event-related-potentials (ERPs). Earlier ERP research faced the problem of finding non-emotional feedback that is perceptually similar to emotional feedback. For this reason, we compared strong vs. mild emotional face expressions. Twenty older (65-76 years) and 20 younger (19-27 years) adults performed a probabilistic learning task in which they learned via positive (happy faces) and negative (disgusted faces) emotional feedback. Our findings indicate enhanced learning performance in younger as compared to older adults. However, both age groups showed better learning after strong as compared to mild emotional feedback. In the ERPs, older adults exhibited a larger peak-to-peak FRN after mild compared to strong emotional feedback. We assume that mild expressions may have been more difficult to read for older adults and thus larger expectancy violations occurred. Regarding the mean P3b, usually assumed to reflect working memory updating, we found a larger component for older adults, especially in response to strong negative emotional feedback, which is probably mediating better performance in this condition. In contrast, younger adults exhibited stronger updating in response to negative feedback, independently of the strength of emotional expression.

FUNDING: This work was funded by the German Research Foundation (DFG, grant FE 1247/2-2).

Topics: 1.3 Human Studies: General Population - Elderly/ Geriatric, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.1 Aging, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION II-062 | NEURAL PROCESSES OF FEAR CONDITIONING IN OCD, PARTICIPANTS AT RISK, AND CONTROLS

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While adequate fear as a reaction to dangerous stimuli and its generalization are essential for survival, these fear learning processes often exceed a functional level in patients with obsessive-compulsive disorder (OCD). Using differential fear conditioning paradigms, mechanisms of fear acquisition and extinction have been linked to symptom development, maintenance, and treatment of OCD. In the present study, a differential fear conditioning paradigm consisting of five phases (habituation, acquisition, generalization, extinction, and return of fear) is performed using geometrical forms in which one color is paired with an aversive electrotactile stimulation (CS+) whereas another is not (CS-). Three additional colors in between the CS+ and CS- serve as generalization stimuli. Behavioral (i.e., ratings), EEG, and fear potentiated startle data are being investigated. The sample consists of patients with OCD, high-risk participants (i.e., first-degree relatives of patients with OCD and participants who experienced childhood trauma), and controls. We aim to collect data from $n = 200$ participants. Data collection is still ongoing (current $n = 110$). Preliminary results suggest a successful fear learning, both in behavioral, as indicated by larger ratings for the CS+ compared to the CS- and neural data, as indicated by an LPP differentiation between the CS+ and the CS-. Group analyses are still pending. In conclusion, the current study adds to a better understanding of fear learning processes in OCD through examining patients and high-risk participants in multiple outcome measures.

FUNDING: DFG-Grant – RI-2853/2-1 | DFG – GRK 2753/1 – Projektnummer 44964084.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.2 Myography (EMG etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.22 Learning/ conditioning, 4.23 Emotion/affect

POSTER SESSION II-063 | ELECTROPHYSIOLOGICAL MECHANISMS OF PROACTIVE INHIBITION: INSIGHTS FROM A CUED-STOP SIGNAL PARADIGM

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Proactive inhibition is the anticipatory engagement of cognitive control mechanisms undertaken to suppress prepotent responses or inhibit upcoming actions before they occur. In the present study, we investigated the neurophysiological mechanisms of proactive inhibition using a cued-stop signal paradigm and EEG measurement. In

the task, participants had to react to probes presented on the screen by pressing a button on the keyboard. In some trials a stop-signal appeared shortly after the presentation of the probe, requiring the inhibition of already initiated responses. Additionally, subjects were presented with cues indicating the probability of stop-signal appearance (0% vs. 60%) in subsequent probes. We measured event-related potentials as well as changes in EEG frequency bands evoked by the appearance of cues. Our results revealed that cues signaling a 60% probability of a stop signal (compared to 0% cues) elicited larger amplitudes of the contingent negative variation (CNV), reflecting enhanced preparatory activation. Moreover, the high probability of stop signals was associated with decreased alpha power over parietal areas, which is indicative of increased attentional allocation to task-relevant stimuli. These findings allowed for better understanding of neural mechanisms underlying the cognitive preparation for inhibiting reactions.

FUNDING: The study was funded by the grant from the National Science Centre (Narodowe Centrum Nauki; NCN) given to the presenting author (decision number 2021/41/N/HS6/02832).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION II-064 | CLIMATE ANXIETY AND THE NEURAL TIME COURSE UNDERLYING THE PROCESSING OF CLIMATE CHANGE RELEVANT IMAGES

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Climate change is an urgent global issue. Understanding the psychological mechanisms involved in processing climate change information may facilitate behavioral engagement to promote change. But, not all individuals respond in the same way to climate change information. For some, increasing exposure to climate change-related consequences leads to elevated climate anxiety, which can increase pro-environmental behavior. Recent research has explored the neural mechanisms of climate anxiety and pro-environmental behavior. Yet, the neural time course underlying climate change information processing and its association with climate anxiety is unknown. This study aimed to assess the electrocortical time course involved in processing climate change relevant images and its relationship with climate anxiety. Fifty-nine university students completed an image viewing task including emotionally positive (windmills & other mitigation strategies) and negative (industrial pollution & natural disasters) climate relevant and irrelevant images. During the task, electrical brain activity recordings were acquired using 64-channel EEG. Participants took the Climate Change Anxiety Questionnaire. Early ERPs indicated a differentiation between climate relevant and irrelevant images. Later ERPs showed a distinction between positive and negative climate images, such that climate solutions seemed most salient, climate change impacts intermediate, and irrelevant images least salient. Climate anxiety correlated with greater ΔN1 (negative - irrelevant) amplitudes, which may indicate an early threat bias.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.23 Emotion/affect, 4.26 Other

POSTER SESSION II-065 | CARDIOVASCULAR PATTERNS ASSOCIATED WITH THREAT-CHALLENGE RATIO: REPLICATION OF WITHIN-SUBJECTS ANALYSIS USING BAYESIAN MIXED MODELING APPROACH

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Previous research has established associations between threat-challenge ratio (subjective ratings of expected stressfulness/coping ability) and cardiovascular activity during motivated performance situations. However, to our knowledge, only one study has directly evaluated these associations within an individual, despite evidence that threat-challenge ratio varies within an individual over time and across situations. The current study aimed to replicate this earlier study using Bayesian mixed modeling. A sample of healthy adults (N= 51) completed four trials of serial subtraction (SS) from the Trier Social Stress Task. Electrocardiography and impedance cardiography were recorded to derive estimates of pre-ejection period (PEP) and cardiac output (CO). Threat-challenge ratios were calculated by dividing expected stressfulness ratings by coping ratings from before each trial, with a higher value indicating more a threat-like response. Two univariate Bayesian mixed models with uninformative priors were generated to assess the association between threat-challenge ratio and changes in CO and PEP during SS.

Threat-challenge ratio had a negative association with changes in CO (Beta= -0.38, 95% credible interval [CI] [-0.67, -0.11]), and positive association with changes in PEP (Beta=1.52, 95% CI [0.21, 2.97]). This is consistent with the results of the earlier study. These results demonstrate the feasibility of a Bayesian approach, and future analyses will include multivariate analysis with informative priors to further increase statistical power and enhance interpretability.

FUNDING: This project was supported by the U.S. Army Research Institute for the Behavioral and Social Sciences (W911NF-16-1-0191) awarded to K. Quigley and J. Wormwood, Co-PIs.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.10 Stress

POSTER SESSION II-066 | NEURAL DYNAMICS OF MID-MOVEMENT SENSORIMOTOR ERROR CORRECTIONS

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Mid-movement error corrections (ECs) are critical for successfully catching objects that move unpredictably. Yet, neural correlates of mid-movement ECs are unclear. EEG data were collected with 33 healthy, young adults during a manual interception task (MIT), enabling both precise measurement of behavioral movements and temporal dynamics of neural signals. The MIT involves holding the handle of a planar robot while trying to intercept a visual target moving across a screen, with instructions to "catch" the target when it changes color. We compared event-related EEG data for trials in which the target was captured (TC) on the first movement vs. those with 1-2 ECs prior to target capture. Beginning ~150ms prior to movement onset, a frontal-central negativity was evident for both TC and EC trials. This negativity persisted longer in EC trials, consistent with ERP literature on frontal midline activity in conflict and error processing. TC trial activity diverged from EC at ~400ms, shifting to a central-parietal positivity. The average time of TC relative to movement onset was 264ms (range 167-428ms). Thus, we propose that the anterior-posterior shift reflects ongoing reward processing from TC, as well as inter-trial performance evaluation and adjustment for subsequent trials. We also show mid-movement ECs are best modeled as continuous control actions supported by a frontal-central negativity, rather than recurring, discrete events. Future work will investigate these dynamics in those with neuromotor injury (e.g., stroke), toward individualized therapeutic interventions.

FUNDING: This work was supported by NIH R21NS121624 from the National Institute of Neurological Disorders and Stroke.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 2.15 Computational / Simulation, 3.1 Observational Study: Cross-Sectional, 4.25 Cognitive control/executive functions, 4.26 Other

POSTER SESSION II-067 | THE IMPACT OF CONTEXT ON VISUAL SEARCH STRATEGIES IN YOUNGER AND OLDER ADULTS

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Our research question was if older adults process task-irrelevant stimuli to a greater extent than younger adults due to their decreased inhibitory control, whether this information can later influence their behaviour in a subsequent task. 22 younger (20.8±2.0 yrs) and 20 older (67.7±3.3 yrs) adults participated in a visual search task while their EEG was recorded. Participants in the training phase executed singleton (search the different stimulus among homogeneous distractors) and feature (search the circle among heterogeneous distractors) search tasks embedded in two categories of task-irrelevant pictures, with half of the trials featuring colour pop-outs. In the test phase the stimuli and the instruction were held similarly: search the circle among the homogeneous distractors while disregard the background images. In the training phase the only age group difference was the age-related slowing in reaction time (RT), N2pc and P_D latency. Additionally, we found differences in the search mode: RT was slower, N2pc latency longer, N2pc and P_D amplitude lower during singleton compared to feature search. However, we also found that the irrelevant background pictures influenced the search mode during the test phase, despite no physical difference between stimuli and consistent instruction. RT was longer in singleton search when pop-outs were presented, but not in feature search mode. N2pc amplitude was larger in singleton than feature search trials. Our results suggest that irrelevant context becomes associated

with the task regardless of age and influences strategy implementation.

FUNDING: The research was supported by the Ministry of Innovation and Technology of Hungary from the National Research, Development and Innovation Fund (OTKA K 132880).

Topics: 1.3 Human Studies: General Population - Elderly/ Geriatric, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.1 Aging, 4.20 Attention

POSTER SESSION II-068 | A COUPLED LATENT DIFFERENTIAL EQUATION APPROACH TO UNDERSTANDING SECOND-BY-SECOND MOTHER-CHILD RSA DYNAMICS IN EARLY CHILDHOOD

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Parent and child respiratory sinus arrhythmia (RSA) coregulation (CO) supports children's emerging emotion regulation and predicts child psychopathology (Beauchaine, 2015; Lunkenheimer et al., 2021). However, prior studies have not sufficiently mapped parent- versus child-led RSA CO dynamics, nor the time scales on which they operate, which constrains an understanding of their implications for development and psychopathology. This study examined mother-child RSA dynamics at different time scales of RSA estimation, focusing on whether change in second-by-second mother or child RSA led to dampened or amplified RSA oscillations of the other during a challenging puzzle task. Participants were 107 mother-child dyads at child age 3 years (53% female; 74% White) oversampled for familial risks. Coupled latent differential equation models (Hu et al., 2014) with 5-dimension time-delay embedding (i.e., oscillations estimated across 5 consecutive RSA values) revealed child-led CO, such that greater changes in child RSA (i.e., quicker returns to homeostasis) predicted more rapid damping of mother RSA (i.e., fluctuations that diminished in range over time). No RSA CO was evident with a 10-dimension time-delay. These findings revealed children's greater RSA regulation led to mothers' RSA down-regulation over time, suggesting children's better regulatory capacities reduce maternal arousal, and that these processes occur on a faster time scale. This novel finding may inform analytic modeling choices, etiological knowledge, and intervention targets in future work on parent-child RSA CO.

FUNDING: This study was funded by National Institute of Child Health and Human Development (K01HD068170, R01HD097189) awarded to EL.

Topics: 1.2 Human Studies: General Population - Children/ Adolescents, 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.2 Development, 4.26 Other

POSTER SESSION II-069 | AFFECTIVE INFLUENCES ON EFFORT AND THE ACTION SHIELDING EFFECT IN A 'DO YOUR BEST' CONTEXT

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The Action Shielding Model (Gendolla et al., 2021) identifies the way individuals engage in action - through personal choice or external attribution - as a moderator of affective influences on effort. Building on prior research on the action shielding effect within the context of fixed difficulty standards, our laboratory experiment (N = 104) extends this research line to an unfixed "do your best" context. We investigated whether personal choice, as opposed to external attribution, moderates incidental affective influences on effort-related cardiovascular responses in situations where no explicit performance standards are provided. We expected strong action shielding and thus low receptivity to affective influences when participants could choose aspects of the task to be performed. In contrast, we expected high receptivity to affective influences when the task was assigned, and consequently influences on subjective task difficulty and effort. The response pattern of cardiac pre-ejection period (PEP) during performance aligned with our hypothesis: Participants in the assigned condition showed lower PEP reactivity when exposed to positive incidental affective stimulation compared to negative affective stimulation while performing the task. Notably, these affective influences were absent among participants who personally chose task aspects. This supports the moderating role of personal choice and demonstrates a nuanced interplay between personal choice, affective influences and effort.

FUNDING: SNF: 100014_185348.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.19 Motivation, 4.23 Emotion/affect

POSTER SESSION II-070 | BODY POSTURE OUTLINES SPECIFIC FREQUENCY-DEPENDENT BRAIN CONNECTIVITY: A HIGH-DENSITY ELECTROENCEPHALOGRAPHY STUDY

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The effect of body posture on brain functional connectivity (FC) has been barely investigated due to technological and practical limitations linked to currently available neuroimaging techniques. Recent methodological advances on high-density electroencephalography (hdEEG) systems have enabled the detection of brain networks and opened the way for using hdEEG as a brain imaging tool to assess FC in different body positions. In this study, we used hdEEG data to investigate whether different body postures outline specific FC. We collected resting state hdEEG data in 18 young adults in two different body postures, i.e., upright sitting position (SP) and bed rest (BR). Following hdEEG data source localization, we performed a seed-based FC analysis in several brain networks, including Somatomotor (SMN), Visual (VN), and Cingulo-insular (CIN) networks in delta, theta, alpha, beta, and gamma frequency bands. We then assessed differences in FC between the SP and BR body positions. FC showed network- and frequency-specific features associated with a different body posture. We reported overall higher FC in the delta frequency band for the SP, compared to the BR, body posture. Also, we observed that the level of network segregation generally decreased in BR, for the VN and CIN in the theta frequency band and for the SMN in the beta frequency band. Our study provided the first electrophysiological evidence of differences in resting state FC associated with body posture. We found that attention, perceptual and motor networks might be especially affected by a different body position.

FUNDING: STARS@UNIPD programme for the INTEGRATE (Inter-Network communication to Explore how simulated microGRavity can model Aging Traits on Earth) project to MM.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.15 Computational/Simulation, 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.25 Cognitive control/executive functions, 4.26 Other

POSTER SESSION II-071 | NON-INVASIVE TDCS STIMULATION OF THE VENTROMEDIAL PREFRONTAL CORTEX MODULATES EMOTIONAL RESPONSE TO MUSIC

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Previous research has shown that non-invasive excitatory stimulation of the vmPFC by tDCS increases the positivity bias toward pleasant scenes and faces in comparison to unpleasant emotional stimuli. Given the highly emotional nature of music, we aimed to explore whether neuromodulation via vmPFC-tDCS could modulate music-induced emotional processing. A total of 30 healthy volunteers (15 women) participated in two laboratory sessions, in which an excitatory and inhibitory vmPFC-tDCS was administered. Before (i.e. at baseline) and after stimulation, participants listened to 60 unpleasant and pleasant music excerpts (30 pleasant, 30 unpleasant) from the Film Music Stimulus Set (FMSS), each 8 seconds long, while the induced neural activity was recorded using whole-head magnetoencephalography. Results showed a relative increase/reduction of neural vmPFC activity in the alpha frequency band during the listening to unpleasant/pleasant music after excitatory compared to inhibitory stimulation. As increased alpha typically correlates with reduced arousal related neural activity, these results confirmed our hypothesis that excitatory compared to inhibitory vmPFC-tDCS evokes an enhanced/reduced positivity/negativity valence bias in healthy individuals. Our findings recommend clinical interventions using non-invasive neuromodulation in patients with depression or other affective disorders with altered vmPFC default mode activation.

FUNDING: DFG project - The tinnitus network: comorbidity, plasticity and response to treatment Women in Research (WiRe) Fellowships - Figuring Out How Our Brains and Bodies Tick with Emotion.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.6 Eye Tracking (blink, movement, size), 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.23 Emotion/affect

SESSION II-072 | INTRINSIC MOTIVATION AFFECTS ELECTROPHYSIOLOGICAL UNDERPINNINGS OF WORKING MEMORY

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In this study, we explored the impact of intrinsic motivation on oscillatory brain activity during the encoding, retention, and retrieval processes of working memory (WM). We recorded EEG from 48 participants during the performance of the Sternberg task, with set sizes varying between 3 and 15 letters. We transformed the objective difficulty levels into three subjective difficulty levels: "easy", "difficult", and "very difficult". To investigate the impact of intrinsic motivation, we used three personality trait factors as indicators: the Resilience factor (associated with mental toughness, self-efficacy, and achievement motivation), Need for Cognition, and Self-assessed Effort to perform a task. Our results showed that motivational personality traits influenced EEG correlates of WM, particularly under conditions of high subjective difficulty. However, contrary to our expectations, the Resilience factor was related to reduced alpha depression during encoding and retrieval at the "very difficult" task level. Likewise, Self-assessed Effort reduced retention-related theta activation at the “difficult” condition. Based on our findings, we can conclude that the Resilience personality trait impacts the mechanism of effort allocation during encoding and retrieval of WM. It is possible that individuals with high Resilience are better able to conserve cognitive resources when faced with excessively demanding tasks. Meanwhile, the level of effort invested in retention may depend on perceived current level of effort.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.11 Personality, 4.19 Motivation, 4.25 Cognitive control/executive functions

POSTER SESSION II-073 | THE CONSEQUENCES OF COLOR VIVIDNESS ON ATTENTIONAL DEPLOYMENT IN VISUAL SEARCH

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We investigated how the saliency of visual items influences visual information prioritization that is relevant to the task. Color chroma (CIELab 1979) was manipulated in two visual search experiments, while the subjective luminance and color hue of all search array items was controlled. While recording the electroencephalogram, human participants searched for a target of predefined shape and color among three other shapes when it emerged from a stream of flickering isoluminant grey placeholders. All four items were tagged with an individual flicker frequency evoking distinguishable Steady-State Visual Evoked Potentials (SSVEPs) known to originate in early, including color sensitive, visual cortex and to track deployment of attentional resources. Forty participants performed the task with item colors of low chroma and another set of forty participants performed it with high chroma colors. Higher chroma generally boosted SSVEP amplitudes independent of item type, i.e., targets or distractors. Interestingly, deployment of attention to targets relative to distractors was comparable between the different chromatic conditions. The results suggest that attentional deployment to items in a search array depends on their low level stimulus features, which need to be well controlled to allow inferences about capture or suppression of particular search items. Furthermore, frequency-tagging techniques can be advantageous to studying these low level contributions to how humans prioritize information of behavioral relevance.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.20 Attention

POSTER SESSION II-074 | HEART RATE VARIABILITY, AIR POLLUTION AND FITNESS

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Heart rate variability (HRV), an index of cardiac vagal modulation of parasympathetic activity, can serve as an indicator of self-regulation at the cognitive, emotional and health level. While exposure to air pollution can decrease HRV, higher physical fitness is cardioprotective. Whether the benefits of exercise/fitness on HRV apply to situations where exercise is performed in polluted air is unknown. Data from the Czech Study Healthy Aging in Industrial Environment were utilized comprising 890 adults aged 18-65 years (mean age 37.4yrs,SE±0.41). For each participant an level of the lifetime exposure to PM2.5 was calculated. Main HRV variables were RMSSD and HF-HRV. Cardiorespiratory fitness was determined by peak aerobic power and participants were categorized into fitness groups according to ACSM guidelines. After controling for age, sex, education, higher exposure to PM2.5 correlated with lower RMSSD and HF-HRV ($\tau \leq -0.04; p \leq 0.047$). Stratified analysis by fitness level revealed an association between exposure to PM2.5 and lower RMSSD and HF-HRV in participants with very poor/poor fitness($\tau \leq -0.11; p \leq 0.038$), whereas the negative effect of PM2.5 on RMSSD was abrogated in those with fair/good or excellent/superior fitness($\tau \geq -0.05; p \geq 0.111$). Additional adjustments for cardiometabolic condition and medication use had little effect on the observed associations. We showed that physical fitness may modify the PM2.5-HRV association and conclude that physical fitness may be protective against the negative effects of air pollution on the autonomic nervous system.

FUNDING: The submitted study has been produced with the financial support of the European Union under the LERCO project number CZ.10.03.01/00/22_003/0000003 via the Operational Programme Just Transition. Data were collected in the project "Healthy Aging in Industrial Environment – HAIE (No. CZ.02.1.01/0.0/0.0/16_019/0000798".

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 3.1 Observational Study: Cross-Sectional, 4.1 Aging, 4.26 Other

POSTER SESSION II-075 | MINDFULNESS TRAINING MODULATES EARLY SOMATOSENSORY PROCESSING

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Mindfulness-based interventions are increasingly utilised to address common mental and physical health problems, such as depression, anxiety, and chronic pain. However, the underlying neural mechanisms are largely unknown. The present study investigated effects of the 8-week Mindfulness-Based Stress Reduction (MBSR) program on modality-specific attentional processes and mental health outcomes. Before and after the program, participants (n=22) completed self-report mental health measures and performed an auditory-tactile attention task with concurrent electroencephalography recording. In this task, participants were presented with a sequence of touches and tones. They had to either count touches in one of two experimental blocks, or tones in the other block. Early somatosensory event-related potentials (ERPs; N20-P50 components) were significantly modulated when touch was attended, consistent with changes to thalamic and primary somatosensory cortex activations. In contrast, no such modulations were present in the auditory modality, and attentional modulations of mid- or later latency components were also not changed. Analysis of the self-report measures revealed a reduction of incidence of minor psychiatric disorder. These findings show a modality specific effect on thalamocortical processes by mindfulness training. This change may be the stepping stone to wider cognitive and mental health improvements elicited by MBSR programs.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.20 Attention, 4.22 Learning/conditioning

POSTER SESSION II-076 | NATURE IMAGERY'S IMPACT ON ERROR RELATED NEGATIVITY

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Attention Restoration Theory (ART) proposes that natural environments allow the brain's cognitive abilities to restore and recover, thus increasing attentional resources. Measuring brain activity in response to natural stimuli through Event Related Potentials (ERPs), as assessed by electroencephalography (EEG), can explore this theory. A validated ERP used for assessing attention and cognitive control is the Error Related Negativity Component (ERN). Based on ART, there are increased attentional resources to devout to cognitively demanding tasks after viewing nature. Therefore, an increase in ERN amplitude while performing an attentionally demanding task is expected post-natural stimuli. This effect has been observed in real-world nature. This study aimed to determine whether exposure to nature imagery influences the amplitude of the ERN similarly to real-world nature. During this study, 62 individuals participated in three experimental sessions in a 2x3 between-subjects repeated measures design. Participants viewed no nature imagery in session 1, were randomized into either a nature-imagery viewing condition or urban-imagery viewing condition in session 2, and viewed no nature imagery in session 3 (view time was 10 minutes per setting). In each condition, a Flanker Task was completed while ERN amplitude was assessed. The results indicate no significant differences in ERN amplitude between the nature and urban settings and an insignificant interaction between setting and session. This indicates that nature imagery does not elicit the same benefits as real nature immersion.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.4 Clinical Trial (RCT etc.), 4.12 Sensation/perception/interoception, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION II-077 | PROACTIVE P3 CORRELATES WITH DRIFT RATES IN DRIFT DIFFUSION MODEL OF COGNITIVE CONTROL AND PREDICTS PSYCHOSIS PATIENT IMPAIRMENTS

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We sought to determine whether hierarchical drift diffusion modeling (hDDM) parameters provided useful guidance for interpreting P3's in a cognitive control paradigm, and how well these metrics characterized people with psychosis (PwP). 68 people with psychosis (36 with EEG) and 64 controls (51 with EEG) performed a variant of the expectancy AX cognitive control paradigm across two sessions. Data from both sessions were combined in an hDDM that resolved trial-level data in terms of drift rate, decision threshold, non-decision time and bias. ERP analyses were locked to the cue, which indicated whether cognitive control would be needed or not when responding to the probe stimulus 1-3.5s later. Behaviorally, PwP showed a non-specific impairment in proactive cognitive control. HDDM modeling found PwP had slower drift rates to probe stimuli, thought to reflect evidence accumulation ($F[1, 121] = 22.73$, $p < .005$). Cue-related P3 responses correlated with probe-related drift rates (r's = .33-.51) in both HC and in PwP. SHapley Additive exPlanations (SHAP) showed drift rates on proactively-cued trials discriminated between PwP and controls and defined the dimensions that stratified the patient sample. While deficits in the central executive network generator of the P3 are known to be impaired in psychosis, here proactive P3's reflected state maintenance processes to facilitate subsequent evidence accumulation rather than evidence accumulation itself, and that processes appeared impaired in psychosis patients.

FUNDING: NIMH P50MH119569.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.25 Cognitive control/executive functions

POSTER SESSION II-078 | LATEROFRONTOPARIETAL NETWORK CONNECTIVITY IN FIRST-EPISODE SCHIZOPHRENIA

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Schizophrenia (SZ) is associated with executive functioning impairment as early as the clinical high risk and first-episode (FE) phases of illness. However, consensus is lacking on associated aberrant brain network connectivity and how such connectivity may be improved via cognitive training (CT). Impediments to progress may include reliance on a unitary model of lateral frontoparietal network (L-FPN), a neural network that is integral to executive functioning. Based on research distinguishing two L-FPN subnetworks that display opposite coupling to default mode network (DMN) and dorsal attention network (DAN), the present study evaluated L-FPN_A and L-FPN_B subnetworks to determine: 1) how FE SZ differ from healthy comparison (HC) subjects in L-FPN inter- and intra-network functional connectivity, and 2) if CT alters L-FPN connectivity in FE SZ. Resting-state fMRI from 47 FE SZ and 36 HC prior to CT was used to compare a) connectivity between L-FPN_A and L-FPN_B and b) L-FPN_A/L-FPN_B connectivity with DAN and DMN. Follow-up data collected from 18 FE SZ were analyzed to assess changes in L-FPN connectivity after 6 months of CT. Prior to CT, FE SZ and HC exhibited similar inter- and intra-L-FPN subnetwork connectivity. Following CT, L-FPN intranetwork connectivity increased among FE SZ (d=0.2). Findings suggest that the early phase of SZ is associated with minimal disruption to L-FPN network connectivity. CT may strengthen intranetwork L-FPN connectivity in FE SZ, suggesting that CT has potential to prevent or reduce aberrant connectivity associated with the chronic phase of SZ.

FUNDING: This work was supported by the National Institute of Mental Health (R01 MH110544 and R01 MH110544-S1) and the UCLA Division of Graduate Education.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.5 Secondary Analysis, 4.7 Psychopathology, 4.25 Cognitive control/executive functions

POSTER SESSION II-079 | INTRAINDIVIDUAL VARIABILITY OF ERN AND REWP IN PSYCHOSIS

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Studies of performance monitoring in psychosis often neglect the intraindividual variability of event-related brain potentials (ERPs). However, variability of ERP indices of performance monitoring might represent a key feature of psychosis. Blunted error-related negativity (ERN) and intact reward positivity (RewP) are commonly observed in psychosis. We hypothesized that patients with psychotic disorders would show greater intraindividual variability of ERN and similar variability of RewP than controls. ERPs from flanker and doors tasks and symptom ratings of 135 patients with psychotic disorders, 150 healthy comparison participants from the NIMH data archive (R01MH110434-01) were analyzed. Multilevel location-scale models were used to examine intraindividual variability of ERPs. Expected group differences were found for mean ERN and RewP. However, groups did not differ in intraindividual variability of ERN and RewP. Exploratory analyses showed that symptoms did not predict intraindividual variability of ERN; however, thought disorder symptoms predicted greater variability of RewP. Findings indicate that patients with psychotic disorders demonstrated stability in indices of performance monitoring and reward processing. Considering the comparable stability of ERPs, future research might investigate trial-by-trial changes in ERP amplitudes predict behavioral adjustments as possible evidence of intact performance monitoring.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.5 Secondary Analysis, 4.7 Psychopathology, 4.21 Decision making, 4.25 Cognitive control/executive functions

POSTER SESSION II-080 | DEVIATING DYNAMICS OF PUPIL SIZE DURING SUSTAINED ATTENTION IN CHILDREN WITH ADHD

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Attention and arousal influence the pupil size. In particular, tonic changes in pupil diameter are supposed to be influenced by the activity of the locus coeruleus-norepinephrine (LC-NE) system. This small structure in the brain stem significantly contributes to the regulation of attention and arousal. Dysfunction of both plays a critical role in attention-deficit/hyperactivity disorder (ADHD), but the underlying neural and neurochemical processes and their interplay are not yet sufficiently understood. This study examines changes in pupil size and performance in a newly developed sustained attention task in children and adolescents with ADHD and healthy age-matched controls (N=65, mean age 11.1 years). As expected, performance was reduced in individuals with ADHD compared to controls. Pupil diameter decreased during the task in the control group but not in the ADHD group. The results suggest an insufficient adaptation of arousal to task demands and an accompanying overactivity of the LC-NE system in the ADHD group. These findings underline the need for further research to elucidate the complex interplay between attention, arousal, and the underlying neural and neurochemical processes in ADHD.

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Topics: 1.5 Human Studies: Clinical Samples- Children / Adolescents, 2.6 Eye Tracking (blink, movement, size), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION II-081 | NEURAL UNDERPINNING OF FREEZING RESPONSES IN ANTICIPATION OF AVOIDABLE AND INEVITABLE THREATS

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Freezing is an adaptive defensive response to prepare for subsequent escape from imminent threats that has been primarily studied in rodents. In humans, freezing seems to be characterized by a multimodal pattern of heart rate bradycardia, elevated skin conductance, and freezing of gaze. However, the underlying neural mechanisms are not yet well understood. Here, we assessed functional magnetic resonance imaging data in anticipation of avoidable and inevitable painful stimulation. Fifty participants observed naturalistic images in the scanner while their heart rate, skin conductance, eye movements, and pupil dilation were recorded. The color of the fixation cross preceding each trial was indicative of the trial type and predicted an inevitable shock, no shock, or an avoidable shock after picture offset. In the latter condition, the shock could be evaded by a quick button press upon stimulus offset. As expected, gaze centralization, reflected by reduced average fixation distances from the center of the screen, occurred predominantly during anticipation of avoidable threats. Likewise, autonomic responses were strongest in the flight trials, followed by the inevitable shock trials, with the weakest responses observed during the safety trials devoid of aversive stimulation. These results were further related to neural activity changes in subcortical threat-related circuits, but also in sensory, and motor areas, underscoring the complex nature of freezing responses aimed at enhancing perceptional processing and action preparation.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.6 Eye Tracking (blink, movement, size), 3.3 Lab Based Experiment, 4.19 Motivation, 4.20 Attention, 4.23 Emotion/affect

POSTER SESSION II-082 | SENSITIZATION AND IMMUNIZATION THROUGH OBSERVATIONAL LEARNING - AN EXPERIMENTAL EVALUATION OF PRIOR LEARNING EXPERIENCES AND MODELING BEHAVIORS IN THE CONTEXT OF INTEROCEPTIVE THREAT

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Research on the etiology of interoceptive fear assigns early experiences and modeling behaviors an important role. This study investigated how self-reported observational learning experiences interact with different demonstrator behavior to interoceptive threat (loaded breathing) on modulating future fear learning in observers. A differential conditioning paradigm with geometrical shapes (CSs) and inspiratory resistive loads to induce temporary dyspnea (US) was used. The experiment was divided into an observational learning and a conditioning phase (direct acquisition and extinction). Observational learning experiences were manipulated by filming a confederate demonstrator reacting either fearful or calm to the CS+ while completing an interoceptive conditioning experiment. Fear learning was assessed using subjective fear and US-expectancy ratings as well as psychophysiological measures, i.e., skin conductance response (SCR) and startle eyeblink. Prior learning experiences were assessed using the Learning History Questionnaire. Compared to the observers of the control condition and the calm demonstrator, observers of the fearful demonstrator exhibited greater CS+/CS- differences at the beginning of direct fear conditioning as indicated by larger startle eyeblink response magnitude for CS+ as compared to CS- and ITI. However, this effect was specific for participants who reported prior observational learning experiences. Results will be discussed with reference to implications for the etiology of anxiety disorders.
Topics: 1.1 Human Studies: General Population - Adults, 2.2 Myography (EMG etc.), 2.7 Skin responses, 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.12 Sensation/perception/interoception, 4.22 Learning/conditioning

POSTER SESSION II-083 | NAVIGATING THROUGH EMOTION-COGNITION INTERACTIONS: BRAIN OSCILLATIONS OF VISUO-SPATIAL ATTENTION AND AUDITORY EMOTIONAL PROCESSING DURING SIMULATED DRIVING

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During driving, several cognitive processes are required, including visuospatial attention and working memory. In addition, some cognitive resources are also allocated to environmental stimuli, such as conversations. However, research on interacting emotional and cognitive processes and their underlying neurophysiological signatures remains scarce. We investigated interactions of emotional speech and task load during simulated driving in a magnetoencephalography study. We hypothesised that for low load (LW) drives with sufficient cognitive resources, low (LV) and high (HV) valence but not neutral (NV) speech captures attention, but without major interference. During high load (HW), only HV and NV but not LV speech effects can be downregulated by executive control. Spatial permutation-based clustering of MEG sensor data revealed emotion and workload effects in the theta, alpha, and beta bands. We observed increased fronto-temporal theta as well as parieto-temporal alpha and beta during LV and HV compared to NV, suggesting the recruitment of frontal executive functions and re-orientation either towards the road or the emotional speech processing and appraisal. Increases in alpha and beta power during emotional speech likely reflect functional suppression of (right) parieto-temporal emotion-based processes. Decreased beta oscillations during high workload drives imply increased visual processing. In conclusion, findings indicate that emotional but not neutral speech independent of the current cognitive load recruits specific cognitive control mechanisms and processing modes.
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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/

Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.20 Attention, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION II-084 | LATERAL FRONTOPOLAR THETA OSCILLATIONS SUPPORT FLEXIBLE SWITCHING BETWEEN EMOTION REGULATION STRATEGIES

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Emotion regulation (ER) flexibility, the ability to switch to an alternative ER strategy when the current strategy falls short, is central to well-being. However, neural mechanisms of this adaptive ability remain largely unknown. Lateral frontopolar cortex (FPC) has been suggested to support flexible behavior by monitoring and evaluating the validity of current versus alternative behavioural strategies. Here, we tested whether it would also be involved in flexible switching between ER strategies. Sixty-three participants implemented reappraisal or distraction as an ER strategy in response to emotional pictures of varying reappraisal affordance levels (subjective reappraisal difficulty). Subsequently, they decided to maintain the current or switch to the alternative ER strategy and consequently implemented the chosen strategy. Switching was predicted by the reduced physiological efficacy of an initial ER strategy (indexed by EMG corrugator activity) and was made in accordance with situational demands (reappraisal affordances). Switching to an alternative ER strategy increased theta-band (2–6 Hz) power over lateral FPC around the time of the switch. Theta-power increase over lateral FPC might reflect weighting the evidence for switching to an alternative versus maintaining the current ER strategy. These findings provide insights into cortical oscillatory processes supporting flexible strategy switching and suggest promising neural targets for stimulation-based therapies aimed at enhancing ER flexibility in affective psychopathologies.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.2 Myography (EMG etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.23 Emotion/affect

POSTER SESSION II-085 | FEASIBILITY OF USING HIGH-FREQUENCY SSVEP IN PROBING GOAL-DRIVEN AND STIMULUS-DRIVEN AFFECTIVE ATTENTION

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The generation and regulation of emotional responses can unfold over several seconds. This limits the usefulness of event-related potentials that are most sensitive to temporal dynamics within about a second after the onset of a stimulus. At its core, ERP is merely a sudden change in stimulus contrast reflected in aggregated EEG waveform, which is, among other things, influenced by affective attention. Considering this, a potential solution would be to increase the number of these contrast changes in a unit of time, an approach known as SSVEP which provides an opportunity to conduct a query over a much longer time-window. In this study (N=44) we did just that; more specifically, we tested the feasibility of using a barely noticeable (and therefore less disturbing) periodic contrast modulation in the gamma range to probe variation in bottom-up affective attention driven by stimulus valence (negative vs. neutral) and top-down attention (unregulated viewing vs. distraction) deployed towards the same stimuli. The time-frequency analysis based on rhythmic entrainment source separation (Cohen & Gulbinaite, 2017) revealed a sensitivity towards top-down attention, albeit in an unexpected direction and only in the first time-window. Surprisingly, affective valence did not modulate EEG power at the tagged frequency. This raises questions about the differential origins of these effects and about the feasibility of the high-frequency SSVEP in the study of visual affective attention.

FUNDING: Estonian Research Council grant PSG525 (provided to Andero Uusberg).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.20 Attention, 4.23 Emotion/affect

POSTER SESSION II-086 | CHOICE RESPONSES DURING THREAT AND REWARD: COGNITIVE MODELING AND ELECTROPHYSIOLOGY

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Response selection and decision making are fundamental building blocks of adaptive behavior, particularly when distinguishing threatening from non-threatening situations. In the present study, an EZ-diffusion model was used to investigate (1) how model-estimated decision parameters vary across cues associated with threat and reward outcomes and (2) if these parameters are related with alpha-power changes recorded from the EEG. Participants (N=65) completed a multi-cue task where cues (90 per condition) were presented in pseudo-random order. Each trial began with a fixation cross followed by a colored cue. The color indicated the potential outcome: threat (electric shock) or a monetary reward ($5 total). The cue was followed by a naturalistic image and then a command screen that prompted participants to respond. Participants that responded correctly either avoided the shock or earned a point toward the monetary reward. There was a significantly higher drift rate for the shock compared to the reward condition, indicating that participants accumulated evidence more rapidly under threat compared to reward. This was consistent with posterior alpha-power findings: Cue-evoked alpha-power was lower as participants prepared their response in the shock condition, compared to the reward. This is consistent with heightened sensitivity to threat cues. Together, these findings are consistent with the notion that the interplay of sensation and motor action is facilitated under threat.

FUNDING: NIMH grant R01MH125615.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.6 Eye Tracking (blink, movement, size), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.21 Decision making, 4.22 Learning/conditioning

POSTER SESSION II-087 | A NEUROVISCERAL APPROACH TO BRAIN FOG SYMPTOMS IN POST-COVID SURVIVORS

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Previous studies have shown that some individuals following acute COVID-19 infection may demonstrate symptoms of so-called brain fog, manifested by difficulties with memory, concentration and reasoning. Meanwhile, in several other conditions, reduced vagal activity, recorded by heart rate variability on the electrocardiogram (HRV-ECG), has been linked to impaired cognitive function. The present study sought to examine the relationship between cardiac vagal activity and complaints of brain fog in a sample of 53 patients with post-COVID syndrome (31 women; age = 52.7 years). Participants underwent a 5-minute assessment of HRV at rest and were then given an attention task to assess concentration and resistance to mental fatigue. Linear regressions showed that HRV predicted performance in both accuracy during the concentration task ($B^*=0.32$; $r2=0.087$; $p<0.02$) and resistance to mental fatigue ($B^*=-0.35$; $r2=0.074$; $p<0.03$). To our knowledge, this is the first study to investigate brain fog symptoms after COVID-19 infection from a neurovisceral perspective. These findings may support the relationships between vagal activity and COVID-19 cognitive deficits after the acute phase of infection.

FUNDING: This work was supported by Carlos Chagas Filho Foundation of Research Support in Rio de Janeiro (FAPERJ).

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION II-088 | AN ACUTE BOUT OF AEROBIC EXERCISE ENHANCES REAPPRAISAL AND REDUCES EMOTIONAL REACTIVITY IN INDIVIDUALS WITH ELEVATED ANXIETY SENSITIVITY

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Anxiety disorders are the most common mental disorders in the U.S. and rates have been steadily increasing in young adults (18-25 years old). Anxiety sensitivity (AS) is a transdiagnostic risk factor that can be modified through intervention. Exercise is an effective treatment for AS, but how exercise leads to these changes in AS remains unknown. Thus, the purpose of this study was to examine whether cognitive reappraisal (CR) is a mechanism that explains exercise induced changes in AS. Using a randomized within-subjects crossover design in a sample of 65 college-aged females with elevated AS, measures of CR and AS were assessed before and after 20-min of either an acute bout of moderate-intensity aerobic exercise or a control condition during two separate, counterbalanced sessions. A computer-based electroencephalogram (EEG)

reappraisal task was used to assess CR, which was indexed by the late-positive potential (LPP) amplitude. Contrary to expectations, results showed a significant increase in LPP amplitude for reappraisal trials after the exercise intervention compared to the control. Interestingly, however, results showed a significant decrease in LPP amplitude while participants passively viewed anxiety-related images following exercise compared to the control. No significant changes in AS were observed in either group. Thus, the results confirm that an acute bout of aerobic exercise leads to changes in purported mechanisms of action in AS – namely, increased CR and decreased emotional reactivity – despite the lack of immediate reductions in self-reported AS symptoms.

FUNDING: This project was funded by the National Science Foundation Graduate Research Fellowship Program.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.19 Other, 3.3 Lab Based Experiment, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION II-089 | FIND YOUR RHYTHM AND REGULATE: BREATH-SYNCED VIBRATION DURING BREATH-FOCUSED MINDFULNESS REDUCES RESPIRATION VARIABILITY IN TRAUMA-EXPOSED ADULTS

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Stress and anxiety are associated with increased autonomic arousal, including altered respiration. Breath-focused mindfulness has been shown to reduce stress and anxiety, but trauma-exposed adults with dissociation have difficulty engaging in mindfulness. Our ongoing trial examines if vibration-augmented breath-focused mindfulness (VABF) can improve engagement. Here, we test if VABF reduces respiration rate (RR) or respiration variability (RV), and we test for associations between RR and RV with negative emotions. 128 trauma-exposed adults (mean age=30.21 years; *SD*=11.83 years) with elevated dissociation volunteered to participate in our ongoing clinical trial and completed ≥5/8 visits. Participants were randomized to one of four mindfulness interventions: VABF (n=34); breath-focus only (BF; n=33); vibration only (V; n=34); open awareness (OA; no vibration or breath-focus, n=27). Linear mixed-effects models (LMEs) tested effects of intervention type, visit, and their interaction on RR and RV and tested for associations between RR and RV with negative emotions. LMEs showed a significant interaction between intervention type and visit on RV (p=.014; η_p^2=.01), such that VABF decreased RV across visits while the other interventions (BF, V, OA) increased RV across visits. RV was also found to be positively associated with anxiety and anger ratings (ps<.001; rs>.141). These findings provide support that RV is a modifiable target through VABF and is a meaningful metric to examine regulatory processes in clinical populations with higher autonomic arousal and negative emotionality.

FUNDING: This study was supported by funding from the National Institutes of National Center for Complementary and Integrative Health under award number R01AT011267 (awardees: Negar Fani, Greg Siegle, Robert Krafty) and from the National Institute of Mental Health under award number F32MH134631 (awardee: Timothy McDermott; sponsors: Negar Fani, Greg Siegle).

Topics: 1.1 Human Studies: General Population - Adults, 2.4 Respiratory, 3.4 Clinical Trial (RCT etc.), 4.7 Psychopathology, 4.15 Biofeedback, 4.23 Emotion/affect

POSTER SESSION II-090 | FRONTAL OSCILLATORY DYNAMICS UNDERLIE THE PERCEIVED-TIME-DEPENDENT ACCUMULATION OF PHYSICAL FATIGUE

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Recent studies suggested that fundamental psychophysiological processes, such as physical fatigue, follow a subjective rather than an objective temporal evolution. However, the neural correlates underlying this effect and its disentanglement from motivational factors (i.e., performance goals) remain unknown. To investigate how physical fatigue can be subjectively influenced, we asked 24 subjects to perform 100 isometric knee extensions in four separate sessions. While the rest time between contractions was identical for each session, each contraction's real (R) and perceived (P) time were independently manipulated. In each session, the contractions' time was either short (10s) or long (12s), while the clock displayed to the participants

was either Normal (N) or Biased (B). This manipulation led to 4 counterbalanced conditions: N10 (10s P, 10s R), N12 (12s P, 12s R), B10 (10s P, 12s R), B12 (12s P, 10s R). Using force and EMG recordings, we first showed that the increase in physical fatigue over contractions was larger in N12 compared to N10, B12 but also B10, in which the real workload was the same. Moreover, EEG analyses revealed a significant power difference in theta and beta bands over frontal but not motor areas, between N10 and N12, but no difference between conditions with the same subjective time. All in all, these results highlight a subjective time-dependent fatigue accumulation (i) irrespective of motivational factors, (ii) that can be slowed down but not accelerated, (iii) that is mediated by an oscillatory dynamic following subjective time in frontal areas.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.2 Myography (EMG etc.), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.14 Unconscious processes, 4.26 Other

POSTER SESSION II-091 | EVIDENCE FOR POST-DECISIONAL CONFLICT MONITORING IN DELAY DISCOUNTING

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Impulsivity can be measured by offering a sequence of various binary choices between smaller, immediately available rewards and larger, later available rewards. An individual's delay discount (DD) rate reflects the aggregate decision-making tendency. This study aimed to establish whether post-decisional neurophysiological processes reflecting the presence of error monitoring are involved in delay discounting. A large sample (N=97) was investigated, including 46 females and 51 males. The electroencephalogram (EEG) was recorded during the classic monetary choice questionnaire (MCQ-27). Error-related event-related potentials (ERPs) and event-related oscillations (EROs) following responses were analyzed. A modest relationship between error positivity (Pe) and DD rate was seen centro-parietal, with higher amplitude for low DD individuals after choosing immediate rewards and for high DD individuals after choosing delayed rewards, respectively. A robust association was found between DD rate and theta oscillation power increases. This was most prominent in low DD individuals after making an immediate reward choice, showing activation of all electrodes. This study provides clear evidence for conflict monitoring as a post-decision process in delay discounting. Findings suggest that diminished theta band power bursts and lower Pe amplitude, observed after choosing an immediate reward, reflect the neurophysiological consequence and possibly the cause of steep delay discounting. High DD was characterized by prefrontal hypoactivation and appears to result from affective decision-making.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.11 Personality, 4.21 Decision making, 4.25 Cognitive control/executive functions

POSTER SESSION II-092 | INFLUENCE OF 2-WEEK TRANSCUTANEOUS VAGUS NERVE STIMULATION ON MEMORY: FINDINGS FROM A RANDOMIZED TRIAL IN NON-CLINICAL ADULTS

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Background: Transcutaneous vagus nerve stimulation (tVNS) is a promising therapeutic method, however its ability to enhance memory is underexplored, especially considering long-term stimulation. Methods: In a single-blind, randomized, placebo-wait list controlled trial (NCT04070547), 76 participants (30 males; mean age=48.32), aged 18–75, were randomized into 4 groups: EARLY active/placebo tVNS or LATE active/placebo tVNS. The study lasted 4 weeks, including a 2-week intervention (4 hours/day) on the tragus (active tVNS) or earlobe (placebo tVNS). The EARLY groups underwent the intervention immediately after the first visit (days 0 to 13), while the LATE groups underwent 2 weeks intervention after the first visit (days 14 to 27). Memory performance was assessed using the Rey Auditory Verbal Learning Test (RAVLT). The main statistical analysis was conducted using a mixed linear regression model and contrast analysis. Results: Active tVNS significantly improved immediate recall (IR) and short-term memory score (STMS) in EARLY (IR: p=.013; STMS: p=.009) and LATE groups (IR: p=.007; STMS: p=.023). Increased IM and STMS persisted over the follow-up period in the EARLY tVNS group. The effect of tVNS was superior to sham for IM but not for STMS in both EARLY ($\chi2$=4.41, p =.036) and LATE groups ($\chi2$=6.89, p=.009). We observed no improvement in delayed recall in any of the 4 groups (p>.113). Conclusion: Our findings suggest that tVNS may improve memory, particularly immediate recall and may be an effective method in preventing memory loss and mitigating cognitive aging.

FUNDING: Data were collected as part of the project funded by the Grant Agency of the Czech Republic (GACR17-22346Y). The submitted study was produced with financial support from the 'Healthy Aging in Industrial Environment – HAIE' project (No. CZ.02.1.01/0.0/0.0/16_019/0000798) and the Student Grant Award (SGS07/LF/2023).

Topics: 1.1 Human Studies: General Population - Adults, 2.18 Brain stimulation, 2.19 Other, 3.4 Clinical Trial (RCT etc.), 4.1 Aging, 4.18 Memory

POSTER SESSION II-093 | PROACTIVE REAPPRAISAL IS ASSOCIATED WITH REDUCED PUPIL RESPONSIVITY AND LOWER SUBJECTIVE EFFORT IN HIGH ANXIETY INDIVIDUALS

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Anxiety is linked to deficits in cognitive control, which is crucial to successful reappraisal (reinterpreting a situation's meaning to lower distress). Dual mechanisms of control (DMC) theory posits that cognitive control can be engaged in a *proactive* mode prior to a demanding task, or a *reactive* mode as momentary demands increase. Proactive control reduces effort during cognitive tasks (e.g., dorsolateral prefrontal activity), and these proactive benefits are reduced for anxious individuals. However, it is unknown whether anxiety-related proactive deficits extend to reappraisal. In this study, 81 adults (18-85 yrs) reappraised 40 negative images, and reported trait anxiety symptoms via the DASS-21. Cues to reappraise each image were provided before a proactive (4s) or reactive (500ms) delay prior to image onset. Effort was tracked by strategy effort ratings and baseline-corrected, range-normed pupil dilation. Age-corrected multilevel models revealed no effect of anxiety on effort. However, a significant Delay x Anxiety interaction showed lower pupil responses for proactive than reactive reappraisal, and reduced proactive benefits in high anxiety individuals ($p<.001$). Interestingly, proactive control, but not reactive, predicted lower effort for high anxiety individuals ($p<.05$). Thus, proactive reappraisal was physiologically beneficial, but less effortful for anxious individuals, in contrast to classic cognitive tasks. Findings outline important temporal considerations relevant to the delivery and optimization of reappraisal interventions for anxiety disorders.

Topics: 1.1 Human Studies: General Population - Adults, 2.6 Eye Tracking (blink, movement, size), 2.11 Questionnaires/Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION II-094 | SPARING OF NATURAL LANGUAGE PROCESSING DEFICITS IN SCHIZOTYPAL PERSONALITY DISORDER COMPARED WITH SCHIZOPHRENIA: SYMPTOM AND SUPERIOR TEMPORAL GYRUS VOLUME CORRELATES

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Thought disorder and disorganized speech occur across the schizophrenia (SZ) spectrum, including deficits in syntactic complexity and semantic coherence. Increasingly, these language features are studied using natural language processing (NLP) rather than traditional clinical ratings. This is the *first* study to examine NLP across the spectrum and how NLP features are correlated with symptom severity and volume of left superior temporal gyrus (STG)-a key language area implicated in SZ pathophysiology. We studied 41 Healthy Controls (HC), 26 individuals with schizotypal personality disorder (SPD), and 26 SZ patients. All received structured diagnostic interviews, the Positive and Negative Syndrome Scale, and 3T MRI. Speech samples were elicited using an open-ended interview. Part-of-Speech tags, phrase length, and BERT embeddings were generated for NLP analysis. Groups were compared using ANCOVA (all $p's<0.05$). Cortical reconstruction/volumetric segmentation was performed using Freesurfer software. Correlations examined associations between NLP, symptoms, and STG volume. SZ patients showed: (a) reduced complexity compared with HC and SPD groups. Across SPD+SZ groups, *reduced* complexity was associated with *smaller* STG; (b) greater coherence, consistent with perseveration, compared with HC and SPD. Across SPD+SZ groups, *greater* coherence was associated with *greater* negative but not positive symptoms. These findings suggest that sparing of language and STG volume deficits in SPD may serve as protective factors in

mitigating psychosis. Data from a larger sample will be presented.

FUNDING: This work was supported by NIMH grants (R01 MH121411 and MH121411-02S1) and a VA CSR&D Senior Research Career Scientist Award (1IK6 CX002700) to Dr. Hazlett.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.11 Personality, 4.13 Speech/language

POSTER SESSION II-095 | CONTEXT AND PERCEIVED EMOTIONS JOINTLY INFLUENCE EMOTIONAL MIMICRY OF AMBIGUOUS EXPRESSIONS

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The occurrence of emotional mimicry, defined as the imitation of the emotions of others, is crucial for fostering positive affiliative social interactions. However, emotional mimicry does not always take place. It depends on the observer's ability to interpret the emotional signals of others accurately and perceive them as conducive to affiliation and harmony. As such, the context during which an emotion is observed plays a major role for whether or not mimicry can be observed. In situations where expressing an emotion violates norms, mimicry is absent—yet contexts also aid in understanding complex or ambiguous emotions. Thus, contexts serve a dual function: they help 2) detect moral violations that impede affiliation and hence impair mimicry and 2) facilitate the understanding of ambiguous emotional displays and hence drive mimicry responses. Our study aimed to explore how different contexts influence mimicry of pure and ambiguous emotions. For this, 83 participants were exposed to pure and blended emotional stimuli presented in three distinct contexts—cognitive, visual, and auditory—while facial electromyography (EMG) was recorded to measure mimicry. Our results reveal that 1) pure emotions elicited mimicry only in congruent contexts as a function the perceived intensity of the target emotion and) ambiguous emotions elicited mimicry in accordance with contextual cues and the perceived intensity of the context-driven emotion. These findings highlight the nuanced nature of emotional signal interpretation within different contexts and its role for emotional mimicry processes.

Topics: 1.1 Human Studies: General Population - Adults, 2.2 Myography (EMG etc.), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.23 Emotion/affect

POSTER SESSION II-096 | THE PREDICTED RESIDUAL METHOD OF CALCULATING TRIAL RESPONSE CONSISTENCY (TRC): TRIAL-BY-TRIAL VARIABILITY IN THE FLANKER STIMULUS P3 PREDICTS BEHAVIORAL PERFORMANCE

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Interest in modeling single-trial event-related potential (ERP) data has substantially increased with the ease of access to advanced statistical modeling software – and for good reason. Single-trial approaches allow researchers to separate within- from between-subject effects and can model the effect of trial structure on brain responses and behavior (Volpert-Esmond et al., 2018). Brain response consistency (i.e., the within-subject variability of an ERP trial-to-trial) has been implicated as a between-subject predictor of psychopathology (Lazzaro et al., 1997). However, the consistency of a brain response might change throughout the course of a task, and these trial-by-trial dynamics are not captured by existing analytical approaches (i.e., producing a single metric representative of the whole task). The current project introduces the Predicted Residual Method to calculate Trial Response Consistency (tRC), which enables the calculation of estimated within-subject response variability on a trial-by-trial basis. Multilevel modeling of data from an Eriksen flanker task (Eriksen & Eriksen, 1974) collected from 200 college and community adults demonstrates the predictive utility of the tRC of Stimulus P3 above and beyond both single-trial amplitude and overall signal-averaged Stimulus P3 amplitude in predicting trial accuracy (b = .07, p = .014). The relationships between tRC and psychopathology, personality, and contextual factors will be explored.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION II-097 | EXPLORING THE ROLE OF PHYSICAL ACTIVITY IN THE ASSOCIATION BETWEEN STRESS AND ANHEDONIA IN ADOLESCENTS

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Theoretical research indicates that exposure to stressors can induce anhedonia, which may lead to increased depression. However, the role of lifestyle factors, such as physical activity, and how they influence stress vulnerability remains poorly understood. This study uses data collected from a community sample of 57 adolescents (age range = 13-17 years). Neural response to reward (i.e., the reward positivity [RewP]) was elicited using a monetary guessing task, while anhedonia (Children's Depression Inventory-2) and lifetime stress (Stress and Adversity Inventory for Adolescents) were both self-reported. Physical activity was assessed across one week using a wrist-worn accelerometer. Results from zero-order correlations indicated that increased physical activity was associated with reduced anhedonia; no relationships between physical activity, RewP, or lifetime stress were observed. However, increased physical activity interacted with lifetime stress in relation to the RewP and anhedonia in separate moderated regression analyses. Specifically, adolescents engaging in higher levels of physical activity demonstrate resilience against stress-related alterations in neural response to reward and anhedonia. Overall, these findings highlight the importance of including assessments of lifestyle factors, such as physical activity, to elucidate our understanding of protective factors implicated in the stress and anhedonia relationship.

Topics: 1.5 Human Studies: Clinical Samples- Children/Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 2.19 Other, 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.10 Stress, 4.26 Other

POSTER SESSION II-098 | ETHNIC DIFFERENCES IN BLOOD PRESSURE RELATED HIPPOCAMPAL MORPHOLOGY

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Background: African Americans (AAs) exhibit a higher prevalence of elevated blood pressure (BP) compared to European Americans (EAs). Notably, increased BP has been linked to decreased brain volume, particularly in the hippocampus. It's plausible that AAs might have decreased brain volume, especially in the hippocampus, with accompanying elevations in BP relative to EAs. This study aimed to investigate whether AAs and EAs display distinct associations between BP, hippocampal volume, and total brain volume (TBV), focusing on the hemodynamic factors involved in BP regulation. Methods: We analyzed data from 119 participants (25 AAs, 94 EAs). Autonomic and hemodynamic measures were collected, including heart rate variability (HRV), baroreflex sensitivity (BRS), heart rate (HR), systolic and diastolic blood pressure (SBP and DBP), cardiac output (CO), and total peripheral resistance (TPR). Hippocampal volume and TBV were assessed using MRI. Results: AAs had smaller hippocampal volumes, lower TBV, greater TPR, and higher DBP compared to EAs. HRV, BRS, and HR were significantly correlated with TBV in AAs, but not in EAs. For left hippocampal volume, AAs showed significant associations with HRV, HR, DBP, and BRS, opposite to EAs. CO predicted right hippocampal volume in AAs, while TPR was a predictor in EAs. Conclusions: Ethnic differences exist in the relationship between BP and brain volume. Different hemodynamic mechanisms may contribute to elevated BP and alterations in TBV across ethnic groups, potentially influencing brain volume related diseases with higher risk among AAs.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.5 Hemodynamic (BP), 3.5 Secondary Analysis, 4.1 Aging, 4.5 Population-specific health, 4.16 Neurological disorders / Neuropathology

POSTER SESSION II-099 | PSYCHOLOGICAL AND PHYSIOLOGICAL EVIDENCE OF ENHANCED POSITIVE EMOTIONS IN DEPRESSION PATIENTS THROUGH EMOTIONAL ADVANCE ORGANIZER TECHNIQUE

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Background: Numerous case studies have indicated that the Emotional Advance Organizer Technique (EOT) enhances positive emotions and mitigates depressive symptoms in individuals with depression. However, experimental validation is necessary. Methods: Forty depression patients (BDI ≥14) participated in a 2 (EOT group vs. control group) × 2 (pre-test vs. post-test) study. Positive Emotion and Depression Symptoms were measured using the PANAS and BDI scales, respectively. Physiological data (Respiration, Heart Rate, Skin Conductance) were collected using Bio Trace Biofeedback instrument. Results: Homogeneity tests showed no significant pre-test differences. Repeated measures ANOVA revealed significant interaction effects of group and time [F_{PE} (1,38) = 67.04, η^2 = 0.64; F_{RSP} (1,38) = 8.727, η^2 = 0.187; F_{SC} (1,38) = 13.142, η^2 = 0.257; F_{DS} (1,38) = 175.06, η^2 = 0.822; F_{HR} (1,38) = 8.776, η^2 = 0.188]. Simple effect analysis showed that post-test significantly increased Positive Emotion, Respiration, and Skin Conductance, and significantly decreased Depression Symptoms and Heart Rate in the EOT group. No significant differences were observed in the control group. During the post-test, Positive Emotion, Respiration, and Skin Conductance in the EOT group were significantly higher than those in the control group. Depression Symptoms and Heart Rate in the EOT group were significantly lower than in the control group. Conclusion: EOT demonstrates the ability to enhance positive emotions and physiological biomarkers and reduce depressive symptoms in depression patients.
FUNDING: This study was funded by Postgraduate Education Reform Project of Liaoning Province (384).
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.23 Emotion/affect

POSTER SESSION II-100 | PSYCHOMETRIC RELIABILITY OF ERROR-RELATED NEGATIVITY ACROSS FLANKER, STROOP, AND GO/NO-GO TASKS

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The internal consistency of error-related negativity (ERN) is of considerable interest due to the number of trials retained for averaging not being entirely under the control of the experimenter, as some participants commit few errors. Despite evidence that the task used to elicit ERN moderates internal consistency, few studies have examined this possibility in the same sample. We measured ERN during three widely used tasks (flanker, Stroop, Go/no-go) in a sample of 182 undergraduates. Generalizability theory estimates were used to examine internal consistency as a function of increasing error trial count. Post-estimation contrasts from Bayesian multilevel models were used to compare internal consistency estimates across tasks. We expected ERN and DERN (error minus correct) from the flanker task and Go/no-go task to demonstrate higher dependability than the Stroop task when including 20 error trials. ERN from the Go/no-go task demonstrated numerically higher dependability than flanker and Stroop across all trial counts. ERN from Go/no-go required the fewest trials to reach dependability thresholds of .7, .8, and .9. Results from post-estimation contrasts revealed ERN from the Go/no-go task demonstrated higher dependability than ERN from the Stroop task at 20 trials, providing partial support for our ERN hypothesis. Tasks did not differ in reliability estimates of DERN, failing to support our DERN hypothesis. These findings support the need to consider the task used for recording when focusing on error-trial ERN across tasks and the comparability of DERN across tasks.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.25 Cognitive control/executive functions

POSTER SESSION II-101 | EMOTIONAL NEGLECT IS ASSOCIATED WITH A BLUNTED ERROR-RELATED NEGATIVITY

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In the UK, about a quarter of adults report experiences of maltreatment (i.e., abuse and neglect) while growing up. Maltreatment is a major risk factor for the development of mental health problems, likely mediated in part by alterations in core brain systems related to cognitive control. Neuroscientific studies linking childhood maltreatment to neural markers of cognitive control and anterior cingulate cortex function are few and methodologically limited. The studies that do exist have produced inconsistent findings and rely on a cumulative trauma score rather than distinguishing between types of maltreatment experiences. Given that the dimensional model of adversity proposes differential effects of threat (i.e., abuse) and deprivation (i.e., neglect) experiences, we examined the extent to which these experiences differentially impacted a neural measure of cognitive control localized to the anterior cingulate cortex – the Error-related Negativity. Participants ($N = 66$) completed the Adverse Childhood Experience Questionnaire for Adults and the Ericksen Flanker Task while EEG was recorded. Higher cumulative levels of maltreatment were associated with a blunted (less negative) Error-related Negativity. Moreover, these effects were stronger for neglect compared to abuse and strongest for emotional neglect. These results suggest that deprivation (vs. abuse) experiences may be more strongly linked to the cognitive control functions of the anterior cingulate cortex.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.2 Development, 4.11 Personality, 4.25 Cognitive control/executive functions

POSTER SESSION II-102 | COGNITIVE PROCESSING OF PARTNER'S SPOKEN WORDS IN NATURAL CONVERSATION: AN EEG STUDY

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Conversation is an essential part of human social interaction. In this study, we investigated how cognitive processing of a partner's spoken words during natural conversation is modulated in participants' own and their partners' interest in perceived conversation contents. Moreover, we examined the emotional intensity of perceived conversation content and individual empathic traits. We simultaneously recorded EEG and speech data from 20 dyads (40 participants) engaged in five sessions, 10 min each, of natural face-to-face conversation. In these sessions, participants were instructed to limit large gestures and intense movements. The onset times for content words were identified from the speech data and were used to estimate the temporal response function elicited by the speech partner's words. We identified the ERP components N1, P2, N400, and late positive potential (LPP) associated with various stages of cognitive processing. The P2 amplitude, which reflects early attentional allocation to spoken words, was greater when the partner's interest level was higher. The LPP amplitude, reflecting sustained attention to spoken words, was greater in individuals with higher personal distress scores on the interpersonal reactivity index (IRI). These results indicate that early and sustained attention to a partner's spoken words during natural conversation is modulated by both the partner's interest and listener's empathic traits, highlighting the importance of considering dyadic and individual factors in understanding cognitive processing in social interaction.

FUNDING: This work was supported by JSPS KAKENHI Grant Number JP23K16934.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.17 Machine Learning/ Deep Learning, 3.3 Lab Based Experiment, 4.24 Social factors

POSTER SESSION II-103 | OPTIMIZING THE STRESS RESPONSE OF MEDICAL STUDENTS IN A SIMULATED BREAKING BAD NEWS ENCOUNTER

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Breaking bad news (BBN) is a distressing but necessary task, in which physicians deliver serious diagnoses to their patients. In this study, we used the biopsychosocial model of challenge and threat (BPSM-CT) as guiding framework to investigate the effectiveness of a stress arousal reappraisal (SAR) intervention in improving the cardiovascular response of medical students tasked with BBN in a simulated setting. As part of the BPSM-CT, task engagement is indexed by reduced pre-ejection period (PEP), and a challenge-type response is characterized by higher cardiac output (CO) and lower total peripheral resistance (TPR) than a threat-type response. $N = 104$ participants were randomly assigned to either a SAR group or a control group. SAR instructions encouraged participants to reinterpret their physiological reactions to the BBN task as functional coping resources and were expected to lead to a challenge-type cardiovascular response. The BBN encounter was highly engaging for the sample as whole, as indexed by a significant decrease in PEP from baseline to the task. In line with predictions, the cardiovascular response of SAR participants was significantly more efficient (i.e., higher CO and lower TPR) than the response of the control group. The physiological task engagement supports the relevance of using simulated settings in medical education. Importantly, the results suggest that a short SAR intervention can have beneficial cardiovascular effects in the BBN context. SAR is a promising low threshold intervention which could easily be integrated into the academic curriculum.

FUNDING: This study is funded by the Swiss National Science Foundation (subsidy number: 100019_200831).

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.5 Hemodynamic (BP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.10 Stress

POSTER SESSION II-104 | NEURAL CORRELATES OF CROSS-MODAL FEAR GENERALIZATION: AN AUDITORY FEAR CONDITIONING MEG STUDY

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Fear generalization has been examined in the context of visual stimuli and its association with prefrontal and visual cortical areas. However, further investigations are warranted to elucidate the involvement of different stimulus modalities and to broaden our understanding of dysfunctional fear learning. This study incorporates auditory stimuli to assess the generalization of fear responses and delineate the neural mechanisms involved in such processes. Additionally, we examine the interaction between visual and auditory modalities in fear generalization. Forty healthy subjects underwent a fear conditioning paradigm in which either a low frequency or a high frequency tone was aversively conditioned (CS+). Before and after the conditioning phase, we also presented seven generalization stimuli (GS) with frequencies logarithmically distributed between CS- and CS+. In addition, explicit ratings of these stimuli were requested, and a stimulus discrimination task was performed before and after this paradigm. Neuronal activity was recorded by magnetoencephalography. Neural activity reflecting fear-generalization was found in frontal and auditory areas, among others. Subjects showed generalization effects in their ratings of the GS stimuli across modalities: the more similar GS were to the aversively conditioned stimulus, the higher the ratings were in terms of fear elicited and the likelihood of the aversive stimulus occurring. These findings suggest that fear-generalization effects can be replicated at the behavioral and neural level with this novel auditory-based paradigm.

FUNDING: German Research Foundation (Deutsche Forschungsgemeinschaft, DFG).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.23 Emotion/affect

POSTER SESSION II-105 | A MODEL-FITTING APPROACH TO SIMULATING THE REWARD POSITIVITY

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You can only understand what you can create. Here we modeled the Reward Positivity (RewP) as an additive and temporally independent ERP feature on top of the obligatory background ERP (i.e. a loss condition). For each participant, gradient descent was used to minimize the sum of squared errors of a half-cosine fit with three free parameters of frequency, scale, and onset time. By selecting the electrode with lowest SSE, the spatial and temporal variance of the RewP was quantified in a data-driven manner defined by individual differences. While the psychometric advantages of this approach are clear, there were theoretical and methodological benefits as well. A single factor created from aggregated parameters accounted for about 2/3 of the variance in the empirical RewP (n=114: R^2=.64), which was larger in a highly depressed subset of this sample (n=50: R^2=.73). This aggregate factor accounted for a higher portion of variance in depressive symptoms than the empirical RewP (n=50: R^2=.09, p<.05 vs. R^2=.01). In a separate sample (n=24), modeling accounted for the known tendency of the RewP to occur earlier in auditory than visual feedback. Models with similar parameter constraints accounted for this effect with a 114ms difference in onset time. Together, these simulation outcomes support the hypothesis that the RewP is an additive and temporally independent ERP feature, and they provide a psychometrically superior method for accounting for individual differences variance in this sensitive and specific biomarker of reward.

FUNDING: NIMH 1R01MH119382.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.15 Computational/Simulation, 3.3 Lab Based Experiment, 4.19 Motivation, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION II-106 | PUPIL DILATION AS A METRIC OF AVERSIVE GENERALIZATION LEARNING: SENSITIVITY TO EXPERIMENTAL MANIPULATION AND INTER-INDIVIDUAL DIFFERENCES

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Aversive generalization learning is a process whereby an initially neutral stimulus (i.e. a CS+) becomes associated with an aversive outcome, and generalization stimuli (GSs) that share features with the CS+ elicit similar but weaker defensive responses. Inter-individual differences in aversive generalization are thought to be part of the causal nexus of emotion psychopathology. Thus, there is a need for reliable and robust quantification of defensive reactivity during aversive generalization learning. This study examined the suitability of pupil dilation metrics as indices of inter-individual differences in aversive generalization. We measured pupil dilation in two studies with young adults, using auditory (N=44) and visual (N=58) stimuli. In study one, one of three tones served as the CS+. In study two, seven faces manipulated across a similarity gradient were utilized, with the central face serving as CS+. Both studies showed amplified pupil dilation responses to the CS+, but differed in the generalization pattern observed: Study one showed an all-or-nothing learning pattern, with both GSs equally unaffected by learning. Study two exhibited a generalization pattern, in which GSs similar to the CS+ evoked greater responses than dissimilar GSs. Across studies, a hierarchical linear model indicated a relationship between the conditioned pupil response and self-reported negative affect from a battery of questionnaires. Findings support the usage of pupil dilation as a suitable metric of aversive generalization, including its inter-individual differences.

FUNDING: Misophonia research fund National Institute of Mental Health.

Topics: 1.1 Human Studies: General Population - Adults, 2.6 Eye Tracking (blink, movement, size), 2.11 Questionnaires/Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.22 Learning/conditioning, 4.23 Emotion/affect

POSTER SESSION II-107 | INVESTIGATING THE CORRESPONDENCE BETWEEN AROUSAL AND THE LATE POSITIVE POTENTIAL USING REPRESENTATIONAL SIMILARITY ANALISIS

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The Late Positive Potential (LPP), a positive slow wave maximal at centro-parietal electrodes (from 300-800ms), has been consistently associated with experienced arousal, as indicated by increased LPP amplitudes evoked by highly arousing (unpleasant and pleasant) compared to low-arousing neutral stimuli. In the current study, our aim is to extend these findings by examining the trial-by-trial correspondence between the LPP amplitudes and experienced arousal using representational similarity analysis (RSA). We tested different models of subjective arousal that either assume similar (Nearest Neighbor, NN, model) or dissimilar (inverted Anna Karenina, AK, model) LPP amplitudes among trials rated with comparable arousal levels. A total of 44 participants underwent a passive picture viewing tasks (30 pleasant, 30 unpleasant and 30 neutral images) while EEG was recorded. Thereafter, the previously seen images were rated in terms of arousal. Replicating previous findings, we observed larger LPP amplitudes (quantified with a temporo-spatial Principal Components Analysis) for highly arousing compared to neutral images. Moreover, RSA revealed strong evidence for an association between LPP amplitudes and NN models of arousal ($BF_{10} = 12$) but decisive evidence for an association with the inverted AK model ($BF_{10} > 100$), suggesting that LPP responses become more dissimilar with increasing levels of subjective arousal. These results point towards increased situational variability when relating subjective arousal to LPP amplitudes, particularly between trials evoking high levels of arousal.
FUNDING: Ministerio de Ciencia, Innovación y Universidades (Spain; Grant PID2019-104522GB-I00/AEI/10.13039/501100011033) and Universitat Jaume I (Grants: PID2015-03; UJI-2023-26).
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.23 Emotion/affect

POSTER SESSION II-108 | TAVNS EFFECTS ON THE PHYSIOLOGICAL RESPONSE AND COGNITIVE PERFORMANCE DURING ACUTE MENTAL STRESS

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Transcutaneous auricular vagus nerve stimulation (taVNS) has shown to modulate autonomic responses and enhancing cognitive function. Prior research suggests that taVNS may exert these effects by increasing vagal activation and central noradrenergic activity. Despite this, the impact of taVNS on acute mental stress remains unexplored. This study investigated whether taVNS attenuates the physiological stress response while simultaneously enhancing the cognitive performance during the Paced Auditory Serial Addition Task (PASAT). The PASAT is a challenging task that assesses working memory and divided attention and serves as potent mental stressor. Forty-one participants were randomly assigned to receive either taVNS stimulation on the left cymba conchae or a sham stimulation on the ear lobe in a between-subject design. Participants received 15-min stimulation before completing a social-evaluated version of the PASAT, while stimulation continued. Similar to previous studies, our findings reveal an initial decline in heart rate (HR) following stimulation onset. However, taVNS did not impact cardiac stress response or PASAT performance. Additionally, our findings indicate a marginally significant increase in perceived subjective stress following taVNS, potentially associated with heightened central arousal induced by the stimulation. Future studies with larger samples and alternative stress induction protocols are needed to draw more conclusive results.
Topics: 1.1 Human Studies: General Population - Adults, 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.10 Stress, 4.20 Attention

POSTER SESSION II-109 | DUAL-TASK INTERFERENCE IN FIBROMYALGIA: BEHAVIORAL AND NEURAL DATA

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Beyond chronic pain, patients with fibromyalgia report difficulties when daily activities require to handle multiple sources of information simultaneously, as these stimuli compete for the same processing resources. Given that cognitive processing involves rapid stages encompassing

various mental operations, electroencephalographic activity was recorded and analyzed through event-related potentials. Nineteen fibromyalgia patients and twenty-four healthy subjects participated in the experiment. The psychological refractory period paradigm was employed in the experimental setting to study dual-task interference, analyzing both behavioral and neural responses. This dual-task paradigm, (see Luck, 1998), involved a sequence of two letters presented for 100 ms with a stimulus onset asynchrony (SOA) between them manipulated across three conditions (100, 250, or 400 ms). Shorter SOAs lead to produce more intense interference in response selection and increasing the reaction time to S2 associated with stimulus categorization. Behavioral analyses revealed a main effect of SOA, indicating that shorter SOAs led to higher response times than longer SOA conditions. Additionally, fibromyalgia patients exhibited longer reaction times compared to healthy subjects. At the neural level, the P3 wave's amplitude at parietal sites significantly increased at shorter SOAs for patients with fibromyalgia compared to healthy subjects. The findings suggest that experimental conditions involving a high demand for cognitive resources can reveal cognitive dysfunctions in fibromyalgia.

FUNDING: This research was supported by the Ministerio de Ciencia e Innovación of Spain (MICINN; grant PID2020-115463RB-I00).

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.9 Pain, 4.25 Cognitive control/executive functions

POSTER SESSION II-110 | THE LATE POSITIVE POTENTIAL DURING SELF-REFERENTIAL PROCESSING PREDICTS THE DEVELOPMENT OF DEPRESSION ACROSS ADOLESCENCE

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Negative attentional biases and self-schemas have been implicated in the development of depression. Research has indicated that a larger late positive potential (LPP) to negative self-referential words is related to depression and risk for depression. However, it is unclear whether the LPP to self-referential words predicts the actual development of depression. The present study examined whether the LPP during self-referential processing predicts the development of depression across adolescence. The sample included 165 8 to 14-year-old girls with no history of depression who completed the self-referential encoding task (SRET) while electroencephalography was recorded at a baseline assessment. Participants completed the Kiddie Schedule for Affective Disorders and Schizophrenia for School Aged Children at 2-year, 4-year, and 6-year follow-up assessments. Results indicated that a larger LPP to negative self-referential words at baseline predicted an increased likelihood of developing chronic-intermittent depression (i.e., persistent and/or recurrent), but not non-chronic, single episode depression, across adolescence. In contrast, neither SRET recall biases nor the LPP to positive self-referential words predicted the development of either type of depression. The present study suggests that the LPP associated with a negative self-schema predicts the development of a chronic form of depression across adolescence. Moreover, the present study highlights the importance of considering clinical course in the examination of biomarkers of risk for depression.

FUNDING: This study was funded by the National Institute of Mental Health (R01MH097767) awarded to B.D.N and G.H.

Topics: 1.5 Human Studies: Clinical Samples- Children/Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.2 Observational Study: Longitudinal, 4.2 Development, 4.7 Psychopathology, 4.23 Emotion/affect

POSTER SESSION II-111 | BRAIN-BODY DYSCONNECTIVITY: DEFICIENT AUTONOMIC REGULATION OF CORTICAL FUNCTION IN FIRST-EPISODE SCHIZOPHRENIA

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An accumulating body of evidence indicates that peripheral physiological rhythms help regulate and organize large-scale brain activity. Given that schizophrenia (SZ) is characterized by marked abnormalities in oscillatory cortical activity as well as changes in autonomic function, the present study aimed to identify mechanisms by which central and autonomic nervous system deficits may be related. We evaluated phase-amplitude coupling (PAC) as a physiological mechanism through which ANS and CNS activity are integrated and that may be disrupted in SZ. PAC was measured between high-frequency heart rate variability (HF-HRV) as an index of ANS activity and EEG

oscillations in 36 individuals with first-episode SZ and 38 healthy comparison participants at rest. HRV-EEG coupling was lower in SZ in the alpha and theta bands, and HRV-EEG coupling uniquely predicted group membership whereas HRV and EEG power did not. HRV-EEG coupling in the alpha band correlated with measures of sustained attention in SZ. Granger causality analyses indicated a stronger heart-to-brain effect than brain-to-heart effect, consistent across groups. Lower HRV-EEG coupling indicates deficient autonomic regulation of cortical activity in SZ, suggesting that neural dysconnectivity extends to brain-body interactions. Deficient ANS-CNS integration in SZ may foster a breakdown in the spatiotemporal organization of brain activity, which may contribute to core cognitive symptoms of SZ such as dysregulated attention. These findings encourage pursuit of therapies targeting autonomic function for the treatment of SZ.

FUNDING: This work was supported by the National Institute of Mental Health (R01 MH110544 and R01 MH110544-S1) and by the National Science Foundation Graduate Research Fellowship Program (DGE-2034835).

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.25 Cognitive control/executive functions

POSTER SESSION II-112 | NEUROPHYSIOLOGICAL PROFILES OF ATTENTION BIAS IN THE PRESENCE OF SOCIAL THREAT AND ASSOCIATIONS WITH SOCIAL ANXIETY AND DEPRESSIVE SYMPTOMS IN ADOLESCENTS

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Attention bias (AB), or differential attentional allocation to threatening versus neutral stimuli, is thought to underlie risk for internalizing symptoms. Although AB can be measured across neurophysiological levels, including eye-tracking and EEG/ERP, these are rarely integrated and there may be unique profiles of AB across measures, given heterogeneity in internalizing symptoms. We used latent profile analysis (LPA) to address this gap. Adolescents aged 12-14 (N=84; 55% female; 80% White; 38% annual family income <$70,000) completed a dot-probe task with angry and neutral faces while eye-tracking and EEG data were recorded. Social anxiety and depressive symptoms were self-reported concurrently and one year later. Five variables were submitted to LPA: fixation time and time to disengage from angry faces, derived from eye-tracking, and ERPs (P1, N170, N2) to threat derived from EEG. Best-fitting LPA yielded three profiles: no bias across measures (n=66; 78.6%), longer fixation and blunted N170 amplitudes to threat (n=12; 14.3%), and difficulty disengaging from and larger N2 amplitudes to threat (n=6; 7.1%). There were no significant differences in social anxiety across profiles. However, profile membership predicted prospective depressive symptoms [$F(2, 42) = 7.61$, $p = .002$], such that youth with the second profile reported increases in depressive symptoms one year later. Findings suggest that heightened eye-tracking bias coupled with blunted neural processing of social threat characterize a unique profile of AB associated with risk for depressive symptoms.

FUNDING: This work was supported by the National Institute of Mental Health, Grant R01-MH114974, awarded to KAB. MPC was supported by the National Center for Advancing Translational Sciences, Grant TL1 TR002016.

Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.6 Eye Tracking (blink, movement, size), 2.11 Questionnaires/ Interviews, 3.2 Observational Study: Longitudinal, 4.7 Psychopathology, 4.20 Attention, 4.23 Emotion/affect

POSTER SESSION II-113 | DISENGAGE OR NOT DISENGAGE: HOW DOES EMOTIONAL AND SOCIAL CONTENT AFFECT ATTENTION SHIFTS? AN EEG AND EYE-TRACKING COREGISTRATION STUDY SERIES

Sahura Ertugrul, Louisa Kulke
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It is important to disengage our attention from emotionally significant events like car crashes and proceed with our tasks, which can be challenging. The current set of studies investigated the effect of emotional (positive, negative, neutral) and social (social, nonsocial) content on following an attention-shift task by combining eye-tracking and ERP. Study 1 instructed participants to shift their attention promptly from a central emotional target to a peripheral neutral one. The participants took longer to disengage their gaze from images with social than non-social content, $p = .006$, but the valence did not affect saccade latency, $p = .127$, $BF = .031$. There was also no effect of valence and sociality on P1 latency in response to the peripheral target, $p > .111$, $BF < .076$, although the Early Posterior Negativity in response to the central stimulus was significantly modulated by valence, $p < .001$. Study 2 measured participants' self-initiated (non-instructed) attention shifts using the same design. Again, valence and sociality had no significant effect on P1 and saccade

latencies. However, the frequency of saccades was affected by valence and sociality, $p < .0001$ for both. In conclusion, the results suggest that emotional content affects the decision of whether to disengage from a stimulus, but once one has decided to shift attention, the speed of the shift no longer depends on the valence. This may explain previous mixed findings in the literature, as the effect of emotional experiences on cognitive functions is difficult to detect.

FUNDING: German Academic Exchange Service (DAAD) - Short-Term Grants, 2020.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.6 Eye Tracking (blink, movement, size), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.20 Attention, 4.23 Emotion/affect, 4.26 Other

POSTER SESSION II-114 | GETTING NEUROFREQ-Y: NEW OPEN TOOLS FOR FLEXIBLE TIME-FREQUENCY ANALYSIS

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NeuroFreq, a MATLAB toolbox for advanced time-frequency (TF) analysis of EEG data, enables flexible comparison of TF methods by integrating nine decomposition techniques. These range from linear methods like Short-time Fourier Transform and Continuous Wavelet Transform, to quadratic Reduced Interference Distributions. It offers additional tools for averaging, baselining, and aggregating multichannel, multitrial datasets. Advanced features include the concurrent phaser method for differentiating evoked from induced activities, and time-frequency spectral parameterization to distinguish oscillatory from aperiodic power. Empirical evaluations using EEG data from a visual oddball task validate NeuroFreq's capability to systematically compare TF methods and provide methodological insights. Results reveal that STFT and complex demodulation perform consistently well across frequencies, RID methods excel at low frequencies but underperform at high frequencies, and wavelet methods show strength at high frequencies but limitations at lower ones. Additional analyses of task EEG data indicate that baseline corrections (often used to highlight oscillations) do not account for aperiodic power in cognitive tasks, suggesting a need to reassess some EEG research assumptions about oscillatory versus aperiodic components. NeuroFreq provides essential tools for conducting detailed, reproducible EEG analyses, enabling direct comparisons between TF methods and advancing our understanding of neural dynamics.

FUNDING: This toolbox was developed and tested over an extended period of time. Over this time I was supported by the National Institutes of Health's National Center for Advancing Translational Sciences, grants TL1TR002493 and UL1TR002494, and the National Institute of Mental Health, grant T32-MH115866. The content is solely my responsibility and does not necessarily represent the official views of the National Center for Advancing Translational Sciences or the National Institute of Mental Health.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.15 Computational/Simulation, 3.5 Secondary Analysis, 4.25 Cognitive control/executive functions, 4.26 Other

POSTER SESSION II-115 | INVESTIGATING TASK EFFECTS ON REWP AND P300 IN INTERNALIZING DISORDERS AND NONCLINICAL CONTROLS

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Feedback evaluation and learning are crucial for adaptive behavior, especially in mental health where feedback processing deviations are common. Two event-related potentials (ERPs), the Reward Positivity (RewP) and P300, serve as neural feedback processing markers in reward-based tasks. The P300 has been linked to value updating, while the RewP indicates initial reward sensitivity. Research suggests a link between these ERPs and learning. We investigated feedback processing in patients with internalizing disorders and participants without current disorders across two paradigms. Participants completed a guessing game with randomized monetary rewards or losses. Consecutively, they engaged in a probabilistic reversal learning task, discerning which of two differently colored doors was rewarded. Task structures were comparable. Building on prior research, we expected heightened RewP amplitudes after rewards, inter-task ERP correlations, and group disparities in ERP amplitudes. We also examined how learning mechanisms affect P300 and RewP across groups and their correlation with self-reported questionnaires. Data analysis with results from 180 patients and 50 healthy individuals is ongoing. Preliminary findings suggest ERP associations across paradigms and learning effects on P300 and RewP. Initial results hint at potential relations between internalizing symptoms and aberrant feedback processing. Altered feedback processing has shown to predict treatment response, emphasizing the

importance of understanding the role of feedback processing in mental disorders.

FUNDING: Supported by the German Research Foundation (DFG-Forschungsgruppe 5187, KA815/9-1).

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.22 Learning/conditioning, 4.25 Cognitive control/executive functions

POSTER SESSION II-116 | SELF-REFERENTIAL INFORMATION IMPAIRS COGNITIVE CONTROL IN SOCIAL ANXIETY

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Cognitive control refers to the ability to direct attentional resources toward task-related information while ignoring task-irrelevant distractors. Self-referential information can serve as a cue to improve cognitive control. Cognitive models of social anxiety disorder (SAD) – a condition characterised by a fear of scrutiny by others) implicate negative self-referential processing in the aetiology and maintenance of clinical symptoms. For individuals with symptoms of SAD, self-referential information may interfere with attention allocation, and impair cognitive control. The current study investigated the relationship between SAD symptoms, self-referential processing, and cognitive control. A modified self-relevant Stroop task was employed while EEG was recorded. Participants ($N = 143$) reported the colour of personality-trait words prefixed either by 'I am outwardly', 'I am genuinely' (self-relevant trials) or 'it is clearly' (non-self-relevant trials). SAD symptoms were assessed using the Social Phobia Inventory (SPIN) and the P300 component was analysed as an index of cognitive control. P300 amplitudes were greater on self-relevant trials, compared to non-self-relevant trials indicating enhanced cognitive control. However, for participants with elevated SAD symptoms, P300 amplitudes were reduced on self-relevant trials compared to non-self-relevant trials. These results suggest that self-referential information may impair cognitive control for individuals with elevated SAD symptoms.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.20 Attention, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION II-117 | MODULATORY EFFECTS OF TRANSCRANIAL DIRECT CURRENT STIMULATION (TDCS) ON BLOOD PRESSURE-RELATED HYPOALGESIA

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This study investigated the impact of transcranial direct current stimulation (tDCS) on pain perception and blood pressure (BP)-related hypoalgesia mechanisms. Fifty-eight right-handed participants were randomly assigned to: 1) bilateral tDCS over the Dorsolateral Prefrontal Cortex (DLPFC) administered at a current intensity of 2mA for a duration of 20 min or 2) non-stimulation (Sham). Pain measurements (pain threshold, tolerance, pain intensity and unpleasantness perception), BP and heart period were recorded before, during, and after stimulation. Baroreflex sensitivity (BRS) was calculated by the sequence method. tDCS caused an increase in pain intensity perception, unpleasantness and BRS which remained after the stimulation period. While BP was positively associated with pain threshold and tolerance before stimulation and throughout the entire procedure in the Sham group, no correlations were found during tDCS. Similarly, the correlations between BP and BRS ceased to exist in the tDCS group. After stimulation, only a positive correlation remained in the tDCS group, concretely between diastolic BP and pain threshold. Additionally, a negative association between BRS and pain tolerance was obtained during tDCS, which was not observed either post-tDCS or in the sham group. According to the results, tDCS applied over the DLPFC could modulate pain perception and BP-related hypoalgesia mechanisms. Notably, tDCS anode targeted to the left DLPFC and cathode to the right DLPFC, can induce an inhibition of BP-related hypoalgesia mechanisms resulting in a heightened pain perception.

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Topics: 1.1 Human Studies: General Population - Adults, 2.5 Hemodynamic (BP), 2.18 Brain stimulation, 2.19 Other, 3.4 Clinical Trial (RCT etc.), 4.9 Pain, 4.12 Sensation/perception/interoception, 4.26 Other

POSTER SESSION II-118 | INDIVIDUAL DIFFERENCES IN SELF-REGULATION AND THE MMN

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This study examines the relation between individual differences in self-reported self-regulation and the auditory mismatch negativity (MMN). Although researchers have examined how effortful control is related to conscious classification and discrimination tasks, few studies have examined the influence of personality traits on pre-attentive, nonconscious processing indexed by the MMN. The MMN is an event-related negativity occurring 100-200 ms post-stimulus onset in frontocentral electrodes. In a large sample (n=250) the MMN was measured using a passive auditory oddball task and related to several self-report measures of self-regulation: Adult Temperament Questionnaire (ATQ)-Effortful Control, Barrett Impulsivity, Lay's Procrastination, Perceived Stress, and Perfectionism scales. The ATQ was positively correlated with the MMN, indicating larger amplitudes associated with greater effortful control. Impulsivity and procrastination were negatively correlated with the MMN amplitudes indicating less auditory differentiation with higher scores. Perfectionism and perceived stress were not correlated with the MMN. When entered into a multiple regression, only procrastination significantly predicted MMN amplitudes. The default mode network may be implicated, as individuals with high levels of procrastination may not be able to suppress the neural noise effectively during task-related activities. Individuals who struggle with planning and task avoidance may have difficulty automatically detecting patterns in their environment, leading to downstream cognitive deficits.

FUNDING: NSF DUE 1626554 & 1914855.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.14 Unconscious processes, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION II-119 | HEAR YOUR (E) MOTION IN DANCING: EFFECTS OF MOTION-SOUND CONGRUENCY AND MOTION-MODULATED MUSIC ON PERCEIVED SENSE OF AGENCY AND MOTOR ACTIVITY

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Sense of agency (SoA) refers to the experience of causing effects on the outside world via action. While laboratory paradigms exist for eliciting and quantifying SoA, we here used an innovative device, the MotionComposer (MC), to study SoA in an applied setting that involves dancing. In short, the MC uses 3D-motion tracking to convert body motion instantly into pleasant music, giving a compelling feeling of playing one´s own body like a musical instrument. Thirty young adults (23f, 6m, 1d) with normal hearing conducted 6 experimental conditions (2 min each) of dancing with continuous assessment of overall motor activity. In separate blocks, we used congruent or incongruent motion-sound conditions for both pitch (i.e., upward movement = higher (or lower) pitch) and volume (i.e., bigger motion amplitude = more (or less) volume). After each block, participants judged SoA, pleasantness, congruency, and creativity. Whereas pitch congruency had little effects on ratings, volume congruency enhanced rated pleasantness, congruency, and creativity. Effects on rated SoA were negligible. In two free dancing blocks in which participants danced to their favourite music while their movements did nor did not modulate the music, sound-modulation of music elicited a prominent decrease of overall motor activity, combined with blunted ratings for congruency and pleasantness. We discuss these results in relation to the double potential of the MC as a tool for the experimental study of the SoA in a whole-body action context, and as a possible intervention tool for various target groups.

Topics: 1.1 Human Studies: General Population - Adults, 2.2 Myography (EMG etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 2.15 Computational / Simulation, 3.3 Lab Based Experiment, 4.5 Population-specific health, 4.12 Sensation/perception/interoception, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION II-120 | PREDICTING RESPONSIVITY TO NON-INVASIVE NEUROMODULATION AS A METHOD FOR ENHANCING DECISION-MAKING UNDER STRESS

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Real-world decision-making (DM) involves rapidly assessing nuanced situations and making critical choices, often with potentially life-or-death consequences. For example, intelligence analysts must make threat assessments and target verification decisions under tight time constraints. Consequently, it is vital to develop novel interventions that support DM in stressful scenarios. However, there is significant inter-individual variability in responses to such interventions. The present study investigates the efficacy of a neuromodulation to enhance time-constrained DM and the feasibility of personalizing the intervention using cognitive, neural, and/or physiological predictors. Three tasks capture different aspects of DM: 1) a satellite image target verification task assesses complex perceptual DM, 2) a variation of a multi-armed bandit task assesses risky DM and resource allocation, and 3) a recognition memory task. Participants received cervical transcutaneous vagus nerve stimulation (tVNS) before speeded or self-paced DM tasks. A pre-stimulation resting-state electroencephalography (EEG) was recorded at each session's start, while heart rate variability (HRV) and pupillometry were recorded during task performance. We discuss the overall impact of tVNS on DM performance (e.g., accuracy, response times) and examine features predicting individual differences in responsiveness to tVNS for enhancing performance metrics. Finally, we discuss the implications and considerations for enhancing human DM with neuromodulation.

FUNDING: Air Force Research Laboratory, FA8650-20-D-6207.

Topics: 1.1 Human Studies: General Population - Adults, 2.6 Eye Tracking (blink, movement, size), 2.13 Behavioral Tasks (e.g. stress exposure), 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.18 Memory, 4.21 Decision making, 4.26 Other

LATE-BREAKING POSTER SESSION II-121 | PREDICTING VALENCE AND AROUSAL FROM PUPIL REACTIVITY IN VR: A MACHINE LEARNING APPROACH

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Most studies on emotion prediction rely on contact measures like EEG, EDA, or HR. We present a method for arousal and valence prediction based solely on pupil reactivity. Data were collected from 100 participants (50 men and 50 women, aged 18-30) viewing 120 emotional images with known valence and arousal ratings from databases like IAPS, NAPS, GAPED, and EmoPics. Images, divided into 40 positive, 40 negative, and 40 neutral, were shown in random order via a VR headset equipped with a PupilLabs eye-tracker. Each picture was displayed for 5 seconds with a random 4-6 second interval. Two breaks for eye-tracker recalibration were scheduled after every 40 images. After removing artifacts and outliers, data were segmented into epochs for each image. We extracted statistical parameters such as mean, median, kurtosis, standard deviation, and regression parameters. Using these, we performed binary and multiclass classification for valence and arousal. For binary valence, we distinguished extreme values due to the normal label distribution. Various classifiers were tested with Python and the pycaret library, achieving the best results with Light Gradient-Boosting Machine. Binary classification resulted in F1 scores of 0.64 for valence and 0.73 for arousal. Multiclass prediction with 9 levels fared worse yieldeding F1 scores of 0.28 and 0.31 for valence and arousal, respectively. Our approach, used in VR environments, is unobtrusive for participants, promising real-world applications.

FUNDING: Innovation Incubator 4.0, program of the Ministry of Science and Higher Education nr MNiSW/2020/329/DIR within the scope of EU Smart Growth Operational Programme 2014-2020.

Topics: 1.1 Human Studies: General Population - Adults, 2.6 Eye Tracking (blink, movement, size), 2.17 Machine Learning/ Deep Learning, 3.3 Lab Based Experiment, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION II-122 | HOW DOES COGNITIVE REAPPRAISAL IMPACT SOCIAL INFORMATION PROCESSING IN LONELY INDIVIDUALS - A MULTIMODAL STUDY

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The current conceptualizations of affective response frame it as an interplay between bottom-up processes that steer our attention to salient environmental stimuli (e.g., threats) and top-down mechanisms that allow us to downregulate it if needed. Loneliness is believed to affect both processes by increasing one's tendency to respond to social stimuli as threatening while concurrently decreasing one's ability to use top-down emotion regulation techniques like cognitive reappraisal. The current study investigated these mechanisms using well-established neurophysiological markers of affective response to static affective (neutral vs negative) stimuli with social or nonsocial content. During the main task, 148 participants (77 females, 25.3+/-4.4 y.o.) were asked to either passively view or reappraise negative stimuli depending on the preceding cue. Behavioral ratings of arousal and valence elicited by the stimuli and event-related potentials and short-term changes in electrocardiographic and electrodermal activity were analyzed. Results showed that loneliness is associated with an increased physiological bottom-up response, as indicated by late positive potential and decreased declarative arousal ratings of social negative vs. neutral stimuli. Furthermore, loneliness was associated with a reduced ability to reappraise negative stimuli, as evidenced by behavioral ratings and heart rate deceleration. In conclusion, loneliness alters affective responses by enhancing automatic physiological reactions to social threats while impairing conscious awareness of these reactions.

FUNDING: National Centre of Science, Poland 2019/35/B/HS6/00517, PI: Łukasz Okruszek.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 3.1 Observational Study: Cross-Sectional, 4.23 Emotion/affect, 4.24 Social factors

LATE-BREAKING POSTER SESSION II-123 | INVESTIGATING LEARNING DYNAMICS IN DETERMINISTIC AND PROBABILISTIC ENVIRONMENTS: AN EEG STUDY

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Predictability of the learning environment plays a crucial role in how individuals process information and adapt their learning strategies. This study aims to explore the pattern of learning dynamics in deterministic (predictable) and probabilistic (unpredictable) environments using a unified experimental design. Understanding the neural mechanisms underlying these processes can advance the field of cognitive neuroscience and provide insights into adaptive learning strategies. An EEG experiment was conducted with 46 participants who completed a Paired Associate Learning task. Participants were asked to learn whether a presented pair of pictures was correct, based on feedback, under either deterministic or probabilistic conditions. EEG data were recorded using a high-density 256-channel system across four learning time-points. The analysis revealed a statistically significant difference in the dynamics of amplitude change in Error-Related Negativity (ERN) and Feedback-Related Negativity (FN) between deterministic and probabilistic conditions. Specifically, the amplitude changes of ERN and FN demonstrated distinct temporal patterns, indicative of divergent neural strategies employed by the brain to process feedback information based on the predictability of the learning environment. The observed variations in ERN and FN amplitudes suggest that the brain adapts its error-processing strategies based on the certainty of the learning environment. This research contributes to the understanding of how the brain processes feedback and adjusts learning strategies accordingly.

FUNDING: This research was funded by the National Science Centre grant (No. 2019/35/D/HS6/02417, PI: Magda Gawlowska PhD).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.21 Decision making, 4.22 Learning/conditioning

LATE-BREAKING POSTER SESSION II-124 | REWARD PREDICTION ERROR CODING IN THE FEEDBACK-RELATED NEGATIVITY IS MODULATED BY MOTIVATIONAL BIASES WHEN LEARNING FROM IMMEDIATE AND DELAYED FEEDBACK

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Learning to execute a response to obtain a reward or to withhold a response to avoid punishment is easier than the reverse. This "Pavlovian bias" (PB) is thought to be manifested in prediction error (PE) related dopaminergic (DA) activity in the striatum, which is reflected in the feedback-related negativity (FRN) in the event-related potential. However, research on feedback processing and PE coding in the context of the PB is sparse. In addition, previous work suggests a reduced role of the striatum when feedback is delayed by several seconds, but it is unclear if feedback timing modulates the PB. In the present study, 61 healthy adults completed an EEG variant of an orthogonalized go/nogo task which required learning to respond (go) or withhold a response (nogo) to obtain a reward or avoid loss, with feedback immediate or delayed. Results revealed a PB for both feedback timings. However, FRN amplitudes reflected a negative PE only for learning from immediate feedback, possibly due to reduced striatal involvement for delayed feedback, with stronger PE coding for avoiding loss than seeking reward, and for go relative to nogo. Interestingly, only for immediate feedback, the FRN was more pronounced for unfavorable compared to favorable feedback when seeking reward, while the reverse pattern emerged for avoiding loss. Results highlight context dependence of the FRN and suggest neural manifestation of the PB that cannot be solely explained by striatal DA activity. More research is needed to fully unravel the neural underpinnings of motivational biases on instrumental learning.

FUNDING: This work was partially funded by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG; project number 438203225 awarded to JP).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.22 Learning/conditioning, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION II-125 | TRANSCUTANEOUS AURICULAR VAGUS NERVE STIMULATION (TAVNS) MODULATES BEHAVIOUR AND PUPIL DILATION IN A PATCH-LEAVING TASK

Anna Marzecová[1], Lina Skora[1,2], Brent Vernaillen[3], Evelina Andronova[1], Gerhard Jocham[1]
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Patch-leaving decisions are thought to be under the control of the locus coeruleus noradrenergic system (LC-NE). Transcutaneous auricular vagus nerve stimulation (taVNS) is a non-invasive neurostimulation technique proposed to activate neuromodulatory pathways, including the LC-NE. In the present sham-controlled, single-blind pupillometry study, we investigated whether the hypothesised increase in LC-NE activity under taVNS modulates behaviour and pupil dilation in a patch-leaving task. Participants faced decisions between either continuing to collect rewards from a patch with a diminishing reward rate or moving to another patch with replenished rewards. Moving incurred a time ('travel') cost. Short 1-s taVNS pulses delivered during stimulus presentation – thought to mimic phasic LC-NE activation – were expected to lead to more optimal performance and an increase in pupil dilation. Decision-making behaviour was influenced by taVNS, with participants being more prone to make leave decisions under active taVNS than under sham, indicative of more optimal performance. Pupil dilation was larger on trials with leave decisions than on trials with stay decisions, increasing towards leave decisions within and across trials. Crucially, this pattern was influenced by taVNS, with increased pupil dilation on stay trials under active taVNS relative to sham. In conclusion, phasic arousal induced by brief active taVNS pulses promotes patch-leaving behaviour and modulates its pupillometric signature.

FUNDING: This work was supported by the Deutsche Forschungsgemeinschaft (DFG) grant JO-787/6-1 and by the Research Foundation Flanders (FWO) postdoctoral fellowship (12V5620N).

Topics: 1.1 Human Studies: General Population - Adults, 2.6 Eye Tracking (blink, movement, size), 2.13 Behavioral Tasks (e.g. stress exposure), 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.21 Decision making

LATE-BREAKING POSTER SESSION II-126 |

CHARACTERIZING THE EFFECTS OF TRANSCUTANEOUS VAGUS NERVE STIMULATION (TVNS) ON CORTICOSPINAL EXCITABILITY AND CORTICAL INHIBITION VIA TRANSCRANIAL MAGNETIC STIMULATION (TMS)

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tVNS has been proposed as a treatment for refining GABAergic transmission. Behavioral studies showed that it can improve the performance in inhibitory (GABA-mediated) tasks. However, the studies investigating its effects on motor cortex GABA-mediated inhibition provided contrasting results. We assessed the effect of active (vs. sham) left ear tVNS on corticospinal excitability (CSE) and cortical inhibition as assessed through single and paired-pulse TMS. To control for state-dependent effects, tVNS was delivered while participants performed a visuo-motor task with their left or right index finger. In a baseline condition and after delivering tVNS, CSE and inhibitory (GABA-A and GABA-B mediated) indices were assessed from the left (ipsilateral) or the right (contralateral to tVNS) motor cortex - for the participants performing the task, respectively, with the right and the left hand. Indices were recorded from the First Dorsal Interossei (FDI) and the Adbuctor Digiti Minimi (control) muscles. Active vs. sham tVNS improved the performance at the visuomotor task. Moreover, in the female participants only active tVNS increased (compared to sham and to baseline) inhibitory GABA-A mediated mechanism. Importantly, the effect was independent from the stimulated motor cortex but it was specific for the muscle involved in the task (FDI). The study encourages the application of tVNS as coadjutant treatment for disorders featured by altered GABA-A mediated mechanisms, while calling for tailoring the protocol on individual (such as gender) and state dependent variables.

FUNDING: This work is supported by Fondazione Regionale per la Ricerca Biomedica (Regione Lombardia), project FRRB 3438840 BOOST "Bottom-up and tOp-down neuromOdulation of motor plaSTicity in cerebral palsy".

Topics: 1.1 Human Studies: General Population - Adults, 2.18 Brain stimulation, 2.19 Other, 3.3 Lab Based Experiment, 4.3 Sex differences, 4.4 Gender, 4.26 Other

LATE-BREAKING POSTER SESSION II-127 |

VNS BREATHING ADHERENCE AND ITS IMPACT ON HRV INDICATORS AND SYMPTOM BURDEN IN POST-COVID PATIENTS. SECONDARY RESULTS FROM A RANDOMISED CONTROLLED CLINICAL TRIAL

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Background: Functional post-COVID symptoms are rising, with an estimated prevalence of 51% in community cohorts. Autonomic dysfunction is a primary cause of symptoms like fatigue or depression, anxiety, somatic disorders, pain, & general health issues. Yet, clinical treatment options are limited, and the road to diagnoses are lengthy and winded for most patients. Objective: The RCT tested interventions, including slow-paced breathing to stimulate vagus nerve activity (DRKS00028488). Here, we examining adherence as a moderator of changes in HRV-indicators and functional symptoms. Methods: Two of three intervention arms practiced slow-paced breathing (6 min, 2x/day) for 4 weeks, recording adherence using paper/pencil. Adherence was the proportion of reported vs. expected practice. Linear mixed models analyzed pre-post changes of lab-based measures in A) 2min seated resting HRV and B) 2min HRV reactivity to facial cold-water exposure. HRV was calculated using Kubios Software from Faros 180 ECG devices. Results: 36 patients (70% female) had 92% mean adherence (SD 11%). Higher adherence correlated with greater symptom score reduction and resting HFnu increase ($p<0.05$) in both conditions. No other HRVparameters showed statistical significant effects but similar trends. Conclusion: SPB intervention had small effects on symptoms and HFnu, indicating potential underdosage. Future studies should increase practice length from 6 to 18 minutes (tripel). PostCOVID-Patients were generally satisfied with the slow-paced breathing and it appeared to be feasible in an ambulatory clinical setting.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 2.11 Questionnaires/Interviews, 3.4 Clinical Trial (RCT etc.), 4.5 Population-specific health, 4.26 Other

LATE-BREAKING POSTER SESSION II-128 |

SLOW RESONANCE-PACED BREATHING MODULATES INHIBITORY CONTROL IN THE CONTEXT OF SALIENT ALCOHOL CUES

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Conscious attempts to regulate alcohol use are often undermined by the implementation of behavioral control in the presence of alcohol cues. A recent proof-of-concept study targeted the cardiovascular system as a potential conduit to alter automatic neural processes that maintain cue salience, yet few studies have examined the manipulation of the cardiovascular system through paced breathing on inhibitory control. Resonance-paced breathing (RPB) is a brief cardiovascular manipulation that enhances medial PFC activity via bottom-up afferent signaling across the central autonomic network, theoretically affecting inhibitory processing. We examined within-person changes in frontocentral N2 and P3 and parietal P3 amplitudes following RPB, a rhythmical breathing task paced at 0.1 Hz (6 breaths per minute) and a low demand cognitive task (CTRL) performed on separate days. One hundred young adults (20.7+2.3 years, 69 females) who endorsed binge alcohol drinking within the past month enrolled in a within-subjects crossover study. Participants completed 5-minutes of RPB or the control task (CTRL) followed by an alcohol-cued Go/No-Go task. Condition (RPB/CTRL) x Beverage (Alcohol/Non-Alc) rmANCOVAs that covaried for visit and task order revealed larger frontocentral N2, smaller frontocentral P3 and smaller parietal P3 amplitudes, and faster response time (RT) following RPB (ps<.05, η2s>.08). The findings suggest that RPB may alter neural mechanisms of inhibitory control in a manner theoretically consistent with strengthening of higher-level cognitive processing and adaptive behavior.

FUNDING: NIAAA R21AA029604.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.15 Biofeedback, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION II-129 |

AN ACTIVE INFERENCE ACCOUNT OF P300-LIKE CORTICAL RESPONSES IN CARD SORTING: IMPLICATIONS FOR THEORIES OF PREFRONTAL EXECUTIVE FUNCTIONS

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Objective: To reconsider P3-like cortical responses to feedback cues and target cards in a computerized version of the Wisconsin card sorting task (WCST) from active (Bayesian) inference views. Under this new theory, the two classes of frontal and nonfrontal P3-like responses can be recast in terms of precision-weighted prediction errors at hierarchically ordered frontoparietal cortical networks. Method: Formal modelling of Bayesian surprise using the active inference framework was applied to a selection of published event-related potential (ERP) studies. Model-based analyses aimed (1) to identify which parameters of active inference models better explained choices and reaction times in a (simplified) WCST task, and (2) to estimate the mutual information between hidden states (i.e., sorting rules) and sensory outcomes (i.e., feedback cues) transmitted across frontoparietal association cortices, so as to model P3-like ERPs. Results: Our computational approach suggests that the anterior P300 (P3a, novelty P3) indexes perceptual inference for anticipatory action selection and/or inhibition. In turn, the posterior P300 (P3b, LPC) likely consists of a mixture of both perceptual inference and learning, as these two processes are often confounded in the averaged ERP waveforms. Conclusions: Active inference could potentially explain many paradoxes of the frontal lobe riddle. On this view, frontal and parietal P3-like responses offer promising biomarkers of epistemic (exploratory) and pragmatic (exploitative) behaviour during perceptual inference and learning in card sorting tasks.

FUNDING: Supported by AEI grant PID2019-106045GB-I00 (AEI/10.13039/501100011033).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 2.15 Computational / Simulation, 3.5 Secondary Analysis, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION II-130 | MUSCLE-DEPENDENT FACILITATION OF SPINAL REFLEX EXCITABILITY IN THE LOWER LIMB COMPARED TO PLEASANT EMOTIONS IN UNPLEASANT EMOTIONS

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Emotions elicit behavioral responses such as approaching and avoidance. Since these motor behaviors are organized and controlled mostly at subconscious levels, spinal reflex activities, especially of lower limb muscles, may be modulated by emotional states. This study investigates emotional effects on spinal reflex excitability of the lower limb muscles. Seventeen healthy males (24.5±2.4 yr) participated. Surface electromyogram was measured from right vastus medialis, biceps femoris, tibialis anterior, soleus, medial gastrocnemius, and lateral gastrocnemius muscles. Four emotional conditions were set, comprising two valences (Pleasant and Unpleasant) and two arousals (High and Low). Participants maintained a supine position while viewing a monitor. Each of the 4 blocks began with a 72-s baseline followed by a 72-s intervention, displaying 12 pictures for 6 s each. Transcutaneous spinal cord stimulation (tSCS) was applied to the lumbar region 12 times during baseline and intervention. Peak-to-peak amplitude of the tSCS responses (spinal reflex) in intervention was averaged for each muscle to evaluate spinal reflex excitability. For biceps femoris muscle, spinal reflex amplitude was significantly influenced by valence, indicating higher amplitude in Unpleasant than in Pleasant ($p = 0.02$, Two-way ART-ANOVA). For other muscles, spinal reflex amplitudes were not significantly different among conditions (All $p > 0.05$). Our results suggest spinal reflex excitability of the lower limb is facilitated in unpleasant emotions compared to pleasant emotions in a muscle-specific manner.

Topics: 1.1 Human Studies: General Population - Adults, 2.2 Myography (EMG etc.), 3.3 Lab Based Experiment, 4.19 Motivation, 4.23 Emotion/affect, 4.26 Other

LATE-BREAKING POSTER SESSION II-131 | HIGH TRAIT ANXIETY ATHLETES HAVE REDUCED RESPONSE INHIBITION

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Although there has been much discussion of the relationship between trait anxiety and poor performance in sport psychology research, the detailed mechanisms have yet to be revealed. However, attention control theory posits that trait anxiety deteriorates the inhibitory function of cognitive processing processes. Therefore, the present study empirically examined the effect of trait anxiety on inhibition function by comparing high-and low-anxiety athletes. Based on the scores of STAI-Y2, the participants were divided into high-anxiety group (group H: n = 8) and low-anxiety group (group L: n = 12).and they engaged in an oddball task, in which the participants press a button when they saw a target stimulus (Go), while they did not with an irrelevant stimulus (NoGo) EEG was measured during the task. This was unipolarly derived from 9 locations on the scalp (Fz, F3, F4, Cz, C3, C4 Pz, P3, P4) according to the international 10-20 system, Each scalp electrode was referenced to the linked earlobes and calculated as an average reference. Two-way ANOVA revealed than the NoGo-N2 amplitude was significantly small and in the group H than that in the group L, which indicates a decrease in ability of cognition related to inhibition. In addition, Two-way ANOVA revealed than the NoGo-P3 amplitude and latency was significantly small and longer in the group H than that in the group L, which indicates a decrease in ability to monitor the inhibitory process and a delay in evaluation time. This supports the possibility that the assertion of attentional control theory can be adapted to athletes.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.11 Personality, 4.20 Attention, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION II-132 | CARDIAC CYCLE MODULATION OF WORKING MEMORY IN NORMOTENSIVE AND UNMEDICATED HYPERTENSIVE INDIVIDUALS

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This study examined the modulatory effects of tonic and phasic variations in blood pressure on working memory. Newly-diagnosed unmedicated hypertensives (n=24) and normotensives (n=46) performed a working memory task under two memory loads (0-back, 2-back) while 128-channel EEG activity was recorded. Targets and non-targets were presented with equal probability at six delays after the ECG R-wave (100 to 600 ms). Difference ERP waveforms (stimulus-locked minus previous-beat-locked) were computed to reduce cardiac and cardiovascular contributions to the ERP signals. Permutation testing revealed that the hypertensives showed larger mid- and late-latency ERP positivity than the normotensives despite no overall behavioral performance differences. Cardiac cycle time analyses indicated that working memory performance was less accurate for stimuli presented at 300 ms and 500 ms after the R-wave for both groups but only under higher memory load. Both groups showed cardiac cycle effects involving mid- and late-latency ERP for stimuli presented at 300 ms and 500 ms after the R-wave. However, fewer effects emerged in the hypertensives. Our study reveals that the phase of the cardiac cycle modulates working memory processing. This modulation may be attributable to baroreceptor-related cortical inhibition. The reduced cardiac cycle modulation in hypertensives fits with their decreased baroreflex sensitivity. In the absence of noticeable cognitive decline, ERP indices and cardiac cycle effects can identify early manifestations of functional deficits in hypertension.

FUNDING: British Heart Foundation (Project grant no. PG/06/040/20698); Research Wales Innovation Fund via Bangor University Innovation and Impact Award.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 3.3 Lab Based Experiment, 4.5 Population-specific health, 4.18 Memory, 4.26 Other

LATE-BREAKING POSTER SESSION II-133 | ELECTROPHYSIOLOGICAL CORRELATES OF ADOLESCENT ALCOHOL USE IN A LARGE POPULATION-BASED SAMPLE

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Neural markers of error processing, such as error-related negativity (ERN), error-related positivity (Pe), and midfrontal theta power have been linked to alcohol use disorders as well as heavy alcohol use. As adolescent alcohol use is a predictor of later alcohol use problems, it is important to study its neurophysiological underpinnings to inform prevention and intervention efforts. However, it remains unclear how these neural markers of alcohol use manifest in a general youth population. In this study, participants of the population-based Generation R cohort completed a Go/No-Go task during an EEG measurement and completed questionnaires on their alcohol use (N = 2840, M_age = 18.4 years, range 16-21 years). Regression models (linear/logistic/ordinal logistic based on outcome type) will be used to investigate the relationship between electrophysiological measures of error-processing, i.e., ERN/Pe mean amplitude at FCz/Cz and midfrontal theta power, and the following alcohol use variables: 1) alcohol initiation (yes/no) and initiation age in years, 2) recent frequency and quantity of alcohol consumption, and 3) binge drinking frequency. Unadjusted models will be presented, as well as models adjusted for relevant confounding factors (i.e., sex, ethnicity, education and household income). As we expect alcohol use outcomes to be correlated, we will employ the Galwey method to estimate the number of independent tests, and apply a Bonferroni correction accordingly. Currently, the dataset has been prepared for analysis and we anticipate presenting our findings at the SPR Meeting.

FUNDING: The general design of Generation R Study is made possible by financial support from the Erasmus Medical Center and the Erasmus University Rotterdam, the Netherlands Organization for Health Research and Development (ZonMW), the Netherlands Organization for Scientific Research (NWO), the Ministry of Health,

Welfare and Sport and the Ministry of Youth and Families. The current study was supported by the Stichting Volksbond Rotterdam (OB & HM) and the Netherlands Organization for Health Research and Development [Aspasia grant No.015.016.056] (HM). The funders had no role in the design and conduct of the study or the writing of the report.

Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.1 Observational Study: Cross-Sectional, 4.5 Population-specific health, 4.25 Cognitive control/executive functions, 4.26 Other

LATE-BREAKING POSTER SESSION II-134 | ATTENTIONAL THREAT BIAS AND ITS ASSOCIATION WITH MOMENTARY SOCIAL ANXIETY IN DAILY LIFE

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Individuals with social anxiety have been shown to pay attention towards or away from threats, called attentional threat bias (ATB). Yet, it is unclear whether ATB is associated with momentary social anxiety and experiential avoidance in daily life. To answer this, we combined an ATB lab task using steady-state visual evoked potentials (ssVEPs) methodology with experience sampling methods (ESM). In the lab, in 184 participants trait social anxiety was assessed first. Next, they viewed a set of frequency-tagged face pairs with different expressions (angry, fearful, and neutral). The ssVEPs elicited by threat and non-threat faces were extracted from EEG to assess the attention towards and away from threats, respectively. Afterward, participants reported their momentary social anxiety and experiential avoidance 3 times a day for 14 days. The replicated findings showed that ATB is linked to higher trait social anxiety. Multilevel models showed that enhanced attention towards angry and fearful faces separately predicted higher momentary social anxiety. Likewise, enhanced attention away from angry and fearful faces also separately predicted higher momentary social anxiety. Notably, only enhanced attention towards angry faces and away from fearful faces separately predicted higher momentary experiential avoidance. These findings suggest that both attention toward and away from threats are associated with increased momentary social anxiety and experiential avoidance. This is the first study to show that a neurophysiological assessment of ATB is linked to daily experiences.

FUNDING: This work was supported by the China scholarship council (CSC).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.12 Ecological Momentary Assessment (EMA), 2.14 Computerized Tasks (e.g. neuropsychology), 3.6 Other (Combine lab based experiment and longitudinal study), 4.7 Psychopathology, 4.20 Attention, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION II-135 | USING HEART RATE VARIABILITY BIOFEEDBACK TRAINING TO IMPROVE WELLBEING, RESILIENCE AND SELF-REGULATION IN FEMALE SURVIVORS OF BREAST CANCER

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Breast cancer survivors suffer a range of chronic cancer-related symptoms. Anxiety, depression, posttraumatic stress, cognitive impairment, insomnia, fatigue, and menopausal symptoms are highly prevalent issues affecting women's quality of life long into survivorship. These symptoms are linked to sympathetic overactivation and reduced heart rate variability (HRV). HRV biofeedback training has been shown to increase baseline HRV, enhance autonomic regulation, and improve diverse symptoms across populations. Our longitudinal RCT included sixty women with primary breast cancer history who were randomly assigned to one of three conditions: 6 breaths per minute (intervention group), 12 breaths per minute (active control group), or wait list group. The two training groups completed a remote 4-week HRV biofeedback training. We found an increase in baseline HRV and improvement in vasomotor symptoms in the main intervention group. Significant improvements in psychological symptoms, cognitive function, fatigue and sleep quality were found in both training groups with relatively superior sustained outcomes in the intervention group compared to active controls. Using a modified Trier Social Stress Test, we also found that women in the intervention group showed more adaptive stress reactivity post-intervention and at the 6 months follow-up. Our findings show that HRV biofeedback is a promising non-invasive tool for autonomic enhancement and cancer-related symptom management in breast cancer.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.4

Clinical Trial (RCT etc.), 4.5 Population-specific health, 4.7 Psychopathology, 4.15 Biofeedback

LATE-BREAKING POSTER SESSION II-136 | DAILY SOCIAL ISOLATION, NOT HEART RATE VARIABILITY, UNVEILS UNIQUE ANHEDONIA PATTERNS: INSIGHTS FROM AN ECOLOGICAL AND COMPUTATIONAL STUDY

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Loneliness and social isolation negatively impact mental health, contributing to anhedonia and depressive symptoms. Impairments in motivational functioning, including deficits in reward learning and sensitivity, are frequently observed in psychiatric conditions characterized by anhedonia. This study investigated possible associations between anhedonia and daily objective and perceived social isolation, linked to lockdowns and other strategies aimed at containing COVID-19. Anhedonia was assessed using the Probabilistic Reward Task (PRT), and tonic heart rate variability (HRV) was measured due to its link to both reward-related functioning and social functions. 114 psychiatrically healthy individuals (71% female) underwent both laboratory and ecological momentary assessments. Computational modeling of PRT performance helped disentangle two components of motivational functioning: reward sensitivity and learning rate. While low HRV was associated with impairments in both components ($beta = .26$, $p < .01$), greater social isolation was related to increased responsiveness to rewarding stimuli ($beta = -.28$, $p < .01$) but a reduced influence of rewards on subsequent behavior ($beta = .22$, $p < .05$). Notably, these associations with motivational behavior were significant only for objective, not subjective, daily social interactions. These findings enhance our understanding of the role of psychophysiological pathways and contextual factors as social isolation in motivational functioning and provide evidence for further research on the pandemic's mental health consequences.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.12 Ecological Momentary Assessment (EMA), 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.19 Motivation, 4.23 Emotion/affect, 4.24 Social factors

LATE-BREAKING POSTER SESSION II-137 | WHEN EXCELLENCE IS A BETTER INCENTIVE THAN INTIMACY: THE ROLE OF TASK INSTRUMENTALITY FOR EFFORT-RELATED CARDIOVASCULRAR REACTIVITY

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Implicit motives are defined as stable affective preferences for certain classes of stimuli (e.g., McClelland et al., 1989). According to Stanton et al. (2010), Facial Expressions of Emotion (FEE) constitute incentives depending on the type of motive considered. These incentives might, in turn, impact the success importance and the effort mobilized in a task (Brehm & Self, 1989). To test this, we embedded in a discrimination task FFEs congruent with the affiliation motive (nAff), which is the need for close social relationships. We measured implicit affiliation, achievement, and power motives with the Picture-Story-Exercise (Schultheiss & Pang, 2007). Effort was operationalized as sympathetically mediated cardiovascular reactivity: preejection period (PEP) and systolic blood pressure (SBP). Participants (N=81) were assigned to one of two experimental conditions: incentive FEEs for nAff (e.g., sadness) vs. disincentive FEEs for nAff (e.g., disgust). We did not find a modulation of PEP and SBP reactivity to FEEs by nAff strength, probably due to a lack of instrumentality of the FEEs for task success. However, the achievement motive (nAch)—which is the need to strive for standards of excellence—proved to be a significant predictor of both PEP and SBP reactivity, independent of FEEs. This result demonstrates that the achievement component inherent in most cognitive laboratory tasks arouses the nAch and leads to higher success importance and stronger sympathetically mediated cardiovascular reactivity (shortening of PEP, increase in SBP), that is, higher effort.

FUNDING: This project is funded by the Fonds National Suisse FNS 10001GM_214960.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 3.3 Lab Based Experiment, 4.11 Personality, 4.19 Motivation

LATE-BREAKING POSTER SESSION II-138 | PREDICTION AND ATTENTION SYNERGISTICALLY SHAPE EARLY SENSORY PROCESSING IN V1: EVIDENCE FROM THE C1 ERP COMPONENT

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Visual perception is not independent from cognition and has been shown to be influenced by top-down processes such as spatial attention and prediction. But the stage at which this influence is exerted is still a point of contention. Research using fMRI has shown that the primary visual cortex (V1) can be affected by these higher order processes but it is unclear when these modulations happen. EEG has the temporal resolution necessary to answer this question and the visually evoked C1 component is particularly well suited for this due to its retinotopic relation to the V1. However, it remains unclear whether processes like attention or prediction influence this early visual component. To address this we developed a new paradigm that maximally utilizes the visual and spatial properties of the C1 and which allows for the independent manipulation of spatial prediction and selective attention. Additionally, to account for the individual differences in the C1 response the experiment is tailored to each participant based on a localiser. The results (n=20) indicate that the C1 is smaller for spatially unexpected than for expected stimuli when attended but not when unattended. Moreover, this interaction seems to be present only in the upper visual field. A significant difference between predicted and unpredicted stimuli in the attended condition can also be seen in the larger P3 response for unexpected stimuli.

FUNDING: The first author is funded by the Ghent university - Special research fund with reference number BOF.24Y.2023.0017.01 awarded to GP and DM.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.20 Attention

LATE-BREAKING POSTER SESSION II-139 | SOCIAL COOPERATION: ERPS TRACE DYNAMIC ROLE TAKING DURING A DYADIC GAME

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Humans are motivationally and cognitively tuned to engage in cooperation to achieve shared goals. EEG hyperscanning allows for an on-line measure of how individual role taking drives stimulus relevance during collaborative tasks. Providing simplified structures of social cooperation, experimental games enable to investigate how processes of coordination unfold over time. Two recent studies utilized the “Pacman Game,” where players jointly navigate a Pacman through a maze to obtain a shared reward. These studies revealed that the P3 component (~300-600 ms post-stimulus onset) not only reflects predictable asymmetries between receiving and sending information, but also that a distinct late positivity (~450-600 ms) differentiates whether the receiver's role is related to correct decision making or action monitoring. The present study varied the game rules by introducing an extra personal reward based on a gamble. Two main findings emerged: First, previous P3 and late positivity results regarding sender-receiver asymmetries and receiver role effects were replicated. Second, we observed a sustained positive potential over centro-parietal sensor sites (~300-1000 ms) related to actually winning (versus only anticipating) the bonus reward. These findings are discussed in the context of shared and individual stimulus relevance. Overall, our data demonstrate that experimental games are a valuable tool for extending basic research on established neural markers to the domain of naturalistic social interaction, as emphasized by the second-person neuroscience perspective.

FUNDING: German Research Foundation (DFG) under Germany's Excellence Strategy (EXC2117-422037984 granted to Harald Schupp).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.20 Attention, 4.21 Decision making, 4.24 Social factors

LATE-BREAKING POSTER SESSION II-140 | NOT JUST BLACK AND WHITE: NEUROCOGNITIVE ERROR PROCESSING AND PERSONALITY TRAITS IN A NEW AMBIVALENT TASK

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Paradigms that induce ambivalence about the correctness of actions are rare. The study explored neurocognitive error processing in an innovative ambivalent task and the relevance of personality traits. Participants were instructed to stop a spinning arrow on the light areas of a fan, with its white, gray, and black areas inducing ambivalence. The study examined whether differences in error-related negativity (ERN, 0-50 ms after response) and feedback-related negativity (FRN, 100-200 ms after feedback onset) amplitudes could be found. Landings on different fan areas with and without visual feedback were compared. 74 participants performed the task while connected to a 64-electrode EEG system. Mean amplitudes were analyzed on electrode site FCz. Landing and feedback effects were assessed using repeated measures ANOVA with planned orthogonal contrasts. Effects of personality traits were evaluated in a multiple linear regression model. Results show a main effects of landing and feedback. However, these effects showed different polarity for ERN and FRN. Only neuroticism and perfectionism had a main effect on ERN and FRN, respectively, while conscientiousness, optimism, pessimism, and tendency to worry had none. The study suggests that early and late components related to error processing show different amplitude patterns under ambivalence and that amplitudes are influenced by the time to process the response and specific traits. Moreover, these results suggest that error processing should not only be investigated after objective errors but with a more faceted stimulus design.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.11 Personality, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION II-141 | NEURAL SIGNATURES OF ADVERSE CHILDHOOD EXPERIENCES: THE ROLE OF ALPHA AND THETA SPECTRAL DYNAMICS AND PHASE COHERENCE IN COGNITIVE PROCESSING

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Trauma and prolonged stress during childhood and adolescence can increase the risks for many health issues. Specifically, adverse childhood experiences (ACEs) can affect the neurochemistry and morphology of the prefrontal cortex, a region responsible for exercising control over an individual's inner state during purposeful, goal-directed, and problem-solving tasks. Here, we used an auditory Go/NoGo paradigm to explore the effects of ACE exposure, type of ACE, and subjective rating of the impact of the ACE(s) on the Error-related Negativity (ERN) and N2 event-related potentials (ERPs) measured via electroencephalography. The ERN represents error detection and the immediate neurological response to mistakes; whereas the N2 represents response inhibition and occurs earlier in the information processing stream. We calculated Event-Related Spectral Perturbation (ERSP) and Intertrial Coherence (ITC) at frontal sites on both alpha and theta frequency bands during the timing of these ERPs. We found that N2 ERSP and ITC across frequency bands was associated with ACEs, such that when N2 ERSP and ITC decreased, ACE exposure increased across dimensions. Our findings show that N2 spectral power and phase synchrony are disrupted on alpha and theta frequency bands as a likely product of childhood adversity. These disruptions during response inhibition tasks suggest deficits in cognitive control at the early stages of the information processing stream. Future studies can expand these findings by assessing global alterations in ERSP and ITC throughout the information processing stream.

FUNDING: NSERC Discovery Grant, Canadian Foundation for Innovation, and John R. Evans Leaders Fund Grants to CL.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.14 Computerized Tasks (e.g. neuropsychology), 3.1 Observational Study: Cross-Sectional, 4.10 Stress, 4.20 Attention, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION II-142 | THE EFFECT OF MEMORY LOAD ON WORKING MEMORY PROCESSING DYNAMICS. A QUANTITATIVE EEG STUDY

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Quantitative EEG (qEEG) correlates underlying the processing dynamics in working memory (WM) is still elusive, particularly in contexts with different WM load levels. We aimed to evaluate the effect of memory load on the qEEG measures in the various steps of WM processing, namely encoding, maintenance, and retrieval while performing a cognitive task. Thirty healthy, right-handed young university adults responded to a modified version of the Sternberg task using strings of three, five, or six uppercase letters as stimuli and a single lower-case letter as the target. The participants had to respond if the letter was previously presented as part of the stimuli or not by pressing a key, with simultaneous recording of the EEG. The behavioral results showed decreased accuracy and higher reaction times for higher memory load trials. Frontocentral theta power significantly increased from encoding to retrieval with a rising memory load, mainly at the lower load level. Disregarding the load, alpha power increased remarkably during the maintenance phase, particularly at parieto-occipital regions in upper alpha frequencies (11-13 Hz), with a lower decrease from maintenance to retrieval for higher memory load trials. The results suggest a specific effect of memory load on the different processing components of working memory while performing a cognitive task. This effect also involves characteristic topographic engagement dynamics of the underlying neural substrates.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.18 Memory, 4.20 Attention, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION II-143 | PARTICIPANTS WITH CHRONIC LOW BACK PAIN DISPLAY A HIGHER N1 PEAK AMPLITUDE IN OCCIPITAL ELECTRODES WHEN SOLVING THE LEFT-RIGHT JUDGMENT TASK

Nuria García-Dopico[1,2,3], Juan Terrasa[1,2,3], Ana González-Roldán[1,2,3], Olga Velasco-Roldán[1,2,3], Carolina Sitges[1,2,3]
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Bodily disruptions have been demonstrated in individuals with chronic low back pain (CLBP). The performance on the left-right judgment task (LRJT) has been purposed as an indirect measure of the cortical bodily representation dependent on implicit motor imagery, although the available evidence is conflicting. The aim of this case-control observational study was to examine the performance (accuracy and reaction times) and event-related potentials while performing the LRJT for back and hand images in individuals with CLBP versus healthy controls. Although both groups displayed the same performance, our results suggested an increased attentional load on participants with chronic low back pain to achieve equal performance, measured by a higher N1 peak amplitude in occipital electrodes, especially when the effect of contextual images arises. The absence of differences in the reaction times for the LRJT between both groups, along with inconsistencies in self-reported data, could question the involvement of implicit motor imagery in solving the task. In conclusion, although there are no differences in the performance of the left-right judgment task (hits, reaction times) between CLBP patients and controls, the analysis of event-related potentials revealed that patients require a higher cognitive load, measured by N1 peak amplitude. Our results suggest disrupted attentional processing in participants with chronic low back pain to solve the LRJT.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.5 Population-specific health, 4.9 Pain, 4.12 Sensation/perception/interoception

LATE-BREAKING POSTER SESSION II-145 | NON-GENOMIC AND GENOMIC CORTISOL EFFECTS ON THE RETURN OF FEAR AFTER CONTEXTUAL EXTINCTION GENERALIZATION

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Previous work has shown timing-dependent effects of stress hormones on memory, and specifically, an impairment of context-dependent extinction memory retrieval, leading to an increase in return of fear (ROF). Beyond these non-genomic effects, not much is known about the genomic effects of cortisol. The current study aims to investigate non-genomic and genomic cortisol effects on ROF after extinction training in multiple contexts. To this end, 120 healthy participants (60 women) undergo a fear conditioning paradigm during which a contingency between an unconditioned stimulus (UCS) and two conditioned stimuli (CS+) is acquired in a specific background context. A third stimulus is not reinforced (CS-). The succeeding extinction training takes place in one (non-generalized, CS+N) or four (generalized, CS+G) other contexts for the two CS+, respectively. The following day, participants are randomly assigned to one of three groups (placebo control, non-genomic cortisol, genomic cortisol) before the start of a retrieval and reinstatement test phase. This phase includes presentations of all three CS in the acquisition, extinction and one novel context. Skin conductance responses indicate successful fear acquisition and extinction. In the retrieval phase, context generalization (as seen in the CS+) appears to generally dampen ROF. Additionally, a trend towards lower ROF in the genomic cortisol group can be inferred, holding promising implications for clinical practice. Expectancy ratings and pupil dilation are discussed as exploratory measures of ROF.

FUNDING: This work is supported by the Deutsche Forschungsgemeinschaft (DFG; German Research Foundation) within the SFB 1280 Extinction Learning (grant number 316803389 - SFB1280; project A09).

Topics: 1.1 Human Studies: General Population - Adults, 2.6 Eye Tracking (blink, movement, size), 2.7 Skin responses, 2.16 Pharmacology, 3.3 Lab Based Experiment, 4.10 Stress, 4.18 Memory, 4.22 Learning/conditioning

LATE-BREAKING POSTER SESSION II-146 | DISTINGUISHING DEPRESSIVE AND SOCIAL ANXIETY SYMPTOMS THROUGH EEG MICROSTATE ANALYSIS

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A growing number of neuroimaging studies have revealed spatial abnormalities in resting-state functional brain network activity in mental disorders. Conversely, abnormalities in resting-state temporal dynamics have been scarcely investigated. EEG microstates have garnered significant attention due to growing evidence linking them to mental activities and large-scale brain networks. However, there is no evidence of a specific pattern that distinguishes between individuals with depressive symptoms and those with social anxiety symptoms. To address this, we examined the EEG microstate properties and dynamics during a 3-min resting state using a 256-channel system in individuals with depressive symptoms (DEP, n = 20), social anxiety symptoms (SAD, n = 26), and healthy controls (CON, n = 23). Results revealed that for microstate A, the SAD group presented a reduced global field power compared to the CON and DEP groups, for microstate C the SAD group presented a reduced global field power compared to the CON group, while for microstates B and D the SAD group presented a reduced global field power compared to the DEP group. In addition, the SAD group presented a faster transition from microstate C to D compared to the DEP group. The distinguishable differences in the EEG microstates of SAD individuals compared to DEP and CON suggest that specific patterns of brain activity dynamics can differentiate between these mental health conditions, which may have implications for understanding the underlying neurophysiological mechanisms.

FUNDING: European Commission Horizon 2020 research and innovation program [grant number 824153] to the POTION project.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION II-147 |

THE POTENTIAL ROLE OF PSYCHOLOGICAL WELL-BEING IN PREVENTING THE RISE OF ADVANCED GLYCATION END PRODUCTS AMONG COMMUNITY-DWELLING OLDER ADULTS IN JAPAN

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Background: Tissue accumulation of Advanced Glycation End Products (AGEs) is linked to cellular aging and diseases like diabetes. Skin AGE accumulation may also relate to depression. Mental health includes not only the absence of mental disorders but also positive feelings (emotional well-being: EWB), positive functioning in individuals (psychological well-being: PWB), and community life (social well-being: SWB). Higher well-being (WB) may be associated with lower diabetes risk and AGE levels. One study found a negative correlation between the WB index and AGEs in males with type-2 diabetes. Further research including both male and female participants, especially elderly individuals at high risk for diseases, is needed to understand the WB and AGE relationship. This cross-sectional study examined this relationship in older adults in Japan. Methods: Elderly participants (n = 71, 76±5 years, 45 females) completed surveys on well-being (MHC-SF) and depression (GDS). Skin AGEs were measured using an AGEs sensor (Sharp, Osaka, Japan) on the left middle finger. Multiple regression with backward elimination tested the association between variables and AGEs. Results: The model was best fitted by MHC-SF (EWB, PWB, SWB). The overall regression was statistically significant (R^2 = .077, $F(3, 67) = 2.94$, p = .039). Higher PWB (e.g., seeking personal growth) was associated with lower AGEs (β = -.531, p = .005), but not EWB or SWB, suggesting specific types of well-being are related to AGEs. Conclusion: Psychological well-being was negatively associated with AGEs in older Japanese adults.
Topics: 1.3 Human Studies: General Population - Elderly/Geriatric, 2.7 Skin responses, 3.1 Observational Study: Cross-Sectional, 4.1 Aging, 4.5 Population-specific health, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION II-148 |

ELECTROPHYSIOLOGICAL CORRELATES OF EMOTIONAL PROCESSING DURING A MOOD INDUCTION TASK IN PARTICIPANTS WITH HIGH TRAITS OF RUMINATION

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The present study aimed at investigating the psychophysiological markers of risk to develop mood disorders, in a community sample selected for two important psychiatric transdiagnostic domains, i.e., perseverative thoughts and ruminations (PT/R). With the aim to prompt a rumination state, we developed a mood induction paradigm based on presentation of validated videoclips able to evoke sadness, suffering and feelings of loss. Subjective reports and high-density EEG data from 20 students with high (≥80th) and 20 with low (≤20th percentile) PT/R were collected. Subjective data analyses included self-perceived valence and arousal for 'love abandonment', 'loneliness' and 'city documentary' (i.e., neutral) clips. Regardless of group, emotional clips elicited greater valence and arousal scores than neutral videos. Between-group sLORETA analysis revealed greater delta and theta activity in low vs. high PT/R participants in left superior parietal lobule during viewing of 'love abandonment' clips. Within-group analysis showed that, in low PT/R participants, compared with neutral clips, 'love abandonment' and 'loneliness' elicited greater alpha activity in superior(left) and middle(right) frontal gyri, respectively. On the contrary, high PT/R participants showed similar right (pre)cuneus alpha increase, regardless of emotional content. Results suggest a decreased sensitivity to negative-valenced stimuli in high PT/R individuals, together with the loss of a specialized frontal hemispheric dominance depending on stimulus content – a pattern found in low PT/R participants.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION II-149 | THE MODULATION OF DAILY-LIFE SELF-CONTROL BY NEURAL CORRELATES OF COGNITIVE CONTROL FUNCTIONS, IMPULSIVITY AND COMPULSIVITY

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Reduced self-control is linked to problematic behavior and psychopathology, potentially driven by impulsivity, compulsivity, and related cognitive processes such as inhibitory control and model-based control. While inhibitory control, represented by the N2, may reflect the basic inhibition of a desired response, model-based (MB) control, represented by the P3b, likely improves goal-directed behavior through a greater influence of long-term consequences of an action. To delineate these effects, we combined single-trial EEG data from 236 participants during a response inhibition and a 2-step reinforcement learning task with an ecological momentary assessment (EMA) of self-control over the course of seven days. During EMA participants rated the strength of their desires, the conflict with higher-order goals and whether they enacted the desire. Relevant interactions between first-level EEG effects and different aspects of self-control are selected in a L1-penalized model. Analyses were preregistered. Initial results show an interaction between conflict strength, the MB-P3b and compulsivity. Individuals are less likely to enact desires if they perceive higher conflicts. However, in highly compulsive individuals with a lower MB-P3b, this regression effect of conflict strength is diminished. Conversely, the association between conflict strength and enactment increases with larger MB-P3b. This suggests that MB control can either exacerbate or protect against the effect of compulsivity on daily-life self-control.
FUNDING: CRC 940.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.12 Ecological Momentary Assessment (EMA), 3.1 Observational Study: Cross-Sectional, 4.21 Decision making, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION II-150 | THE BODILY-EMOTIONAL EXPERIENCE OF TIME: TEMPORAL INTERVAL PERCEPTION IS MODULATED BY ANXIETY

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Time perception is crucial in our life, and emotions can powerfully modulate it. Interoception influences emotional experiences, and the insula plays a key role in this process. However, the neural representation of the relationship between time, emotions, and body remains unclear. We investigated the effect of anxiety on time perception, considering individual variations in trait-anxiety and interoception. We hypothesized that better interoception would predict more intense anxiety, disrupting time perception. This would be mirrored in a modulatory effect of the amygdala on the integrative function of the insula. Thirty participants performed an auditory temporal reproduction task while undergoing fMRI. In half of the blocks, they were at risk of hearing random screams (threat blocks), whereas in the other half, they were ensured that no screams would be presented. Trait-anxiety and interoceptive accuracy were assessed outside the scanner. Our paradigm successfully induced anxiety (state-anxiety) in the threat blocks, and it was intensified by high trait-anxiety and interoceptive accuracy. In turn, increased state-anxiety predicted lower accuracy in temporal reproduction. To determine the interaction effect of emotions and temporal experience at a neural level, we looked at the functional interplay between amygdala and insula. These results suggest a disruptive effect of anxiety on time perception, considering variations in interoception. Exploring the neural underpinning of this process can inform how the brain-body interaction modulates affective and cognitive processes.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION II-151 | EXPLORING THE ROLE OF THE RIGHT HEMISPHERE IN COGNITIVE RESERVE: AN EEG PERSPECTIVE

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Cognitive reserve (CR), a theoretical construct thought to be shaped by the interaction of lifestyle and genetic factors, enhances the brain's ability to adapt to aging, or disease-related loss of neural resources, as well as to use neural networks efficiently. Structural and functional asymmetries are also considered mechanisms that optimize neural resource use. The aim of this study is to investigate the effects of CR on verbal and visuospatial working memory performance, as well as the relationship between the level of CR and the degree of asymmetry in the 2-9 Hz phase locking responses that emerge during these processes. 51 healthy subjects underwent 32-channel EEG recordings while performing verbal and visuospatial modified Sternberg tasks with two difficulty levels (1 and 3 items). CR scores were determined using the Cognitive Reserve Index questionnaire. Phase locking values were compared by repeated measures ANOVA. The effects of CR in 2-9 Hz phase locking values (ITC) were tested via correlation analysis between laterality coefficients (LC) and CR scores. Results revealed a right hemisphere dominance during both tasks ($p = .014$). Furthermore, correlation analyses revealed a positive relationship between CR levels and laterality coefficients under increased task difficulty, with this pattern being particularly pronounced in parietal electrodes ($p < .05$). The findings suggest that CR influences neural asymmetry, particularly highlighting the potential role of the right hemisphere in CR-related mechanisms and pointing to a possible target for therapeutic interventions.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.18 Memory, 4.26 Other

LATE-BREAKING POSTER SESSION II-152 | PUPIL DILATION AS A DOMAIN-GENERAL AUTONOMIC MARKER OF METACOGNITIVE MONITORING

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Metacognition plays a crucial role in learning and decision-making across the life span. However, the neurophysiological substrates of metacognitive processes remain poorly understood. Recent but limited evidence suggests that higher activity in the locus coeruleus-noradrenaline (LC-NA) system may subserve post-response monitoring processes such as error awareness. In the present study we aim at investigating whether pupil dilation, as an indirect and non-exclusive measure of LC activation, is a robust biomarker of metacognitive monitoring across tasks and cognitive domains. Thirty-nine young adults performed multiple experimental tasks during eye-tracking recordings. An adapted version of the *error awareness task* was used to replicate the findings on the link between pupil size and error awareness. Moreover, a novel battery of tasks testing mental rotation, visual perception and working memory was employed to test the association between pupil dilation and confidence judgements across cognitive domains. In line with previous evidence, it was found that pupil size was larger after aware errors as compared to unaware errors. Furthermore, pupil dilation during confidence ratings was found to be greater for high confidence judgements in mental rotation, visual perception and working memory tasks. The study findings suggest that pupil dilation can be used as robust marker of metacognitive processes and that noradrenergic function may support metacognition in a domain-general fashion.

Topics: 1.1 Human Studies: General Population - Adults, 2.6 Eye Tracking (blink, movement, size), 3.1 Observational Study: Cross-Sectional, 4.14 Unconscious processes, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION II-153 | NEURAL REPRESENTATION OF CARDIAC SIGNALS: EXPLORATION WITH SCALP ELECTROENCEPHALOGRAPHY

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The Heartbeat Evoked Potential (HEP) is a potential marker of cardiac signal integration at the cerebral level, obtained by synchronizing EEG activity with ECG R-peaks. The HEP is usually determined from the difference between two experimental conditions, with effects arising in the 250-500ms time window. Theta phase resetting has been proposed as the main mechanism underlying HEP generation. Yet, the HEP critically lacks in characterization, with no clear component and large heterogeneity in latency. Here, to better characterize the HEP, its components, and potential origin, we measured HEP during resting state in 30 adults. ERP components have been identified using peak detection (early component) and cluster-based permutation testing (late component). Results indicate an early left fronto-central component (mean peak latency = 170ms), and a late (300-550ms) central component. Moreover, inter-trial phase clustering in the theta band (peak at 4 Hz) increased relative to baseline over left central sites between 150 & 250ms. These results build upon existing literature, and suggest the existence of multiple HEP components, whose functional significance is yet to be determined. The earlier component may be generated by theta phase resetting, as suggested by topographical and latency overlap. These results are premise of a larger study investigating HEP components modulation and reproducibility during task and rest.

FUNDING: This research is supported by the Exac-T Excellence Center for Autism and Neurodevelopmental disorders and by an iBrain transversal project fund.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 3.1 Observational Study: Cross-Sectional, 4.12 Sensation/perception/interoception

Poster Session III

POSTER SESSION III-001 | AN ACOUSTIC ANALYSIS OF THE NASAL ELECTROLARYNX

Ching-Hung Lai[1], Shu-Wei Tsai[2], Chenhao Chiu[3], David Shang-Yu Hung[2], Miyuki Hsing-Chun Hsieh[1], I-Pei Lee[2], Tammy Tsai[4]
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The nasal electrolarynx (NEL) is an innovative device that assists patients without vocal folds or under endotracheal intubation in producing speech sounds. The NEL has a different path for acoustic wave transmission to the traditional electrolarynx that starts from the nostril, passes through the nasal cavity, velopharyngeal port, and oral cavity, and exits the lips. There are several advantages to the NEL, including being non-handheld and not requiring a specific "sweet spot." However, little is known about the acoustic characteristics of the NEL. This study investigated the acoustic characteristics of the NEL compared to normal speech using ten participants involved in two vowel production sessions. Compared to normal speech, NEL speech had low-frequency deficits in the linear predictive coding spectrum, higher first and second formants, decreased amplitude of the first formant (A1), and increased amplitude of the nasal pole. The results identify the general acoustic features of the NEL, which are discussed using a tube model of the vocal tract and perturbation theory. Understanding the acoustic properties of NEL will help refine the acoustic source and speech recognition in future studies.

Topics: 1.1 Human Studies: General Population - Adults, 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.13 Speech/language

POSTER SESSION III-002 | KEEPING THE APPROACH AVOIDANCE CONFLICT IN THE T-MAZE: A BEHAVIORAL APPROACH TO THE COMPARISON OF HEART PERIOD BETWEEN CONDITIONS

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Approach(Ap)-avoidance(Av) conflict tasks are defined by the same decision leading to both a positive and a negative

outcome. Motivation to approach and to avoid crosses, resulting in the activation of the behavioral inhibition system (BIS). The theory is reflected in physiological data associated with a behavioral task, such as electroencephalography (EEG), and heart period (HP). The present study aims to provide a replication of the existing task, supplemented by two alternative versions, thought to provide more repetitions of overt behavioral conflict. In this within-subject design, 35 healthy participants followed a study protocol including self-reports, and recordings of high-density EEG and ECG signals simultaneous to the performance of a virtual Ap-Av-conflict task. The task consisted of three behaviorally different blocks of trials. Behavioral patterns were classified in three types, and behavioral scores computed in relation to the total of trials in one condition (Ap, Av, and conflict trials): three types of behavior, for all conditions and each block. Only HP results are reported here. A linear mixed effects model showed that there was no significant difference of HP change to baseline between Ap, Av, and conflict conditions in the original paradigm, but there was a difference between Ap and Av conditions in the other versions. If classified according to behavior, the difference between Ap, Av, and conflict behaviors was still not significant, potentially reflecting a lack of robustness of behavioral conflict.

FUNDING: This study was funded by the DFG - Deutsche Forschungsgemeinschaft.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.11 Personality, 4.23 Emotion/affect

POSTER SESSION III-003 | SLOW VS. FAST PROCESSING: UNIQUE CONTRIBUTIONS OF TRAIT ANXIETY TYPES AND DEPRESSION

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Anxious apprehension, anxious arousal, and anhedonic depression can frequently co-occur in individuals, yet the influence of each on cognitive processing and behavior is important for understanding how best to treat them. Indeed, each of these trait affects has been associated with different neural regions and cognitive processes (Engels et al., 2007, Heller et al., 1997, Nitschke et al., 1999, O'Hare & Dien, 2008). Study 1 explores these effects on an emotional word color flanker task using 64-channel EEG (n = 53). Study 2 is in its pilot stage and explores these effects on a Balloon Analogue Risk Task (BART) (n = 16). Unique effects for each trait affect are supported by the data. On neutral incongruent trials, higher levels of anxious arousal are associated with slower reaction times. On trials with negative distraction, higher levels of anhedonic depression are associated with increased N2 amplitudes. Finally, on negative incongruent trials, higher levels of anxious apprehension are associated with increased P2 amplitudes. Differences in the feedback-related negativity (FRN) are also apparent. These findings support ongoing research on the unique neural-cognitive mechanisms underlying different aspects of trait affect and the importance of emotional and cognitive context for understanding these mechanisms. Further, these data build on dual-anxiety models for understanding individual differences in trait anxiety.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.21 Decision making, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION III-004 | SPATIAL SELECTION PRECEDES OBJECT INTEGRATION IN OBJECT-BASED ATTENTION

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Effects of location- and object-based attention on sensory processing have been mostly studied in isolation leaving the relation between them less understood. Here, temporal dynamics of location- and object-based attention were investigated with a probabilistic spatial cueing task and EEG to test temporal differences between the sensory enhancement of two locations in one object. Stimuli consisted of two vertical rectangles filled with a random noise pattern. Each rectangle was superimposed by two flickering clouds of dots to elicit steady-state-visual evoked potentials (SSVEPs), that tagged the two ends of each object. A central cue pointed either to one or to two task-relevant positions on the rectangle. Targets occurred with a much higher probability on the cued position, and with a lower probability on uncued positions. Uncued positions were equidistant to the cued position either on the same object or the different object. Changes in SSVEP amplitudes in a post-cue time window compared to a pre-cue baseline were analyzed to examine the dynamics of early sensory gain modulation by attentional shifts. SSVEPs were modulated by spatial and object-based attention. Facilitation by spatial attention (on the cued position) preceded the facilitation by object-based attention (on the uncued position on the same object) if only one position on that object was cued. This questions the time-invariant enhancement

of both attributes of one object stated by the object integration account.

FUNDING: The research was funded by the German Research Foundation (Deutsche Forschungsgemeinschaft) fund to M.M.M. (MU 972/20-1).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.20 Attention

POSTER SESSION III-005 | DOG PRESENCE IMPROVES COGNITIVE PERFORMANCE IN POLICE OFFICERS WITH POST-TRAUMATIC STRESS DISORDER: AN EVENT-RELATED POTENTIAL STUDY

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Posttraumatic stress disorder (PTSD) has been associated with decreased cognitive control due to an imbalance in the fronto-amygdala circuit. The overactive amygdala increases the demand for regulation of stress-related responses, thus depleting the prefrontal cortex of its limited resources required for cognitive functioning. This study explores whether the presence of a dog as stress-buffer could partially restore cognitive control in PTSD. We compared cognitive performance between police officers with PTSD (n=24) and without PTSD (n=25) using electrophysiological measurements to assess working memory during a 1-back task, both in the presence and the absence of the participants dog. By measuring event related potentials (ERPs), this study aims to contribute to understanding the underlying mechanisms of service dogs for PTSD. The results indicated that the police officers with PTSD exhibited reduced cognitive control, as demonstrated by lower task efficiency and decreased amplitudes of the ERP P3 component in response to background stimuli. The presence of a dog improved cognitive performance in the PTSD group, as reflected by a larger N2 component amplitude to target stimuli. The findings suggest that dogs may act as stress buffers, facilitating cognitive control processes in individuals with PTSD. By understanding the stress-buffering effects of dogs on cognitive control, we can justify the provision of trained service dogs for police officers with severe PTSD.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.25 Cognitive control/executive functions

POSTER SESSION III-006 | GENOTYPE-DEPENDENT DIFFERENT RECRUITMENT OF NEURAL CIRCUITS UNDERLYING SIMILAR CONDITIONED AVERSIVE MOTIVATED BEHAVIOR

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Rationale: Post-traumatic stress disorder (PTSD) is a mental illness characterized by heterogeneous neural changes making difficult the identification of treatment. One of the core feature of PTSD is the strong reactivity to trauma-related cues which can trigger re-experiencing symptoms. Using C57BL/6J (C57) and DBA/2J (DBA) inbred strains - a model of genotype-dependent differences in both neural and behavioral phenotypes - we found a strain-dependent neurobiological differences related to reactivity to cues. Here, the aim of the present study was to investigate the increase in fear memory over time modelled by the cue-induced fear incubation paradigm -which reproduce PTSD-like symptoms - in these two strains. Method: C57 and DBA mice underwent a single training – as a single trauma experienced by humans -where a tone (cue) was paired with a foot shock. Following training, mice were re-exposed only to the cue after 1 day or after 14 days and then brains were processed for c-Fos immunohistochemistry as a marker of neural activation induced by the re-exposition. Results: We found different patterns of brain activation in C57 and DBA mice, indicating different functional connectivity underlying the same incubation of fear. Moreover, the strain-dependent recruitment of a midline thalamic nucleus – an integrative hub - might represent the functional switcher to different circuits. Conclusion: This genotype-dependent model of neural phenotypes might be a useful tool to investigate how dysfunction in different region can impact the same function through common connected areas

FUNDING: Ateneo Sapienza RM1221816BB36E77.

Topics: 1.7 Animal Studies (e.g., rodent models), 2.8 Genetics, 2.13 Behavioral Tasks (e.g. stress exposure), 2.19 Other, 3.3 Lab Based Experiment, 4.18 Memory, 4.19 Motivation, 4.22 Learning/conditioning

POSTER SESSION III-007 | CONFLICT MONITORING IN GERMAN SENTENCE EVALUATION: N2 COMPONENT AND VERBAL KNOWDLEDGE

Anja Leue[1], Eslem Oezkan[1], Suzana-Maria Milea[1], Maximilian Klaehn[1], Corinna Rieger[1], Merlin-Pascal Frenz[1], Fee-Elisabeth Bertram[1], Valentina Kleene[1], André Beauducel[2], Claudia Wich-Reif[2]
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This study investigates individual differences of conflict monitoring by means of the N2 component of the event-related potential in German sentences. The sentences had a correct grammatical structure or comprised an incorrect grammatical structure. Based on conflict monitoring theory, individuals compare grammatical structures stored in working memory with currently presented grammatical sentences. When stored grammatical knowledge does not match the presented grammatical structure, the frontal N2 component should indicate a stimulus conflict (i.e., more negative N2) compared to correct and matching grammatical structures. The preliminary sample includes 124 participants (age: M = 23.85 years; 18-53 years; gender: n = 87 female). Repeated measures ANCOVA was performed for Positions (Fz, FCz, Cz, Pz), Conditions (sentences with correct genitive object, other false or correct grammatical objects), and Trait-verbal intelligence (verbal fluid intelligence, verbal knowledge). Mean and baseline-to-peak N2 amplitudes showed a Condition main effect for the mean and the baseline-to-peak N2 amplitude. Correct sentences with Genitive objects revealed more negative N2s compared to the other correct and false grammatical object types. The Condition x Trait-Verbal knowledge interaction was significant for the baseline-to-peak N2 amplitude. Individuals with higher versus lower Verbal knowledge showed less intense N2-related conflict monitoring for Genitive objects. We discuss these data in terms of robustness across N2 quantifications, monitoring theories and cultural learning issues.

FUNDING: The University of Kiel, Germany funded the reimbursement for participants.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.11 Personality, 4.13 Speech/ language, 4.25 Cognitive control/executive functions

POSTER SESSION III-008 | PHYSIOLOGICAL MARKERS OF NON-INVASIVE NEUROMODULATION DURING DECISION-MAKING

Emma MacNeil[1], Reeshav Shrestha[1,2], Yong Yuan[1,3], Mahmoud Elbasiouny[1,3], Kevin Alexander[1,3], Adam Fenton[1,3], Melissa Key[1,4], William Aue[1]
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Real-world decision-making involves rapidly assessing nuanced situations and making critical choices with potentially life-or-death consequences. For example, intelligence analysts must make threat assessments and target verification decisions under tight time constraints. As such, there is a growing need for providing support to human decision-making; Transcutaneous vagus nerve stimulation (tVNS) has been identified as a potential technique for this end. tVNS is a non-invasive electrical stimulation technique. The current investigation sought to examine physiological changes following repeated sessions of cervical tVNS and establish whether any biomarkers predict tVNS enhancement of cognitive performance. Over three consecutive days, tVNS was used by participants prior to speeded or self-paced decision making tasks. ECG and eye tracking were recorded for the duration of the decision-making tasks. A resting-state electroencephalography (EEG) was also recorded at the start of each session. Heart rate variability (HRV), pupillometry, and EEG signals were assessed to look for physiological changes associated with tVNS administration. Implications and considerations for the use of non-invasive neuromodulation to improve human performance are discussed.

FUNDING: Air Force Research Laboratory, FA8650-20-D-6207.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.6 Eye Tracking (blink, movement, size), 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.21 Decision making, 4.26 Other

POSTER SESSION III-009 | MATCHING LOVE: EXPLORING INTERPERSONAL NEURAL SYNC IN ROMANTIC RELATIONSHIPS USING FNIRS

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Emotion alignment has traditionally been associated with the quality of relationships in mother-child pairs. This alignment often translates into synchronized neurophysiological patterns, known as interpersonal neural synchrony (INS). However, in adult romantic relationships, partners may experience varying levels of satisfaction. To date, no study has investigated how differences in relationship satisfaction between partners affect INS. This exploratory study, involving 15 heterosexual Singaporean Chinese couples, aimed to determine whether congruence in relationship satisfaction influences INS when couples watch positive and negative videos together. Mann-Whitney tests revealed that couples with significant mismatches in relationship satisfaction exhibited reduced INS in specific brain regions during the "happy" emotion condition (W: 7, $p < 0.01$), as well as during the "love" emotion condition (W: 10, $p < 0.05$). These findings suggest that couples with higher congruence in relationship satisfaction demonstrate greater INS during positive emotional states. Further research with larger sample sizes is recommended to validate these findings.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.23 Emotion/affect, 4.24 Social factors

POSTER SESSION III-010 | A COMPARISON OF CONSECUTIVE FEEDBACK PROCESSING IN RISKY DECISION-MAKING BETWEEN ADOLESCENTS AND ADULTS

Corinna Lorenz, Nicola Ferdinand
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Many risky situations, such as alcohol consumption, involve a series of decisions that can lead to substantial losses despite initial positive feelings. This study investigated developmental differences in the processing of consecutive feedback in such risky contexts. Adolescents (aged 14-16 years; $n = 16$) and adults (aged 18-25 years; $n = 25$) completed a modified Columbia Card Task (CCT) while the EEG was recorded. Participants selected cards, each of which promised a small gain but contained a risk of high losses. The feedback reflected the results of the chosen cards and showed how working memory updating, as measured in the P3b, progressed with increasing risk of loss during sequential feedback on cards with different gain amounts, loss amounts and loss probabilities. Adolescents' P3b decreased compared to the adults across the feedback presentation, especially for small losses and large gains. Adults exhibited heightened loss sensitivity and an increase in P3b across the feedback presentation compared to adolescents for negative feedback. P3b increased across the feedback presentation with small gains, and was greater for less likely losses in both groups. These results indicate that successive feedback primarily assesses the risk of losing previously accumulated small gains. Adults retain processing in working memory over the feedback presentation for a longer duration, which promotes anticipation of losses and behavioral adaptation. This is consistent with developmental theories that posit less information use in adolescents and greater loss avoidance in adults.

Topics: 1.2 Human Studies: General Population - Children/Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.2 Development, 4.21 Decision making, 4.25 Cognitive control/executive functions

POSTER SESSION III-011 | MULTIFACTORIAL ANALYSES OF BURNOUT AT RESCUE

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In the modern turbulent world, high demands are placed on the activities of various professionals, which significantly affects the health and well-being of a person, as well as the occurrence of professional burnout. Employees of social professions, particularly rescue workers, are more prone to the influence of stress-causing factors. Our research aims to study the psychophysiological and psychological factors of the development of burnout syndrome of rescuers. 127 subjects participated in the study: 60 rescuers-workers, 67 rescuers-students. The Big Five Personality Test, Boyko's "Burnout Syndrome" diagnostic test, Myers-Briggs Decision Making Diagnostic Test, Coping Strategies Diagnostic Lazarus Test, as well as Heart Rate Variability Diagnostics were used in the research. The research results were subjected to MANOVA multifactorial analysis using SPSS 21.0 statistical package. The following factors were found to have a reliable effect on all stages of professional burnout among rescuers: extroversion-introversion, self-control-impulsivity, decision-making based on subjective emotions, SI, CV, VLF. Moreover, during the stage of exhaustion, the factor of self-criticism - self-sufficiency also exerts significant

influence. The correlational analysis carried out revealed direct significant correlations with avoidance coping strategy and factors of all stages of professional burnout, as well as negative significant correlations with "emotional saving" factor and planning coping. The obtained results can be used in training programs for the prevention of burnout.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 3.3 Lab Based Experiment, 4.10 Stress, 4.21 Decision making

POSTER SESSION III-012 | THE REWARD POSITIVITY DOES NOT ENCODE CURRENT REWARD VALUE

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Successful behavioral adaptation requires an ongoing assessment of rewarding outcomes based on one's current state. A frontocentral ERP associated with reward feedback, the reward positivity (RewP), has been linked to reflect information about reward value and motivational states. It is, however, unclear if changes in the RewP are influenced by changes in reward value as a function of motivational state. To examine this, hungry subjects (n=31) completed two rounds of a modified Doors Task incorporating Pavlovian conditioning during EEG recordings and obtained feedback about cues associated with sweet and savory food reinforcers equally matched in pleasantness and desirability. Subjects underwent reinforcer devaluation, a paradigm designed to isolate inference-based behavior based on decreasing reward value, in between rounds by eating one of the foods to satiety. Prior to devaluation, subjects were hungry and rated both food reinforcers equally pleasant. After devaluation, subjects were sated and rated the devalued food significantly less pleasant, suggesting a sensory-specific change in reward value. Logistic regression of win-stay/lose-switch behavior during the Doors Task shows participants made sensory-specific adjustments in food preferences during post-devaluation. Non-parametric permutation tests based on the tmax statistic performed on frontal, central, and parietal electrodes revealed no significant differences in RewP amplitudes, suggesting devaluation insensitivity of the RewP. These findings suggest the RewP might reflect cached representations of reward value.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.19 Motivation, 4.21 Decision making, 4.22 Learning/conditioning

POSTER SESSION III-013 | NEURONAL RESPONSES TO SELF-INCONGRUENT FEEDBACK ON UPDATING FEEDBACK EXPECTATIONS AND ERPS OF THE SENDER FACE

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Theoretical accounts of social evaluative feedback propose that people exhibit a positively biased self-view and asymmetric updating of feedback expectations. This study answers how social evaluative feedback affects event-related potentials (ERPs) and shows how expectations change through learning about the sender's behavior and how this modulates ERPs towards the sender's faces. In the first session, participants provided a self-rating and rated other supposed peers. In a second EEG session, participants received positive and negative feedback from four senders based on the self-view. Two senders provided feedback that was not related to the participant as a control condition. The supposed sender-faces were presented before and after the main experiment and during the feedback session after each trial. Positive and negative feedback compared to irrelevant feedback led to increased EPN and LPP amplitudes. Behavioral results show that participants adjusted their feedback expectations more rapidly and accurately for the 'negative senders'. Sender faces presented directly after each feedback led to decreased P1 and LPP and increased N170 and EPN amplitudes. An interaction showed emotion differences only directly after feedback, with a larger positivity for faces of the 'positive senders'. The findings illustrate the strong effects of social evaluative feedback with an advantage for updating towards negative sender behavior. Feedback behavior showed little impact on face-related ERPs, which may be due to overlapping processes of feedback integration and expectation updating.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.19 Motivation, 4.23 Emotion/affect, 4.24 Social factors

POSTER SESSION III-014 | EFFECTS OF ELECTROMAGNETIC SHIELDING IN ELECTRIC CARS ON EEG BRAIN ACTIVITY

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Recent research has demonstrated effects of electromagnetic field (EMF) exposure on EEG brain activity and cognitive performance. We investigated whether EMF shielding in the electric car reduces effects of EMF exposure on brain activity, heart rate variability (HRV), and electromyographic (EMG) activity. Participants were tested either in a control electric car or in an electric car that was prepared with EMF shielding (Gabriel-Tech GmbH, Germany). Measurements were taken in both car conditions under different EMF exposures (engine, air conditioning, navigation device, bluetooth mobile call, WiFi). Spontaneous EEG brain activity was recorded from 256 electrodes before, during, and after each experimental condition. EMF emissions were recorded continuously during all EEG measurements. Participants reported significantly more discomfort (nervousness, headache) with increased EMF emissions. Results showed increased beta and gamma activity in frontal and temporal regions under EMF exposure with most increases in the bluetooth mobile call and WiFi condition in the control car compared to the EMF shielded car. Further, data showed that brain activity involved large portions of the frontal and temporal lobes, and hippocampal areas. HRV (LF/HF ratio) decreased, EMG activity increased with higher EMF emissions. Results indicate that EMFs induced physiological changes that have adverse effects on the psychophysiological state, attentional performance, and metabolism of the brain during car driving. Application of EMF shielding in the electric car helps to reduce these effects.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.2 Myography (EMG etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 3.3 Lab Based Experiment, 4.20 Attention, 4.26 Other

POSTER SESSION III-015 | HEART RATE VARIABILITY (HRV) AND GLAUCOMA: POTENTIAL PSYCHOPHYSIOLOGICAL INTERACTIONS AND RECOMMENDATIONS FOR TREATMENT AND INTERVENTIONS

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Open-angle glaucoma is a group of optic neuropathies characterized by dysfunction of the retinal ganglion cells (RCG), followed by irreversible RCG loss, leading to typical changes in the optic nerve head. Glaucoma can affect multiple brain functions and is the leading cause of irreversible blindness worldwide. Comorbidity with noncommunicable diseases such as cardiovascular disease, systemic blood pressure dysregulation or diabetes mellitus is high. It is associated with poor physical and psychological well-being due to the dramatic reduction in quality of life. Heart rate variability (HRV) is a robust cardiovascular indicator of autonomic nervous system (ANS) balance and resistance to allostatic load. HRV indices correlate positively with a person's ability to self-regulate, with physical and mental health, and well-being. In this scoping review, the authors discuss the association between HRV and glaucoma, with a focus on possible interactions of this relationship. Inclusion criteria for eligible studies, structure, rationale, method and outcome assessment follow the PRISMA recommendations. The results of the reviewed studies suggest that poor HRV at rest or in response to stressors is a potential risk factor for glaucoma and more severe progression of optic neuropathy, supporting the role of vascular dysregulation. Based on the results of the scoping review, recommendations for HRV interventions as adjuvant treatment in glaucoma patients are proposed and discussed.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.5 Hemodynamic (BP), 2.19 Other, 3.5 Secondary Analysis, 4.1 Aging, 4.5 Population-specific health, 4.7 Psychopathology

POSTER SESSION III-016 | IDENTIFYING A SHARED SOURCE OF AGE-RELATED DECLINE IN WORKING MEMORY AND DECISION-MAKING

Jade Duffy[1], Hannah McDermott[2], Robert Whelan[1], Redmond O'Connell[1], Peter Murphy[3]
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Working memory and decision-making are core components of cognition that deteriorate with age. While these processes are typically investigated in isolation, emergent evidence from computational and empirical research suggests that a shared neural circuit mechanism underpins both processes. The present study leverages this framework to identify shared and distinct sources of age-related decline in both functions. Younger and older adults (N=33 in each group) completed psychophysical tasks tailored to disentangle sources of variance in WM and DM reports, while scalp EEG and pupil data were recorded. Analysis of noise and bias in working memory and decision-making behaviour, decoding of EEG signals, and interrogation of phasic pupil-linked arousal yielded convergent evidence that the age-related difference in performance across both domains were primarily attributable to degraded sensory encoding. In sum, these findings provide novel insights into the neural basis of these processes and their vulnerability to the inimical effects of ageing.

FUNDING: This work was supported by a H2020 European Research Council Grant (No. 63829H2020) awarded to Redmond G. O'Connell and a H2020 Marie Skłodowska-Curie Actions Individual Fellowship (No. 843158) awarded to Peter R. Murphy.

Topics: 1.3 Human Studies: General Population - Elderly/Geriatric, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.6 Eye Tracking (blink, movement, size), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.1 Aging, 4.18 Memory, 4.21 Decision making

POSTER SESSION III-017 | INTEROCEPTIVE THREAT AND CONDITIONING: THE EFFECT OF UNCONDITIONED STIMULUS PREDICTABILITY AND EXAMINATION OF RETURN OF FEAR

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Interoceptive threat is a fundamental component of panic disorder (PD). Bodily sensations, such as difficulty breathing, can act as conditioned stimuli (CS) when associated with interoceptive threat (US). The learned association (CS-US) is typically acquired in a specific context that serves as a predictor of interoceptive threat. Even after successful extinction the learned associations persist and often emerge as return of fear. Fear of suffocation is assumed to serve as influencing factor. To examine the effect of context by manipulating the predictability of cues, the present study used a cue and context paradigm in which mild dyspnea (CS) was paired with a forced breath holding task (US). Cues were presented either paired (predictable), unpaired (unpredictable) with the US, or without the US (safe) depending upon the context (three pictures of living rooms). Subjective and physiological responses (e.g. startle eyeblink) during acquisition (day 1), extinction, and reinstatement (day 2) were assessed in 30 participants. Preliminary data analysis revealed a successful differentiation between CSs (predictable/unpredictable vs. safe) in subjective reports but not in fear potential startle during acquisition. Subjective reports revealed a stronger fear rating for unpredictable vs. safe/predictable cue and context in the end of extinction. High suffocation fear was associated with greater fear potential startle after reinstatement. Preliminary data suggest the associative learning approach in development of PD and highlight the impact of unpredictability on fear maintenance.

Topics: 1.1 Human Studies: General Population - Adults, 2.2 Myography (EMG etc.), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.12 Sensation/perception/interoception, 4.22 Learning/conditioning

POSTER SESSION III-018 | EFFECTS OF THREAT ON ACTION, ATTENTION AND INHIBITORY CONTROL: AN ERP STUDY

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The ability to control action is crucial for adaptive responding, but can be compromised in situations involving strong emotions, such as threat. This may have important negative consequences, for example when police officers face a potentially armed suspect. Therefore, we experimentally investigated how acute threat affects the ability to control actions in 40 healthy young adults performing a computerized stop-signal shooting task. Opponents associated with high or low threat (cue: predicting loud or soft white noise in case of an error), drew either a phone or a gun (target), after which participants decided to shoot or put their own gun down. Targets were occasionally followed

by a stop-signal to withhold the initiated response. To gain insight in the mechanisms underlying changes in performance, we recorded event-related potentials (ERP) to distinguish threat effects on attention, action preparation, and response inhibition. Behavioral results showed that threat significantly reduced response times and increased accuracy, but did not affect stop-signal reaction times. Preliminary ERP findings suggested that P3 and CNV amplitudes (reflecting attention and response preparation) after high vs. low threat cues did not differ significantly. In contrast, target ERPs (N1, N2, P3) suggested attention-related effects of target type (increased responses to gun vs. phone), and additional tentative increases for high vs. low threat. Additional analyses of stop ERPs will be presented after resolving component overlap.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.20 Attention, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION III-019 | MODULATION OF ATTENTIONAL BIASES TOWARDS FOODS IN EATING DISORDERS

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Eating Disorders (ED) are known for a characteristic behavioural symptomatology (from food restriction to the performance of compensatory behaviours). Similarly, differences in attentional processing of food stimuli have been widely described, both at the attentional, emotional and motivational levels. However, it is a real challenge to find the underlying psychophysiological mechanisms involved in these processes, as well as their possible modification. Forty-two women participated, 12 of whom had symptoms of ED (measured by the S-EDE-Q questionnaire). Participants performed two computer tasks with eye movement recording in order to measure possible attentional bias towards foods with different hedonic and post-ingestive characteristics (*sweet taste vs. distaste, caloric vs. non-caloric, healthy vs. dangerous*). They then performed a food exposure treatment (N = 21) or an inhibitory control task (N = 21) for one week and a subsequent recording of the attentional tasks. Results showed an attentional bias towards high-calorie foods on participant with ED symptoms. Likewise, a decrease in bias towards high-calorie foods was observed after the performed both a food exposure treatment and an inhibitory control task in participant with ED symptoms. These results help to understand the effect of exposure techniques on the decrease in the motivational value of caloric foods in participants with ED symptoms.

FUNDING: Grant ref. PID2021-127139NB-I00 funded by MCIN/AEI/10.13039/501100011033, FPU grant ref. FPU20/03579.

Topics: 1.1 Human Studies: General Population - Adults, 2.6 Eye Tracking (blink, movement, size), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.19 Motivation

POSTER SESSION III-020 | BEHAVIORAL AND ERP CORRELATES OF PRINTED WORD (ORTHOGRAPHIC) LEARNING AND CONSOLIDATION

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This study investigated the behavioral and event-related potential (ERP) correlates of orthographic learning. During five repeated exposures to regular words, pseudohomophones, and pseudowords, twenty-two skilled readers performed a Phonological Decision Task in which they were asked to decide if a letter-string sounded like a real word. A week after this training session, the participants performed a post-test which included a single exposure to all previously exposed letter-strings to assess consolidation effects. The behavioral results indicated that whereas the pseudohomophones produced fewer correct responses compared to the pseudowords and regular words on the first exposure, no differences between the pseudohomophones and pseudowords were found during the other exposures, including the post-test. In addition, repeated exposures reduced the N170 amplitudes produced by the pseudohomophones and also the N170 amplitudes for all three word-types on the post-test. Moreover, the N400 amplitude changes produced by the pseudohomophones was evident during the initial training session (online) and at post-test (offline) indicating that both phases significantly contributed to novel word learning. The results are discussed in terms of the contribution of orthographic learning and offline consolidation to novel printed word learning.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.22 Learning/conditioning

POSTER SESSION III-021 | CLIMATE CONCERN REPRESENTED IN OSCILLATORY NEURAL ACTIVITY

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Climate change is all around us, but more present in some people's minds and lives than others. The concern and anxiety that some people experience about climate change may be linked to underlying neural mechanisms, such as oscillatory brain activity measured by electroencephalogram (EEG). Indeed, differences in magnetic resonance imaging (MRI) based measures of brain structure and function have been linked to climate anxiety and pro-environmental behavior. The oscillations seen in EEG data are categorized into multiple frequency bands. Delta waves have the slowest frequency (0.5-3.5 Hz). The next slowest waves are theta (4-7 Hz) and alpha (8.5-12 Hz). Beta waves have a faster frequency (13-30 Hz), and gamma (30-100 Hz) are the fastest. Individual differences in the relative strength of EEG frequency band activity may reflect differences in cognitive processing across individuals. For example, lower levels of delta activity have been found to be correlated with greater daily pro-environmental behaviors. This study investigated if climate change concern correlated with the relative strength of these frequency bands. Sixty college students participated in our study. After taking part in a greater study related to climate change, participants were asked to rest, alternating between having their eyes closed and open, while EEG data was recorded using a 64 channel cap. Participants then filled out the New Ecological Paradigm, and the Climate Change Anxiety questionnaires. The results may suggest a relationship between climate concern and resting state frequency bands.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 3.3 Lab Based Experiment, 4.11 Personality

POSTER SESSION III-022 | VISUAL IMAGERY DEFICITS AND EEG PATTERNS IN APHANTASIA

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Mental imagery plays a critical role in cognitive functions such as episodic memory and future planning. However, not everyone possesses the ability to generate mental images. A condition known as Aphantasia, affecting approximately 4% of the population, is characterized by the absence of voluntary visual imagination. Behavioral studies show that individuals with Aphantasia recall fewer perceptual details but make fewer memory errors. As research into this condition is still in its infancy, the underlying neural mechanisms, particularly those detectable by EEG's rapid response capabilities, have yet to be thoroughly investigated. This study examines these mechanisms in individuals with Aphantasia using mobile EEG during a 2-back visual working memory task. 80 participants, identified as Aphantasic based on their scores of less than 32 on the Vividness of Visual Imagery Questionnaire (VVIQ), participated in the study. Results showed a significant correlation between reduced central delta power (slow-wave activity) during the task and lower VVIQ scores. Typically associated with memory consolidation during deep sleep, delta waves are known to facilitate the transfer and stabilization of information from short-term to long-term memory. Therefore, the diminished delta power observed in Aphantasic participants suggests potential challenges in memory consolidation, which could contribute to their impaired visual imagery. This discovery advances our understanding of Aphantasia's neural basis and implicates an impairment in slow wave activity connected to its cognitive deficits.

FUNDING: Duke Summer Seminars in Neuroscience and Philosophy (SSNAP) Sub Grant.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.16 Neurological disorders / Neuropathology, 4.18 Memory, 4.20 Attention

POSTER SESSION III-023 | INVESTIGATING THE NEURAL BASIS OF SOCIAL ANXIETY DISORDER USING A NOVEL SOCIAL JUDGEMENT APPROACH-AVOIDANCE TASK

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Social anxiety disorder (SAD) is the experience of intense fear in social situations and diagnoses are rising precipitously since the pandemic. The cognitive processes impacted by symptoms of SAD and their corresponding neural correlates are poorly understood. Existing literature points to two relevant constructs: inaccurate anger perception for ambiguous faces and increased avoidance during perceived anger. To investigate the relationship of these constructs to symptoms of SAD, we developed a novel task that required participants to make a social judgement (anger perception) and then perform an approach or avoid behavior. In our study, participants that were diagnosed with SAD using the Mini International Neuropsychiatric Interview for the DSM-V completed the social judgement approach-avoidance task (SJ-AAT) while high-density electroencephalography (EEG) was recorded. Severity of SAD symptoms were quantified along multiple dimensions using the Liebowitz Social Anxiety Scale. We found that our task captured meaningful differences in social judgement by manipulating the degree of angry-neutral morph. Furthermore, participants with SAD were slower and less accurate when required to approach, relative to avoid, an angry face. Our analyses dissociate individual differences in social judgement and approach-avoidance that are related to prefrontal control over the motor and perceptual system. The neural mechanisms identified in this study will be targeted in a future study using non-invasive brain stimulation to establish causal evidence for these correlational findings.
FUNDING: R00MH126161.
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.25 Cognitive control/executive functions

POSTER SESSION III-024 | ABNORMAL BRAIN ELECTRICAL ACTIVITY ASSOCIATED TO VISUOSPATIAL WORKING MEMORY IN NON-VERBAL LEARNING DISORDER (NVLD)

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NVLD is a neurodevelopmental disorder characterized by deficits in visuospatial abilities but not in reading or verbal competencies. A better understanding of its neural correlates may provide evidence for identifying NVLD as a discrete disorder, since at present it is not formally recognized by the main diagnostic systems. The present study recorded high-density EEG (256 sensors) in 9-15 years old children with NVLD (N=16), ASD without ID (N=16) and TD (N=16), during the performance of the spatial capacity working memory task (SCAT). Subjects saw a target array of 1, 3, 5, or 7 circles around a central fixation for 500 msec, and after a 3 sec delay were shown a single circle in the same or a different position as one of the target circles. Event-related potentials (ERPs) to the onset of the target array were computed, and the statistical inference on ERP data was performed with a permutation based, mass-univariate approach in three time windows, around the P1, the N1 and the P3/LPC. In the P1 time window both NVLD and ASD differed from the TD group, with amplitude changes over parietal and occipital scalp, respectively. In contrast, in the N1 time window, the NVLD group significantly differed from both ASD and TD groups for voltage changes over the right frontal region. A right frontal abnormality in NVLD is consistent with recent evidence in the same NVLD cohort by our group that resting state EEG functional connectivity (delta band) in the right dorsal attentional network (DAN) was predictive of impaired visuospatial performance.
FUNDING: Study supported by an Institutional grant from the DPSS, University of Padua, Italy
Topics: 1.5 Human Studies: Clinical Samples- Children/Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.2 Development, 4.16 Neurological disorders/Neuropathology

POSTER SESSION III-025 | SIMULTANEOUS ALCOHOL AND CANNABIS INTOXICATION SIGNIFICANTLY IMPAIRS NEURAL MEASURES OF ERROR MONITORING FOR 4 HOURS POST-CONSUMPTION

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Increasingly potent formulations of concentrated cannabis products containing high levels of delta-9-tetrahydrocannabinol (THC) are being consumed along with alcohol in USA. Limited research exists on the acute effects of cannabis and alcohol co-intoxication on electroencephalographic (EEG) measures of cognition and related behaviors. This study explored the acute effects of cannabis concentrates combined with alcohol on performance behaviors and two event-related potential (ERP) components, the error-related negativity (ERN) and error positivity (Pe), during a speeded visual flanker task. Participants (N=16, 60% male) were heavy-drinking community members (Age in years: M=33.13; SD=10.47; range=21-56) who also regularly use cannabis products. Participants completed the EEG task at baseline (T1: sober). Then consumed a standardized dose of alcohol, a cannabis concentrate product, followed by completing two more EEG sessions; 1-hour post alcohol consumption (T2: intoxicated) and 4-hours post alcohol consumption (T3: recovery). Reaction times were faster while intoxicated (T2) compared to being sober (T1; $p = .004$) and during recovery (T3; $p = .012$). Errors increased then decrease across timepoints ($p = .068$). The ERN decreased in negativity at intoxicated (T2) compared to sober (T1; $p < .001$) and recovery (T3; $p = .001$) states. The Pe displayed a decrease in positivity while at the intoxicated (T2) state compared to being sober (T1; $p = .002$). Results indicate that acute alcohol and cannabis co-intoxication impairs impulse control and error monitoring for at least 4-hours.

FUNDING: Funding for this poster was awarded by the Institute for Cannabis Research (ICR), Colorado State University Pueblo (PI: Karoly).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.21 Decision making, 4.25 Cognitive control/executive functions

POSTER SESSION III-026 | DUAL-TASK INTERFERENCE IN FIBROMYALGIA: BEHAVIORAL AND NEURAL DATA

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Cognitive dysfunction is a prominent symptom in fibromyalgia (FM), surpassing pain impact. Neuropsychological studies reveal exacerbated dysfunction during high-demand executive tasks, indicating abnormal frontal-parietal network function. FM individuals report difficulties when daily activities require them to handle multiple sources of information simultaneously. Electroencephalographic activity was recorded and analyzed through event-related potentials. 19 FM patients and 24 healthy subjects (HS) participated in the experiment, with ages ranging from 33 to 66 years. Psychological refractory period (PRP) paradigm was employed to study dual-task interference. Two different visual stimuli (S1 and S2) were presented per trail, requiring independent responses. S1 comprised two types of geometric figures, S2 was 'O' or 'X'. Stimulus onset asynchrony (SOA) varied (100, 250, or 400 ms). Shorter SOAs led to higher response times than longer SOA conditions. Additionally, FM patients exhibited longer reaction times compared to HS. At the neural level, the P3 wave's amplitude at parietal sites significantly increased at shorter SOAs for patients with FM compared to HS. Response times were longer in FM patients, suggesting reduced cognitive resources availability for S2 identification and categorization. However, increased P3 amplitude at short SOAs indicated inefficient resource utilization when sharing between stimuli. High cognitive demand conditions unveil FM cognitive dysfunctions, warranting further research for comprehensive understanding.

FUNDING: This research was supported by the Ministerio de Ciencia e Innovación of Spain (MICINN; grant PID2020-115463RB-I00).

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.9 Pain, 4.25 Cognitive control/executive functions

POSTER SESSION III-027 | LESS TIME TO PREDICT DURING ENCODING DOES NOT AFFECT MEMORY FOR EXPECTED BUT FOR UNEXPECTED INFORMATION

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Prior schema knowledge benefits memory for expected and for unexpected information, but by different mechanisms: Whereas forming predictions is necessary for learning unexpected information, predictive processing may be of less relevance for schema-driven encoding of expected information. Consistent with this view, an event-related potentials (ERP) study in our lab revealed qualitative differences in the encoding of expected and unexpected words (Höltje & Mecklinger, 2022): While encoding of unexpected words was characterized by frontal positive slow waves, a parietal ERP subsequent memory effect was only found for expected words (Höltje & Mecklinger, 2022). Supporting the view that predictions play a minor role in expectancy-driven learning, the latter effect is independent of constraint and thus predictive strength. To test whether time to predict would differentially modulate memory for expected and unexpected words, we compared two experiments in which strongly (SC) and weakly constraining (WC) sentences were presented, ending with either an expected or unexpected word. Crucially, sentences and sentence-final words were presented with a 1s- (Exp. 1) or a 0.3s-break (Exp. 2). In both experiments, expected words were better remembered than unexpected ones. However, break duration affected the learning of unexpected words in that there was a memory benefit for these words in the SC over the WC condition for the long break but not for the short break. This resonates with the idea that memory for unexpected information relies on predictive processing having time to unfold.

FUNDING: This study was funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) – Project-ID 232722074 – SFB 1102, project A6.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.13 Speech/language, 4.18 Memory

POSTER SESSION III-028 | CHANGES IN TONIC SKIN CONDUCTANCE IN ACUTE ALCOHOL INTOXICATION

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Little extant research has examined differences in skin conductance level (SCL) following alcohol administration. Given the presence of trace alcohol in perspiration during alcohol consumption and current recommendations to avoid the use of alcohol in site preparation for SCL collection, we hypothesized that alcohol consumption would produce group differences in SCL between alcohol consumption and non-alcohol control groups. The final sample included 30 heavy drinkers ($Mage$=28.60; SD=7.17; 83.3% White) recruited from the community surrounding a mid-south University, randomly assigned to alcohol (n=18) or control (n=12) gender-stratified conditions. The dose for the alcohol condition was .75grams per kilogram of body weight for women and .81grams per kilogram for men, using 40% vodka (1:4 parts alcohol: soda mixer). Control participants were given an equivalent volume of soda. All beverages were divided into three servings consumed within a 30-minute period in a simulated bar lab. Following a 25-minute absorption period, SCL was collected in microsiemens. Peak blood alcohol concentration (BAC) in the alcohol group ranged from .072 to .140, with no correlation between BAC and mean SCL. Our results indicate no significant effect of alcohol, $t(26) = -.51$, $p = .24$, despite SCL being higher in the alcohol group (meanSCL = .038) than control group (meanSCL = .032). These results add to a mixed body literature on alcohol's effect on SCL and potentially allows for comparisons between alcohol and non-alcohol groups in skin conductance response trials without added correction.

Topics: 1.1 Human Studies: General Population - Adults, 2.7 Skin responses, 2.19 Other, 3.3 Lab Based Experiment, 4.15 Biofeedback, 4.26 Other

POSTER SESSION III-029 | TRACING THE INFLUENCE OF POST-CHOICE EVIDENCE ACCUMULATION ON CONFIDENCE

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Recent electrophysiological work indicates that evidence accumulation continues after an initial perceptual choice and informs subsequent confidence judgments. However, the content of this processing and the stopping rules to which it is subjected have not been identified. Our previous work has suggested that the Centro-Parietal Positivity (CPP), which traces evidence accumulation and whose pre-choice amplitude scales with confidence, continues to evolve after choice commitment when evidence remains available. However, it has not yet been determined if its post-choice build-up reflects continued accumulation of evidence for the choice alternatives or a distinct error detection process. In a first experiment, brief 'pulses' of evidence in favour of either the correct or incorrect alternative were presented after an initial decision. The CPP exhibited similar responses to both pulse types, suggesting that its post-choice build-up does not trace an error detection process. In a second experiment, we sought to identify the stopping rule for post-choice accumulation using a perceptual choice task with self-paced confidence reports, and additionally manipulated speed-pressure on the confidence report. Participants' confidence reports were faster, less accurate, and lower when time pressure was increased. While standard decision-confidence models cannot account for these neural results, variants including collapsing post-decision boundaries improved the fits.
FUNDING: Horizon 2020 European Research Council Consolidator Grant IndDecision 865474. Research Foundation Flanders, Belgium (FWO-Vlaanderen, Grant No. 1242924N, awarded to L.V.).
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 2.15 Computational / Simulation, 3.3 Lab Based Experiment, 4.21 Decision making

POSTER SESSION III-030 | DIFFERENTIAL EVENT-RELATED AND OSCILLATORY COMPONENTS OF EEG RESPONSE TO EMOTIONAL BODY MOVEMENT

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Humans are highly sensitive to the emotional content of body movements, but what neural mechanisms underlie this perceptual ability? Previous research using electroencephalography (EEG) has focused on reductions, or suppression, of the mu rhythm (8-13 Hz), an oscillation over sensorimotor cortex, when observing the actions of others. However, many previous studies on the mu rhythm have used highly repetitive and affectively-neutral stimuli (e.g., hand opening/closing), raising the question of whether this oscillation truly captures more dynamic, expressive movements associated with emotion. Here we examined neural responses to emotional vs. neutral whole-body movements using point-light displays (PLDs) in high-density 128-channel EEG (N = 117). Consistent with prior work, we found significant mu suppression for coherent, meaningful biological motion compared to scrambled versions of the same stimuli. However, this reduction was not significantly different for emotional vs. neutral PLDs, suggesting that mu suppression reflects more general processing of human body movements. In contrast, event-related potentials (ERPs) revealed significant sustained activity for emotional vs. neutral PLDs at frontal and central sensors during the same time window. Together, these data support the contribution of neural signals in both the time and frequency domains to perceptual processing of body movements, but that more idiosyncratic and expressive emotional movements may be better characterized in the time domain.
FUNDING: NSF BCS #1923178.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.20 Attention, 4.23 Emotion/affect, 4.26 Other

POSTER SESSION III-031 | A DISCRETE MOTOR-INDEPENDENT SIGNATURE OF URGENCY DURING HUMAN PERCEPTUAL DECISION MAKING

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When faced with a strict deadline, how does the brain adjust its decision processes to account for the passage of time? Computational modelling and electrophysiological investigations have pointed to dynamic 'urgency' processes that serve to progressively reduce the quantity of evidence required to reach choice commitment as time elapses. To date, such urgency dynamics have been observed exclusively in neural signals that accumulate evidence for a specific motor plan. Here, across three complementary experiments, we show that a long-studied human event-related potential, the Contingent Negative Variation (CNV), represents a discrete, motor-independent signature of urgency, aligning closely with model predicted dynamic bound adjustments and exhibiting additional properties that have not been observed in previously identified urgency signatures. Firstly, it provides a discrete representation of urgency as it grows only as a function of time and not evidence strength. Secondly, when choice reports must be withheld until a response cue, the CNV peaks and decays long before response execution, instead mirroring the time course of a motor-independent evidence accumulation signal (Centro-Parietal Positivity (CPP)). Crucially, this suggests that the brain uses urgency signals not only to expedite motor planning but also to hasten cognitive deliberation. Our data demonstrate that urgency processes operate in a variety of perceptual choice scenarios and that they can be monitored in a model-independent manner via non-invasive brain signals.
FUNDING: This study was supported by a grant from the European Research Council: European Research Council Consolidator Grant IndDecision – 865474.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.21 Decision making

POSTER SESSION III-032 | HEART UNDER PRESSURE? IMPACT OF WORKPLACE TELEPRESSURE AND PRIVATE LIFE TELEPRESSURE ON NOCTURNAL HEART RATE VARIABILITY

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The working life of many employees requires the use of modern information and communication technology (ICT) devices. One of the downsides of digital work environments is workplace telepressure (WTP), i.e., the experience of urge and preoccupation to quickly reply to work-related messages and demands using ICT. Similarly, private life telepressure (PTP) refers to the preoccupation with and urge for responding quickly to personal ICT messages. Adopting the Effort-Recovery Model and the concept of allostatic load as theoretical frameworks, we hypothesized that higher levels of WTP and PTP are significantly associated with a lower root mean square of successive differences (rMSSD), an indicator of heart rate variability (HRV). We focused on nocturnal HRV. To test our hypotheses, we conducted an ambulatory assessment study with a sample of 43 healthy workers. For one week, participants reported their WTP and PTP three times per day using 6-item questionnaires and continuously wore the Bittium Faros 180L ECG monitor. Start and end of sleep were determined with actigraphic data. Prior to analyses, rMSSD scores were log-transformed. Using linear mixed-effects models, we tested the relationships between daily WTP/PTP and nocturnal ln-rMSSD at the within-subject level. WTP and PTP did not significantly predict nocturnal HRV (coefficient = -0.00, standard error = 0.01, p-value = 0.99; coefficient = -0.00, standard error = 0.01, p-value = 0.90, respectively). This study suggests no significant impact of WTP/PTP on nocturnal HRV.
FUNDING: Swiss National Science Foundation (SNSF).
Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/

Interviews, 3.6 Other (Ambulatory Assessment study), 4.8 Sleep, 4.10 Stress, 4.26 Other

POSTER SESSION III-033 | INFLUENCE OF PREDICTIVE CUES ON PERCEPTUAL DECISION-MAKING AND CONFIDENCE JUDGMENTS

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Recent human electrophysiology research has highlighted a centro-parietal positivity (CPP) that builds at an evidence-dependent, RT-predictive rate during decision formation and that undergoes amplitude modulations in response to prior knowledge and time pressure that correspond with the decision bound adjustments identified by mathematical models. In addition, the CPP's pre-response amplitude has been shown to scale with choice confidence reports. This raises the question of whether the CPP traces the accumulation of sensory evidence that informs downstream confidence representations, or if it builds as a function of confidence itself. In our experiment, 15 participants engaged in a contrast discrimination task, determining which of two orthogonally-oriented overlaid gratings was higher in contrast while undergoing electroencephalography (EEG) recordings. On a subset of trials, participants were presented with a predictive cue before evidence onset which had 80% validity. During each trial participants were asked to provide graded confidence reports simultaneous with their choice. As anticipated, participants were significantly faster and more accurate when validly cued. Despite reporting higher confidence in their choices on validly cued trials compared to invalidly cue trials, participants exhibited smaller CPP amplitudes prior to response execution. This pattern suggests that rather than being a confidence signal per se, the CPP traces an evidence accumulation process that is subject to a decision boundary that is adapted to take account of prior knowledge.

FUNDING: Horizon 2020 European Research Council Consolidator Grant IndDecision 865474. Research Foundation Flanders, Belgium (FWO-Vlaanderen, Grant No. 1242924N, awarded to L.V.).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 2.15 Computational / Simulation, 3.3 Lab Based Experiment, 4.21 Decision making

POSTER SESSION III-034 | NEURAL CORRELATES OF COGNITIVE CONTROL IN PROBLEMATIC INTERNET USE

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Background. The diagnostic classification of problematic internet use (PIU) as a behavioral addiction remains controversial. PIU often occurs comorbidly with internalizing symptoms (e.g. depression, anxiety) and is alternatively defined as coping. Previous studies have identified psychophysiological markers of performance monitoring and reward processing as reliable correlates across the externalizing-internalizing spectrum. Thus, we investigated error processing (error-related negativity, ERN) and feedback processing (feedback-related negativity, FRN) to contribute to the understanding of the psychopathology of PIU. Methods. Participants were individuals with problematic internet use (PIU; $n = 26$) and individuals with non-problematic internet use (NIU; $n = 30$). Two experiments were conducted: a) flanker task and b) doors monetary task. These were used to investigate event-related potentials effects (a) ERN and b) FRN). ANOVA with repeated measures were used for the data analysis. Results. a) We did not find significant group differences in ERN. The descriptive patterns show potentially diminished ERN in the PIU group. b) We did not find significant group differences in FRN. Descriptive analysis shows potentially enhanced FRN in the PIU group. Discussion. The PIU group showed comparatively subclinical forms of PIU. The results suggest that individuals with subclinical PIU may not have exhibited identifiable psychophysiological deficits in performance monitoring and reward processing. ERN effects tend to support the classification of PIU as a behavioral addiction.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.25 Cognitive control/ executive functions

POSTER SESSION III-035 | A SHIFT IN PERSPECTIVES: INVESTIGATING THE IMPACT OF TRUSTOR-TRUSTEE ROLE REVERSALS ON FEEDBACK-RELATED NEGATIVITY DURING OUTCOME EVALUATION IN THE TRUST GAME

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Generalized trust towards strangers plays a pivotal role in nurturing cooperative interactions within society. In this study, we investigate how changing roles in the Trust Game influences the Feedback-Related Negativity (FRN) during outcome evaluation. 52 female participants played a one-shot variant of the Trust Game with unspecified partners in each role. During the initial 110 trials while acting as trustors, they were instructed to decide whether to trust or not trust their partners. Then they switched to the role of the trustee, and when being trusted were asked to decide whether to reciprocate the trust or betray it. Then, after completing 110 trustee trials, participants resumed their original role as trustors for a further 110 trials. Trust rates as well as decision times in the role of the trustor did not differ before and after playing the role of the trustee. During outcome evaluation in the role of the trustor, FRN amplitudes were larger following loss feedback compared to gain feedback, possibly indicating a violated expectation regarding rewards for trusting decisions, based on social norms of reciprocity. After assuming the role of the trustee, FRN amplitudes to losses were smaller compared to before the role switch, whereas FRN amplitudes to gains did not differ. The shift of perspectives and exposure to the profitability of non-cooperation in the trustees role may have recalibrated the evaluation of the trustee decisions. Consequently, expectations of reward following trusting decisions were adjusted downwards due to the learning experience.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.21 Decision making, 4.24 Social factors

POSTER SESSION III-036 | INFLUENCE OF ALCOHOL USE AND PHYSICAL ACTIVITY BEHAVIORS ON INHIBITORY COGNITIVE CONTROL AMONG COLLEGE STUDENTS

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College students engage in patterns of behaviors that impact their alcohol consumption (e.g., homecoming, spring break) and physical activity (e.g., sitting during class, playing sports). These health behaviors have shown an unusual clustering, such that physically active people drink more alcohol. However, emerging evidence suggests physical activity may be protective against the negative health effects of alcohol use. Alcohol use has been associated with impairments in inhibitory cognitive control, while physical activity has been associated with greater cognitive inhibition. The purpose of this study was to examine the influence of alcohol use and physical activity on inhibitory cognitive control (N2 component) among college students with variable alcohol use behaviors. 39 participants (28 females) provided information about their alcohol use and physical activity behaviors and completed an alcohol-cued Go/No-Go task. Total drinks per week were a significant predictor of increased total N2 amplitudes ($\beta = 0.039$, $p < 0.05$) and increased N2 amplitude to non-alcohol related stimuli ($\beta = 0.4315$, $p < 0.05$). There was a significant interaction between total drinks per week and vigorous physical activity on alcohol cued N2 amplitudes ($\beta = -0.0027$, $p < 0.05$), such that greater vigorous physical activity moderated the relationship between alcohol consumption and N2 amplitude. These findings suggest that alcohol use and physical activity may differentially affect mechanisms underlying behavior change, emphasizing the importance of lifestyle behaviors in shaping cognitive control.

FUNDING: NIAAA; F-31; 1F31AA030715-01.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.25 Cognitive control/executive functions

POSTER SESSION III-037 | THE INTERPLAY BETWEEN FEAR REACTIVITY AND CALLOUS-UNEMOTIONAL TRAITS PREDICTING REACTIVE AND PROACTIVE AGGRESSION

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Prior research has suggested that youth with CU traits are fearless, and this fearlessness plays a bidirectional role in both the development of CU traits and engagement in aggressive behavior. However, research specifically testing the role of fear in the association between CU traits and aggression is scarce. The goal of the present study was to test if fear reactivity, both conscious (self-report) and automatic (skin conductance reactivity; SCR), moderated the association between CU traits and aggression subtypes (reactive and proactive aggression). Participants included 161 adolescents (M_{age}=15 years) who completed

the self-report Inventory of Callous-Unemotional Traits before fear induction (a virtual reality rollercoaster) while skin conductance was recorded. Participants reported emotional reactivity to the fear induction using the Self-Assessment Manikin. Hierarchical regressions found that high fear reactivity on SCR moderated the association between CU traits and reactive aggression, while feeling more excited during fear induction moderated the association between CU traits and proactive aggression. Overall, a possible explanation of our divergent findings between conscious and automatic fear may be the difference between the instinctual biological response to threat versus the cognitive and emotional appraisal and experience of threat. Implications for intervention strategies targeting emotional recognition and regulation in reducing aggression in CD populations are discussed.

FUNDING: The research reported was supported by the National Institute of Mental Health of the National Institutes of Health under award number R01MH123535 (PI: Thomson).

Topics: 1.5 Human Studies: Clinical Samples- Children / Adolescents, 2.7 Skin responses, 2.13 Behavioral Tasks (e.g. stress exposure), 2.19 Other, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.14 Unconscious processes, 4.26 Other

POSTER SESSION III-038 | USING RTMS TO UNDERSTAND THE ROLE OF THE RIGHT DLPFC IN ANXIETY EXPRESSION

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Repetitive transcranial magnetic stimulation (rTMS) treatment protocols targeting the right dlPFC have been effective in reducing anxiety symptoms comorbid with depression. However, the mechanism behind these effects is unclear. Further, it is unclear whether these results generalize to non-depressed individuals. We conducted a series of studies aimed at understanding the link between anxiety potentiated startle and the right dlPFC. Our work combines fMRI, unpredictable shock threat, startle, rTMS, and interleaved TMS/fMRI. This presentation will feature the combined results of several completed rTMS trials aimed at understanding the relationship between right dlPFC function and anxiety expression. Our basic approach is to measure anxiety potentiated startle during unpredictable shock threat before and after a course of active or sham rTMS. We have shown across 3 separate trials that rTMS to the right dlPFC increases anxiety potentiated startle. These findings are independent of both the pattern of stimulation and the timing of the post stimulation measure. Although these results confirm a mechanistic link between right dlPFC excitability and startle, capitalizing upon this link for the benefit of patients will require future exploration.

FUNDING: This project was supported in part by 2 NARSAD Young Investigator Grants from the Brain & Behavior Research Foundation (2018, 2021); and by a K01 award K01MH121777.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions, 4.26 Other

POSTER SESSION III-039 | CONTRAST AVOIDANCE INFLUENCES THE RELATIONSHIP BETWEEN A NEURAL INDEX OF COGNITIVE CONTROL AND SELF-REPORTED WORRY

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Pathological worry has been linked to inefficient inhibitory control (Hallion et al., 2017), which may be seen in greater N2 activity on "go" trials in go/no-go tasks. But little research has explored factors that may explain this link. In the current study, contrast avoidance (i.e., CA; the tendency to create and sustain negative affect to avoid sudden shifts in emotion) was examined as a mediator of the association between the N2 and self-reported worry. Undergraduate student participants ($N = 57$; mean age 20.46 years [*SD* 3.70]), most of whom identified as cisgender women (71.9%, $n=46$) and White (52.6%, $n=30$), completed a Go-NoGo task during EEG collection. The task consisted of 240 trials of Gabor patch stimuli. Two principal components were identified as N2 candidates: (1) TF07SF01, maximal at FCz and 170.90ms and (2) TF08SF2, maximal at Fz and 319.34ms. Difference waves (NoGo-Go) were calculated to isolate activity associated with inhibitory control. There was an indirect effect of TF08SF2 on worry through CA, beta =.20, [.0507, .3690]. The effect was driven by engaging more control on Go trials, reflected as a more negative-going N2, (beta = -.22, [-.3521, -.1001]), not engaging less control on NoGo trials (beta = -.11, [-.2444, .0171]). There was no indirect effect of TF07SF01 on worry through CA. The findings are consistent with attentional control theory, suggesting a link between worry and inefficient inhibitory control. This link may be explained in part by a desire to avoid sharp emotional contrasts.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized

Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.20 Attention, 4.23 Emotion/affect

POSTER SESSION III-040 | EVENT-RELATED POTENTIALS INDICATE LEARNING IN PATIENTS WITH SEVERE BRAIN INJURY

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Very severe brain injuries can result in profound disorders of consciousness (DoC). Such patients are awake but unable to any consistent behavior, thus no standard learning task can be applied to test their remaining learning abilities. As a result, it remains largely unknown whether the brain of these patients is still able to learn, although – paradoxically – most methods of their therapy and rehabilitation presume such ability. Up to date, learning in has only been shown in its simplest kind, i.e., habituation. We intended to check the ability of DoC patients to associative aversive conditioning learning. In Study 1, we used several oddball procedures in forty healthy subjects and twenty DoC patients aiming to establish the most reliable methods of the evaluation of ERP oddball effects at the individual level. In Study 2, we applied these methods in another sample of 22 DoC patients; we used the aversive learning oddball paradigm we had developed earlier (Psychophysiology 2019, DOI: 10.1111/psyp.13370) with loud noise as an unconditional stimulus. The paradigm was implemented in four sessions on two days, twice a day with a 2-hour interval. In twelve patients the ERP components P3 and the stimulus-preceding negativity revealed conditioning effects that increased from session to session indicating associative learning with consolidation of memory trace over time.

FUNDING: German Research Society (DFG), Grant KO-1753/13-4.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.16 Neurological disorders / Neuropathology, 4.22 Learning/conditioning

POSTER SESSION III-041 | THE NEURAL CORRELATES OF EMOTION PROCESSING AND REAPPRAISAL AS REFLECTED IN EEG

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Successful reappraisal modulates the emotional impact by reinterpreting the meaning of emotion-inducing stimuli, evidenced by decreasing the subjective emotional experience. Here, we recorded EEG during a cued emotion-regulation paradigm including negative and neutral pictures to examine whether the Late Positive Potential (LPP) is sensitive to effects of reappraisal. Firstly, we aimed to replicate LPP analyses commonly conducted at midline electrodes (Fz, Cz, Pz). Typically, the centroparietal LPP is sensitive to the emotional content of stimuli, while only some studies also show effects of reappraisal. We found that the early fronto-centro-parietal LPP (400-1000ms) was increased when passively viewing negative compared to neutral pictures, replicating the basic emotional reactivity finding. The parietal LPP was sustained until the offset of negative pictures during reappraisal, but this LPP was not decreased. Secondly, we applied a localizer approach to uncover reappraisal effects with other spatiotemporal characteristics, but these were not found.[VIvd(1] There are numerous indications that theta oscillations are associated with cognitive control, while frontal alpha might reflect inhibition processing. We therefore also explored the effects of emotion processing and reappraisal on oscillatory activity to further disentangle the involved cognitive processes, focusing on frontal and parietal theta- and alpha-band power.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.23 Emotion/affect

POSTER SESSION III-042 | IMAGERY-BASED FEAR CONDITIONING ENHANCES THE LATE POSITIVE POTENTIAL

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Pairing a conditioned stimulus (CS) repeatedly with aversive imagery as unconditioned stimulus (US) induces conditioned subjective and autonomic fear responses which

can explain fears without prior aversive experiences. To investigate underlying brain dynamics, we assessed the Late Positive Potential, an electrocortical response sensitive to classically conditioned fear, together with skin conductance, cardiac interbeat interval, and fear ratings in $N = 48$ participants. Participants underwent either (a) imagery-based fear conditioning, in which aversive CS+ ($CS+_{av}$), neutral CS+ ($CS+_{neu}$) and CS- were paired with cues to imagine an aversive electric shock, a mild vibration, or nothing, respectively; or (b) classical fear conditioning in which CS were paired with physical shocks, physical vibrations, or nothing. The imagery-based conditioning group showed increased LPP amplitudes for $CS+_{av}$ compared to CS- and tentatively to $CS+_{neu}$. Additionally, $CS+_{av}$ evoked higher fear ratings than both non-aversive CS. These effects did not differ significantly between imagery-based and classical conditioning. Meanwhile, strong cardiac deceleration and increased skin conductance responses to $CS+_{av}$ were uniquely observed for classical conditioning. These results suggest that imagery-based conditioning evokes similar cortical and subjective, but not autonomic, responses as conditioning with physical US – advancing our understanding of fear in the absence of aversive real-life experiences.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 3.3 Lab Based Experiment, 4.22 Learning/conditioning, 4.23 Emotion/affect

POSTER SESSION III-043 | THE INFLUENCE OF AUDIO RENDERING ON SOCIAL FEAR CONDITIONING IN VIRTUAL REALITY

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Fear conditioning paradigms are widely used to study emotional learning and anxiety disorders. Recent studies aimed at increasing ecological validity by using Virtual Reality paradigms. However, most studies focused on the visual domain, while auditory contributions to naturalistic paradigms have been neglected. The goal of the present study was to test whether plausibility of auditory presentation of the US (verbal insults) during social fear conditioning influences emotional learning. In a Virtual Reality paradigm ($N = 36$), one virtual agent verbally insulted the participant (CS+), while another agent produced neutral statements (CS-). In addition, a high-quality audio group was presented with externalized, plausible audio rendering, while a control group was presented with standard, non-externalized audios. Emotional learning was measured via physiological (startle probe), behavioral (gaze), and subjective (rating) responses. The results showed successful social fear conditioning indexed by increased startle responses and fear ratings for the CS+ compared to the CS-. For high social-anxious participants we also observed increased gaze avoidance towards the CS+. Interestingly, we did not find differences in emotional learning between the audio groups for any measure, suggesting that social fear conditioning paradigms can be effective in Virtual Reality even with standard audio settings. This might be related to the interplay between perceived proximity of non-externalized audio conditions and emotional arousal which compensates for auditory presentation quality.

FUNDING: The study was conducted as part of the SPP2236 "AUDICTIVE" funded by the DFG (project ID 444832396).

Topics: 1.1 Human Studies: General Population - Adults, 2.2 Myography (EMG etc.), 2.6 Eye Tracking (blink, movement, size), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.22 Learning/conditioning, 4.23 Emotion/affect

POSTER SESSION III-044 | BREAKS IN SENSORIMOTOR CONTINGENCIES GENERATE A CASCADE OF PREDICTION ERRORS ACROSS MULTIPLE LEVELS OF COGNITION

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Place illusion (PI) refers to the sensation of feeling as if one is actually situated within a location depicted in a virtual environment, and achieving PI faithfully can carry significant impacts on the success of entertainment, training, and therapeutic applications in virtual reality (VR). One way to gain an understanding of the mechanisms underlying PI is to intentionally break it by causing disruptions to sensorimotor contingencies. Here, in an exploratory study (n=12), we recorded ERPs while participants used a slingshot to hit targets in a highly immersive VR environment using a head-mounted display (HMD). Critically, on a minority of trials, we induced breaks in PI (BIPs) by briefly freezing the slingshot and the motion of its projectile in place at the moment of the shot's release. The difference in brain activity between the normal and BIP trials revealed not only early effects related to error-monitoring (the N2

component), but also later effects traditionally associated with the processing of semantics and syntax (the N400 and the P600 components, respectively); effects that have not been reported in previous studies introducing sensorimotor disruptions in simpler environments. In contrast to popular presence models, our data suggests that even disruptions to low-level perception can impact higher-level aspects of cognition in VR. Furthermore, our "gamified" paradigm serves as a model for collecting quality ERP data in highly immersive, natural settings. Work is ongoing to replicate these effects in a larger confirmatory study.

FUNDING: This work is supported by the Illusive (01020977) project funded by the European Research Council and the PIXIE (331822) project funded by Academy of Finland.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.26 Other

POSTER SESSION III-045 | CARDIOVASCULAR HEALTH AMONG MINORITY COMMUNITIES: A SCIENTOMETRIC ANALYSIS OF RESEARCH TRENDS AND INFLUENTIAL PUBLICATIONS

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Minority groups often face disparities in health outcomes compared to the majority population, attributed to cumulative exposure to distal stressors like discrimination and unequal socioeconomic status, along with proximal stressors such as concealing identity due to perceived stigma. Autonomic nervous system dysregulation, evidenced by reduced heart rate variability, is considered a potential mechanism linking chronic stress to adverse health events in these populations. This study employed a scientometric approach to review literature on physiological functioning in minority groups (e.g., racial, ethnic, gender, sexual, and neurological minorities). Analysis of 1945 papers from 1953 to 2024 using CiteSpace software revealed nine main research themes and identified the ten most impactful publications. The trajectory of research has shifted from exploring factors underlying minority health disparities to investigating the impact of racism on ethnic minority health. However, a knowledge gap persists regarding autonomic nervous system dysregulation in sexual, gender, and neurological minority groups. Further research is needed to explore methods to mitigate the impact of chronic social stress on minority health outcomes. This data-driven approach offers insights into the main topics in the literature on autonomic and cardiovascular functioning in minorities.

FUNDING: This study was supported by PRIN 2022 (2022EL4MPH) funded by the Ministry of Education, University and Research, Italy.

Topics: 1.1 Human Studies: General Population - Adults, 2.15 Computational / Simulation, 2.17 Machine Learning/ Deep Learning, 3.5 Secondary Analysis, 4.6 Racism/prejudice, 4.10 Stress, 4.24 Social factors

POSTER SESSION III-046 | DECODING IN THE FOURTH DIMENSION: CLASSIFICATION OF TEMPORAL PATTERNS AND THEIR GENERALIZATION ACROSS LOCATIONS

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Neuroscience research has increasingly used decoding techniques, in which multivariate statistical methods identify patterns in neural data to classify experimental conditions. Typically, the features used for decoding are spatial in nature, including voxel patterns and electrode locations. However, the strength of many neurophysiological recording techniques such as magneto/electroencephalography is in their temporal, rather than spatial, resolution. The present work proposes a new decoding method that relies on the temporal information of neural time series. The time-based generalization across location (time-GAL) decodes conditions based on neural dynamics and characterizes the relationship between brain areas based on their ability to cross-decode. The correlation between condition labels and recording locations provides the time course of the decoding results, thus illustrating spatio-temporal dynamics of the neural patterns. Two datasets are used to demonstrate usage of the method, involving (1) event-related potentials in response to affective pictures and (2) steady-state visual evoked potentials in response to aversively conditioned grating stimuli. In both cases, experimental conditions were successfully decoded based on the temporal features contained in the neural time series belonging to regions known to be involved in visual and affective processing. Thus, the GAL approach holds promise for analyzing neural time series, leveraging the rich temporal information in neural time series and providing an assumption-free method to quantifying spatial dependencies.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.17 Machine Learning/ Deep Learning, 3.6 Other (Methodology development), 4.26 Other (Methodology in electrophysiology)

POSTER SESSION III-047 | A MODEL FOR PREDICTING EMOTIONAL DIMENSIONS WITHIN THE INDIVIDUAL: ANALYSIS OF THE POPANE DATASET

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The Popane dataset (Behnke et al., 2022) is a series of seven experiments in which subjects were given a slider representing an emotional scale that they were instructed to move when their feelings changed. Subjects responded on a motivational (approach-avoidance) scale (n=287) or a valence scale (n=368). The sympathetic activity (SAI) and parasympathetic activity (PAI) indices (Valenza et al., 2018) were calculated using ECG, and pulse pressure amplitude (PPA) was calculated from blood pressure, which allowed SAI, PAI, and PPA to be measured at each heartbeat. The SAI, PAI, and PPA were regressed on affect for each subject. The average r-squared of the individual regressions was larger for motivation (.172) than valence (.124), especially for female subjects. Given that most experiments rely on between-subject comparisons and select for relevant time series, a large effect size at an individual level of analysis shows potentially higher prediction than in previous studies. A group-level regression of the beta weights to the R-squared of each individual-level regression was used to compare the model's generalizability by testing which beta weights predicted larger effects. The group-level regression showed that PPA and SAI strongly predicted motivation (F=13.79, p<.001), but valence was nonsignificant, and PPA was the weakest predictor. Results indicate that PPA and SAI are predictive of motivation, but PAI and SAI are predictive of valence. One limitation was the time series, which depended on the individual's responsiveness and accuracy/reliability of the affect slider.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.5 Hemodynamic (BP), 3.3 Lab Based Experiment, 4.19 Motivation, 4.23 Emotion/affect

POSTER SESSION III-048 | REVERSAL LEARNING IN THE HUMAN VISUAL CORTEX

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Reversal learning paradigms are commonly used to investigate cognitive and affective processes, including in neuropsychiatric conditions. The present study uses an aversive reversal learning paradigm to investigate visuocortical responses to threat stimuli. Participants (N = 44; 18-23 years) viewed flickering Gabor patches at different orientations, driving steady-state visual evoked responses (ssVEP) recorded with EEG. An aversive loud noise was used as the unconditioned stimulus, paired with one orientation (CS+) and never with the other (CS-). Then, the contingency between the conditioned and unconditioned stimuli was reversed. Test phases after conditioning and reversal examined frequency-tagged ssVEPs evoked by CS+ and CS-, as well as a neutral Gabor, allowing us to quantify competition effects. Participants rated each stimulus in terms of valence, arousal, and expectancy throughout. EEG-ssVEP data were analyzed using the Hilbert transform. We compared the ssVEP amplitude at the tagging frequencies during the test phases, across the entire topography. As expected, the conditioned threat cue (CS+) prompted heightened competitive bias (relative to the neutral stimulus) in visual cortex, and this effect remained after 60 trials of reversal learning. Behavioral data showed that participants did learn the reversal, despite this learning not being reflected in visuocortical changes. Findings support the notion that a short reversal learning phase is not sufficient to change previously acquired threat biases in neural mass activity.

FUNDING: The research was supported by NIH grant R01MH125615 to Andreas Keil, PhD.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.22 Learning/conditioning, 4.23 Emotion/affect

POSTER SESSION III-049 | OSCILLATORY EEG RESPONSES TO DIFFERENT LEVELS OF INSTRUCTED THREAT

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FMRI (meta) analyses demonstrated substantial and consistent responding of the dorsal anterior cingulate cortex (dACC) to stimuli that signal threat vs. safety. Functional interpretations of the involvement of this area include threat reactivity, activation of the salience network and threat appraisal. Corresponding EEG studies have mainly focused on oscillatory power in the theta range. Some but not other studies have shown threat-safe differences in theta oscillations over medial frontal cortex (centered on FCz). Two studies employing an instructed threat paradigm will be reported. In the first study the threat cue is a male face signaling that a shock can occur with 20% probability at any time during cue presentation (8-12s). The variable cue duration and timing uncertainty may induce temporal variability in shock expectation across trials and participants which may obscure theta responses at group level. Therefore, in the second study cue duration was fixed at 5 s with the shock co-terminating with cue offset. Threat conditions that differed in shock probability were signaled with geometric shapes. In addition to 20%, a second 80% reinforcement condition was included. Time-frequency analysis (EEGlab, complex Morlet wavelet convolution) focused on theta power (4-8 Hz, FCz, 50-450 ms). In neither of the two studies, significant differences between theta responses to threat and safe cues were found. A currently ongoing study uses less explicitly instructed levels of threat imminence to test whether a stronger appraisal component enhances differential theta responses.

FUNDING: Standard university funding.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.7 Skin responses, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.23 Emotion/affect

POSTER SESSION III-050 | USING REWP, EFFORT, AND SELF-REPORTED TRAIT DISPOSITIONS TO DISTINGUISH TEMPORAL COMPONENTS OF REWARD PROCESSING

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The exact nature of when and how effort influences reward processing is unclear, and there are contradictory interpretations as to how reward contingencies influence expectations and valuations. Therefore, we examined the effects of effort on RewP amplitude and how self-reported anticipatory and consummatory trait dispositions relate to RewP. A total of 29 subjects completed the number judgement task while continuous EEG was recorded. Anticipatory and consummatory trait dispositions were measured using the temporal experiences of pleasure scale (TEPS). Results indicated no main effect of level of effort or valence on RewP, while the interaction was not significant. The correlation between TEPS-anticipatory and RewP was not significant, while a statistically significant negative correlation was observed between RewP and TEPS-consummatory scores. The strong negative correlation between RewP and TEPS-consummatory scores is indicative of an inconsistency between self-reported consummatory pleasure and an early physiological marker of reward valuation. This misalignment suggests that RewP is not an index of reward induced pleasure, but the results also indicate that it is not simply a dichotomous marker of valence either. Instead, RewP is suggested to be an index of prediction error and early valuation of the reward, which is influenced by expectations about the reward. Given this, TEPS-consummatory scores should be understood as indices of a consummatory disposition that influences multiple facets involved in reward processing, including shaping expectations about the reward.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.11 Personality, 4.12 Sensation/perception/interoception, 4.14 Unconscious processes

POSTER SESSION III-051 | PEOPLE, PLACES, AND THINGS: EMOTION AND ANIMACY IN SCENE PERCEPTION

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Animate and inanimate categories reflect specific knowledge systems with partly distinct neural mechanisms. Recent studies show that early posterior negativity(EPN) is sensitive to animacy. We examine how scene animacy and emotion affect valence and arousal ratings, and modulate EPN and late positive potential(LPP). 77 participants viewed 180 pleasant, neutral, and unpleasant people, objects, and landscapes scenes, balanced for luminance and complexity. People scenes excluded erotica & mutilations to balance arousal ratings. EEG data were recorded from 128 channels and converted into baseline-deviated ERP epochs from each participant and scene category. All scenes elicited expected valence & arousal ratings, while emotional people and objects scenes were rated more arousing than landscapes.LPP modulation followed arousal ratings, showing greatest positivity for emotional people scenes, followed by objects, while no modulation in emotional landscapes. EPN modulation showed a similar pattern, with pleasant people and objects prompting the greatest negativity, a pattern that remained in a subset of people and object scenes that were closely matched for rated arousal. The EPN was not enhanced by pleasant, relative to neutral landscapes. Thus, scene content interacts with emotional modulation of the EPN and LPP. Despite strong valence and reliably higher arousal ratings, pleasant and unpleasant landscapes did not evoke different ERPs relative to neutral landscapes. In contrast, highly arousing emotional objects modulate the LPP similarly to moderately arousing emotional people.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.23 Emotion/affect

POSTER SESSION III-052 | NATURALLY CYCLING PROGESTERONE LEVELS CORRELATE WITH BOLD INCREASES IN PRIMARY INTEROCEPTIVE CORTEX DURING MEMORY ENCODING

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In females, ovarian hormones naturally cycle. The ovarian hormone cycle (i.e., the menstrual cycle) is known to influence affective experience, but its cognitive influence is less well understood. Further, females are at greater risk of developing Alzheimer's, and so it is important to understand the link between cognitive performance (e.g., memory; fMRI activity related to memory) and natural fluctuations in ovarian hormones (e.g., progesterone and estradiol). To test this, 47 females participated in a series of (3T) fMRI sessions, sampled at timepoints across their menstrual cycle (at most, 6 sessions per subject; 154 sessions total), testing encoding and retrieval of simple word/image pairs. Memory performance (mean d prime) showed no significant difference ($F(2, 140)=0.187$, n.s.), across sampled cycle periods (early follicular, late follicular, mid-luteal). However, during encoding trials that were later forgotten, blood progesterone levels ($N=101$, collected in a subset of participants) was positively correlated with a BOLD increase in bilateral posterior insula (False Decision Rate $p<.05$), or primary interoceptive cortex. These findings raise important questions about how interoceptive information may contribute to or detract from cognitive performance. For example, hormonal fluctuations in females may constitute a particularly prominent source of interoceptive noise.

FUNDING: R01 MH109464.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.10 Blood markers, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.3 Sex differences, 4.12 Sensation/perception/interoception, 4.18 Memory

POSTER SESSION III-053 | "THAT WIN DIDN'T COUNT": EXAMINING NEGATIVE EXPECTANCY BIAS IN HIGHLY ANXIOUS PARTICIPANTS USING FEEDBACK-RELATED NEGATIVITY

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An increased feedback-related negativity (FRN) amplitude has been associated with anxious individuals in response to positive feedback. Researchers have suggested that due to a negative-expectancy bias, positive feedback is more unexpected and may be the cause of a larger ERP compared to non-anxious individuals. Previous research has yet to examine how the manipulation of an individual's expectancy changes the relation between anxiety and FRN amplitude. A sample of 24 (F=13) individuals completed a modified 4-door gambling task for a monetary reward. The gambling task was modified with cues indicating the likelihood of success prior to selection (25, 50, or 75%). Anxiety was measured using the Beck Anxiety Inventory (BAI). Significant differences were found among FRN amplitudes after positive feedback between anxiety categories (p=.03). Post hoc tests revealed that participants with high levels of Anxiety showed significantly more negative FRN amplitudes than those with low levels of Anxiety (p=.04). Across differing cue conditions, negative correlations were found between scores on the BAI and FRN amplitude for 50% cues (p=.03) and 75% (p=.053) cues.
This study supports previous research that anxious participants exhibit an increased FRN response to positive feedback. Findings suggest that this effect may be primarily for ambiguous (50%) or likely (75%) cues where participants may discount their successes. When participants were not likely to win (25% cue), highly anxious participants expectations' may not have differed from those with low anxiety.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.23 Emotion/affect.

POSTER SESSION III-054 | CLASSIFICATION OF PERSONALITY TRAITS USING RESTING-STATE ELECTROPHYSIOLOGICAL SIGNALS

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Personality is a multifaceted concept that encompasses an individual's long-standing attitudes, behaviors, and perspectives. Previous behavioral studies have suggested that personality traits modulate cognitive performance and psychological processes. Recent neuroimaging studies have demonstrated associations between brain structure, cognitive abilities, and various personality traits. In this electroencephalography (EEG) study, we hypothesize that the variety of personality traits could be decoded from individual's electrophysiological signals using resting-state EEG and further classified by machine learning approaches. Sixty-four healthy young adults who completed the self-report NEO Five-Factor Inventory (NEO-FFI) to assess their personality traits underwent resting-state EEG recording. The NEO-FFI is a tool that uses five personality dimensions, including Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness. Participants were divided into high and low groups based on their NEO-FFI scores for each personality dimension. Microstate EEG analyses were performed with distinct microstate parameters extracted from topographical patterns, and the Support Vector Machine (SVM) was applied with distinct microstate parameters as features. The SVM results showed that the classifiers based on microstate features could successfully discriminate high and low groups with the highest accuracy of 92% for conscientiousness, and 86% for extraversion. Our research provides a preliminary validation of using electrophysiological signals to classify personality traits.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.17 Machine Learning/ Deep Learning, 3.3 Lab Based Experiment, 4.11 Personality

POSTER SESSION III-055 | THE GOOD, THE BAD, AND THE COMPUTER: SOCIAL FEEDBACK PROCESSING DEPENDING ON OTHER FEEDBACK BEHAVIOUR

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Social evaluative feedback informs us about how others perceive us. At the same time, it informs us about the sender. We constantly update our expectations of social feedback and shift our attitude towards the sender. Findings propose that people maintain a positively biased expectation of social feedback, while other-related updates may be driven by both positive and negative feedback. This study realized real-life social interactions. Participants (N=40) rated two other peers on different trait adjectives based on a short interaction protocol. In the main EEG experiment, ratings were modified so that participants received self-congruent feedback from two peers. Additionally, both peers provided self-incongruent feedback: One peer only had positive feedback, and the other only had negative feedback. In a control condition, feedback was instructed to represent random computer feedback. Participants updated their feedback expectations and other ratings according to their feedback behavior. However, while self-incongruent compared to congruent feedback led to larger changes in the other rating, there was a global decrease in likeability ratings for the 'negative peer'. Event-related potentials (ERPs) showed corresponding modulations during Late Positive Potential (LPP), being more positive for conditions with higher other-updating changes. To our knowledge, this is the first study that combined the temporal stages of social evaluative feedback processing with subsequent behavioral effects, emphasizing that other updating processes occur during the LPP.

FUNDING: This work was funded by the Innovative Medical Research Fund of the University of Münster Medical School (IMF I-SC 11 22).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.22 Learning/conditioning, 4.24 Social factors

POSTER SESSION III-056 | BEYOND THE UNPREDICTABLE: EXPLORING THE ROBUSTNESS AND 6-MONTH-STABILITY OF EEG, HEART PERIOD AND BRAIN-HEART RESPONSES TO UNPREDICTABLE THREAT

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Unpredictable threat triggers neural and cardiac modulations, and modulates the communication between brain and heart as measured with cardio-electroencephalographic covariance tracing (CECT). Individual differences in brain, heart, and brain-heart responses to threat have been linked to individual differences in personality and pathology. To serve as psychophysiological markers for these conditions, however, they need to be robust and reliable over time. $n = 60$ participants completed an auditory oddball paradigm at two time points (t1, t2). Frequent (standard) and infrequent (deviant) tones were presented in both safe and threat contexts. During threat contexts unpredictable shocks were delivered. Event-related potential (ERP; N1, P2, P3), heart period (HP; A1), and CECT components reflecting within-subject correlations of EEG and HP were measured. We (1) compared result patterns over experimental conditions as a measure of robustness, and (2) computed internal consistency and test-retest correlations as measures of reliability. Experimental effects were highly robust over a 6 month period. Raw amplitudes of ERP ($.77 < r < .91$), HP ($.56 < r < .63$) and CECT ($.35 < r < .44$) components showed moderate test-retest reliability. Test-retest ERP correlations of the magnitude of the experimental threat effect ranged from .30 (P2) to .54 (N1). Taken together, ERP, HP and CECT provide robust, and to some degree reliable and stable measures in the context of unpredictable threat and may be helpful for better understanding key mechanisms and individual differences in threat processing.

FUNDING: This work was supported by the Deutsche Forschungsgemeinschaft (grant number DFG MU 3535/6-1).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.11 Personality, 4.23 Emotion/affect

POSTER SESSION III-057 | MOTIVATIONAL CONTEXT AND ERROR PROCESSING IN IMPULSIVITY AND COMPULSIVITY

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Neural correlates of performance monitoring (PM), specifically the error-related negativity (ERN), are not only sensitive to motivation, but also altered in mental disorders characterized by high levels of impulsivity and compulsivity. We examined the relationship between the ERN and individual differences in impulsivity and compulsivity, and how motivational context impacts this relationship. Participants (n = 221) were recruited along the dimensions of impulsivity and compulsivity, and they performed a flanker task with a potential gain (PG) and a loss avoidance (LA) motivational context to assess the ERN and theta power. Single trial regression was employed to analyze effects of motivational context and the association with impulsivity and compulsivity. High impulsivity and compulsivity predicted higher ERN amplitudes within the PG context, but not the LA context. The interaction between both resulted in ERN amplitudes in the PG context being largest when impulsivity was high and compulsivity was low, and smallest when both were low. The ERN amplitude difference between PG and LA trials was highest if both impulsivity and compulsivity were low. Results indicate that both impulsivity and compulsivity are associated with larger ERN in the PG context, probably indicating higher subjective error significance. Both show a reduced modulation of the ERN with motivational context suggesting deficits in adaptive regulation of PM. Exploring transdiagnostic traits and their interactions may provide valuable insights into motivational effects on PM.

FUNDING: This work was funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation), grant number SFB 940, project C6.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.19 Motivation, 4.25 Cognitive control/ executive functions

POSTER SESSION III-058 | SUPPORTING EXTINCTION MEMORY UPDATING TO PROMOTE EXTINCTION GENERALIZATION IN A CATEGORY-BASED FEAR CONDITIONING PARADIGM

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A challenge in exposure-based treatments is the effective generalization of extinction learning, as it tends to be highly specific to stimuli or situations used during exposure. This empathizes the need for treatments that enhance extinction generalization to overcome stimulus specificity and reduce the risk of relapse. This study aimed to investigate extinction generalization by promoting the updating of extinction memory via mental imagery of the experienced inhibitory association with novel, semantically similar stimuli. To date, 34 participants underwent a three-day, within-subject, category-based fear conditioning paradigm. Two conditioned stimulus (CS) categories were paired with an electric shock during acquisition training (CSa+; CSb+), while one CS category was not (CS-). On day two, extinction training was followed by a prompt to retrieve the inhibitory learning association and to imagine the same experience with novel stimuli for the CSa+ category. On day three, participants were tested for extinction generalization, including elements seen during acquisition and extinction training, as well as new or imagined elements. Preliminary data indicate reduced return of fear for new and imagined stimuli of the category with extinction memory updating (CSa+) compared to the other category (CSb+), as evidenced by reduced skin conductance response and fear-potentiated startle. Our preliminary findings indicate that mental imagery involving novel stimuli may help to facilitate extinction generalization to novel stimuli.

Topics: 1.1 Human Studies: General Population - Adults, 2.2 Myography (EMG etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.22 Learning/conditioning

POSTER SESSION III-059 | HOW AND WHEN SOCIAL ANXIETY MANIFESTS: A META-ANALYSIS INVESTIGATING THE EFFECTS OF SOCIAL ANXIETY ON SUBJECTIVE DISTRESS, AUTONOMIC AND ENDOCRINE MEASURES IN DIFFERENT EXPERIMENTAL SETTINGS

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This meta-analysis explored whether the effects of social anxiety on subjective, autonomic and endocrine responses differ according to the characteristics of the experimental setting. We specifically focused on the degree of social interaction, the aversiveness of the stressor, the naturalism of the situation, and the experimental phase (i.e., anticipation, reactivity, and recovery). We integrated data from 126 empirical research articles investigating differences between clinical populations and healthy controls as well as between high and low socially anxious participants in different age groups (children, adolescents, and adults). Standardized mean differences were analyzed across different outcome measures, i.e. subjective anxiety, heart rate (HR), skin conductance level (SCL), and cortisol. Results revealed that trait social anxiety was consistently associated with higher HR, higher SCL, and higher subjective distress. In all these measures, we observed the largest group differences during the anticipation of a stressor. The naturalism of the situation modulated the effects on HR and subjective distress ratings such that interactions with real people elicited the largest group differences. For subjective distress ratings, this was also true for the mere presentation of facial pictures. SCL was modulated by the degree of social interaction with larger group differences in situations with a higher degree of interaction. No modulating effects were found for the aversiveness of the stressor, and we failed to observe robust group differences for cortisol responses.

FUNDING: This work was funded by the German Research Foundation (Grant No.: 433490190).

Topics: 1.8 Other (It is a meta-analysis including clinical samples and general population of various ages (children, adolescents, adults)), 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 2.11 Questionnaires/Interviews, 3.5 Secondary Analysis, 4.7 Psychopathology, 4.23 Emotion/affect, 4.24 Social factors

POSTER SESSION III-060 | THE INTERPLAY BETWEEN ATTENTION AND MULTISENSORY PROCESSING IN WORKING MEMORY

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Information from different senses is integrated to operate in a multisensory world. However, how multisensory objects are stored in working memory (WM) is not clear yet. Hence, in our first study, participants performed an audio-visual delayed-match-to-sample task, including concurrently presented tones and visual orientations. In separate blocks, participants memorized only the tones, orientations, or both. Following a delay, they compared an audio-visual probe's task-relevant feature(s) with the encoded feature(s). Results showed that task-irrelevant features decayed the task performance. This interference effect suggests that task-irrelevant features were encoded and integrated into WM to some degree. Yet, these features were not reflected in traditional ERP correlates of unisensory working memory. To better understand to what degree the task-irrelevant features are integrated into multisensory object representations, we included unisensory conditions (auditory-only and visual-only) in our second study. We also manipulated the memory item presentation by fostering bottom-up integration or segregating features to quantify the multisensory integration. Similar to the first findings, a behavioral interference effect was observed even when task-irrelevant features of an object occurred in different locations from the task-relevant features, indicating a bottom-up integration between crossmodal information. Using Representational Similarity Analysis, we aim to assess under what conditions a multisensory WM representation occurs.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.18 Memory, 4.20 Attention

POSTER SESSION III-061 | EXPLORING MENTAL EFFORT DEPLOYMENT AND ITS LINKS TO MENTAL FATIGUE WITH PSYCHOPHYSIOLOGICAL MARKERS

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Acute mental fatigue often leads to a temporary decline in performance during or after an effortful cognitive task. To be correctly interpreted as a mental fatigue effect, this decline in performance must be accompanied by a decrease in mental effort and not correlated to a reduction in motivation. Few studies on mental fatigue controlled these two variables in addition to performance. This experiment aimed to investigate performance changes and their link to psychophysiological markers of mental effort. In 2 counterbalanced sessions, 45 participants performed either a 30-min dual 2-back task or control task (watching conferences). The dual 2-back task involved visuo-spatial working memory, requiring participants to remember two types of stimuli (a shape and a spatial position). Both tasks were preceded and followed by a 10-min 2-back task to assess changes in working memory capacity. Analysis of performance and psychophysiological data (pre-ejection period and density of theta waves) revealed consistent prioritization of less effortful behavior, favoring speed over accuracy during the 30-min dual 2-back task and subsequently on the 10-min 2-back task. Both pre-ejection period reactivity and density of theta waves, two markers of effortful control, decreased with time-on-task and subsequently to the dual 2-back task. Importantly, these findings were not attributed to a reduction in motivation and then, can be attributed to mental fatigue.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 3.3 Lab Based Experiment, 4.19 Motivation, 4.25 Cognitive control/executive functions

POSTER SESSION III-062 | FACING EMOTIONAL VOCALIZATIONS AND INSTRUMENTAL SOUNDS: SIGHTED AND BLIND INDIVIDUALS SPONTANEOUSLY AND SELECTIVELY ACTIVATE FACIAL MUSCLES IN RESPONSE TO EMOTIONAL STIMULI

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Facial mimicry of visually observed emotional facial actions is a robust phenomenon. Here, we examined whether such facial mimicry extends to auditory emotional stimuli. We also examined if participants' facial responses differ to sounds that are more strongly associated with congruent facial movements, such as vocal emotional expressions (e.g., laughter, screams), or less associated with movements, such as non-vocal emotional sounds (e.g., happy, scary instrumental sounds). To assess whether facial mimicry of sounds reflects visual-motor or auditory-motor associations, we compared individuals that vary on lifetime visual experience (sighted vs. blind). We used facial electromyography to record the activity of the corrugator supercilii and the zygomaticus major. Participants freely listened to the two types of emotional sounds. Although both types were rated similarly on valence and arousal, only vocal sounds elicited congruent and selective facial responses. Those responses were observed in both groups. However, the muscles' responses of blind participants showed less differentiation between emotion categories of vocalizations. Furthermore, the groups differed in the shape of the time courses of the *zygomatic* activity to human vocalizations. Overall, the study shows that emotion-congruent facial responses occur to non-visual stimuli are more robust to human vocalizations than instrumental sounds. Furthermore, the amount of lifetime visual experience matters little for the occurrence of cross-channel facial mimicry, but it shapes response differentiation.

FUNDING: This study was supported by the grant "Preludium," 2017/25/N/HS6/01052 (KW, PW) funded by the National Science Centre, Poland. MH was supported by the Priority Research Area "Society of the Future" of the Strategic Programme 'Excellence Initiative' at Jagiellonian University.

Topics: 1.1 Human Studies: General Population - Adults, 2.2 Myography (EMG etc.), 3.3 Lab Based Experiment, 4.23 Emotion/affect, 4.24 Social factors

POSTER SESSION III-063 | THE ROLE OF MOTOR REPRESENTATIONS FOR WORKING MEMORY WHEN DEALING WITH INTERFERENCE: NEW EVIDENCE BY NEURAL OSCILLATIONS

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We investigated the role of the action planning processes for working memory (WM) by means of interfering motor tasks. In the main WM task, participants stored the color of an object and the object's shape indicated the response hand to be used for color report. During storage, participants had to respond to a secondary task by a left or right button press, which was either corresponding or non-corresponding to the response hand for the WM task. Furthermore, the interrupting task was based on either a non-colored object (motor interference) or an object with a distracting color (visuomotor interference). We hypothesized that the distracting colors would particularly interfere with WM color report when the response hands of both tasks corresponded. We replicated that task-irrelevant colors interfered with the precision of color report in the WM task. We also observed a lower WM precision when the secondary task was performed with the non-corresponding hand which is opposed to our initial hypothesis. The EEG analyses revealed an early suppression of mu and beta activity (~8-30 Hz) contralateral to the target hand which reappeared after the interrupting task. Contralateral mu suppression wasn't affected by the interference manipulation. The strength of this motor preparation effect was not related to behavioral performance. We conclude that motor relevance of the interfering task affects the visual WM representations, however this doesn't occur as a function of motor preparation, it might be occurring over changing attentional weights through interfering tasks.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.18 Memory, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION III-064 | SELF ESTEEM MODERATES ERP AND BEHAVIORAL RESPONSES TO ACUTE SOCIAL REJECTION

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Forming strong social relationships is critical for human survival. Yet, not every social encounter results in the creation of a new social bond; social rejection is part of life. The current study used event-related brain potentials (ERPs) to examine neural responses to acute experiences of rejection and acceptance, as well as the effects of social rejection on subsequent cognitive processes such as attention and memory for social stimuli, and how individual differences in self esteem moderate these relationships. While ERPs were collected, participants viewed 300 pictures of peers, made a decision about whether they would like or dislike each peer, and then received (false) feedback regarding whether the peer had accepted or rejected them. The N200 component of the ERP, implicated in mismatch detection, was larger when high self esteem individuals were rejected versus accepted, consistent with the idea that individuals high in self-esteem expect to be accepted. In addition, the late positive complex (LPC), implicated in memory updating and encoding, was larger when low self esteem individuals were rejected by those peers they liked versus disliked. Finally, low self esteem individuals both overestimated the frequency with which they were rejected and showed better memory on a subsequent surprise memory task for those peers who had rejected versus accepted them. In sum, behavioral and neural data indicate that self esteem moderates both attention to and memory for acute social rejection.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.18 Memory, 4.23 Emotion/affect, 4.24 Social factors

POSTER SESSION III-065 | SUBJECTIVE SOCIOECONOMIC STATUS MODERATES HOW RESTING HEART RATE VARIABILITY PREDICTS PAIN RESPONSE

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Higher resting heart rate variability (HRV) has been linked to reduced perception of experimentally induced pain—reflecting a general adaptive stress response.

However, we propose that chronic threat exposures due to one's subjective socioeconomic status (SSS) may produce distinct adaptations that moderate how resting HRV relates to pain perception. Specifically, lower SSS individuals exposed to more threats may prioritize threat detection by upregulating sensitivity to stressors, while higher SSS individuals exposed to less threats may instead prioritize affective regulation by downregulating sensitivity to stressors. Thus, we predict that higher HRV would be linked to greater acute pain perception among lower SSS individuals, but reduced acute pain perception among higher SSS individuals. We tested this prediction in 164 healthy young adults exposed to experimental pain via the cold pressor test (CPT). Resting HRV, indexed by the root-mean-square of successive differences in heart rate, and self-reported SSS were measured at rest. Acute pain perception indexed by self-reported pain and pain tolerance indexed by hand-immersion time during the CPT were assessed. Results revealed that for higher SSS individuals, higher resting HRV predicted lower pain reports and subsequently greater pain tolerance during the CPT. Conversely, for lower SSS individuals, higher resting HRV predicted higher pain reports and subsequently lower pain tolerance. These findings suggest that pain responses vary with unique biological adaptations from chronic threat exposures captured by SSS.

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Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.9 Pain, 4.10 Stress, 4.23 Emotion/affect

POSTER SESSION III-066 | ASSOCIATION BETWEEN AMYGDALA STRUCTURE AND FUNCTION WITH TRAUMA SEVERITY IN PATIENTS WITH ANXIETY AND MOOD DISORDER

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Both functional and structural differences in the amygdala have been reported when comparing healthy controls to patients diagnosed with stress-related disorders (e.g., post-traumatic stress disorder, PTSD), but investigations have largely proceeded independently, despite evidence showing that structural and functional data are related. The current study tested the combined contribution of amygdala volume and functional brain activity during emotional visual perception when predicting transdiagnostic trauma severity in a sample (N=100) of patients diagnosed with anxiety and mood disorders. Stepwise multiple regression analysis showed 1) that unique portions of variance of trauma severity are explained by amygdala volume (R^2 = .11, p<.001) and emotional reactivity (R^2 = .06, p=.008), and 2) no interaction between amygdala volume and emotional reactivity in predicting trauma severity. Medication status or demographic characteristics did not affect these associations. Taken together, the data suggest that different neurobiological measures are independently associated with trauma-related psychopathology, underscoring the importance of integrating structural and functional neuroimaging data to refine diagnostic and treatment paradigms in internalizing disorders.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.3 Sex differences, 4.10 Stress, 4.23 Emotion/affect

POSTER SESSION III-067 | APERIODIC EXPONENT AND OFFSET ARE ASSOCIATED WITH DOMAINS OF VERBAL ABILITY, EXECUTIVE FUNCTION, AND PROCESSING SPEED

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There is increasing interest in how the aperiodic exponent and offset of EEG activity are associated with cognitive performance. Much of this work has focused on specific cognitive functions or has not adjusted for age effects. We used data from an open-source dataset (SRM Resting-state EEG, 17-71 years old, $n = 111$) to explore how the aperiodic exponent and offset are associated with domains of cognition (i.e., Processing Speed, Executive Function, Working Memory, Verbal Learning, Verbal Memory, Verbal Fluency, and Psychomotor Speed). Using Principal Component Analysis and K-means Clustering, occipital, frontoparietal, central, and midline electrode clusters were identified. We observed a negative correlation between aperiodic activity and age; the exponent (r = -.18 to -.42, $p < .001$) and offset (r = -.33 to -.43, $p < .001$) decreased with age. When controlling for the effects of age, the exponent and offset were associated with better performance in the Processing Speed (r = -.21 to -.25, $p < .02$), Verbal Memory (r = .21 to .29, $p < .02$),

and Verbal Fluency ($r = .24$ to $.33$, $p < .01$) domains, with these associations observed over frontoparietal, midline, and occipital electrode clusters. Better performance during the Executive Function domain was associated with greater exponents in the frontoparietal cluster ($r = -22$, $p = .02$). These findings suggest that an individual's capacity to utilize verbal information correlate with the balance of excitatory and inhibitory activity, as well as the rate of neural spiking, in the frontoparietal, midline, and occipital brain regions.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.1 Aging, 4.25 Cognitive control/ executive functions

POSTER SESSION III-068 | AUTONOMIC AND RESPIRATORY CHANGES IN YOUNG AND OLD ADULTS WITH NON-CLINICAL DEPRESSION AND ANXIETY

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Previous research has found that good health is tied to flexibility in multiple bodily systems, with reduced variability signalling poor health. Depression and anxiety are found to correlate with lower heart rate variability (HRV), suggesting reduced respiratory rate variability (RRV) due to linked heartbeat-respiration dynamics. However, few studies have explored HRV in non-clinical samples of young and old adults with reported depression and anxiety symptoms, and none have examined their relationship with RRV. We predict that across both young and old subjects, there will be decreased HRV and RRV indices in individuals with higher depression and anxiety scores. Participants were administered the GAD-7 and PHQ-9, while respiratory sinus arrhythmia (RSA), respiration rate, and indices of HRV and RRV were extracted from collected ECG data. Significant relationships were found in young subjects, with depression scores negatively associated with HF-HRV, in line with results found in clinical populations. Novel findings suggest lowered RRV in young subjects with higher levels of anxiety, indicating reduced flexibility and short-term ANS dysregulation, which is consistent with previous studies examining other indices of respiratory variability and anxiety. Our results suggest that in young subjects with affective symptoms, a decrease in parasympathetic activity is a typical physiological response. However, given effects reduced parasympathetic activity has on resultant physiological responses, findings could suggest that reductions in HRV could be a risk marker for depression.

FUNDING: Temasek Laboratories, Nanyang Technological University, Singapore.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 3.3 Lab Based Experiment, 4.1 Aging, 4.7 Psychopathology

POSTER SESSION III-069 | CHILDHOOD TRAUMA LEGACY: EMOTIONAL MEMORY AND NEURAL RESPONSES TO 9/11-RELATED STIMULI

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Trauma's lasting impact often makes it challenging to forget the experience and to regulate the emotions it evokes. Previous research on neural processes of memory suppression following trauma has mainly focused on adults. Using a Directed Forgetting paradigm, we explored memory regulation in individuals exposed to the 9/11 terror attack as children, in 3 groups: exposed with internalizing disorders (N=21), exposed without disorders (N=23), and unexposed control (N=13). Participants viewed 160 neutral and 9/11 scenes cued either to be remembered (TBR) or to be forgotten (TBF) for a recognition test. During the test, while recording EEG, participants viewed both previously shown and new 9/11 and neutral scenes, and indicated whether they remember seeing each one. Memory performance (PR) and bias (Br) for TBR and TBF across 9/11 and neutral scenes reveals a Group X Condition interaction ($p<0.008$), indicating similar low PR across groups for the TBF, but varied PR across groups for the TBR, such that PR was highest for controls and lowest among individuals exposed with disorders. The groups did not differ in Br. RTs were slower for 9/11 than for neutral scenes demonstrating valance effect. Old/new effect was evident in all groups in the 400-600 ms window ($ps<0.03$), in parietal sites. However, its magnitude varied such that the old/new difference was the smallest for the 9/11 scenes among the exposed with disorders group. These findings highlight memory regulation difficulties in the latter group, especially for stimuli associated with their childhood traumatic experiences.

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Topics: 1.8 Other (Sample of now-adults who were exposed to 9/11 terror attack), 2.1 Neuroimaging (EEG, fMRI, fNIRS

etc.), 2.11 Questionnaires/Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.18 Memory, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION III-070 | THE EFFECTS OF MANIPULATING DIFFICULTY AND MEANING OF A BORING TASK ON PSYCHOPHYSIOLOGICAL MARKERS OF ATTENTION AND AROUSAL. AN INVESTIGATION OF THE MAC MODEL OF BOREDOM.

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Despite academic consensus that boredom denotes a whole class of different emotional-motivational states, little research has tested whether different boredom types are associated with specific physiological changes. The Meaning and Attention Components (MAC) model posits that boredom arises from sub-optimal stimulation and meaningfulness of tasks, allowing for specific hypotheses regarding physiological changes and behaviors in different boredom types. This work tested such hypotheses by examining how task difficulty and meaningfulness affect attention, arousal, and subsequent media choices by employing a mixed-methods design with psychophysiological measures (EDA, alpha and theta EEG) and behavioral observations (media choices). Sixty university students undertook boring tasks manipulated for difficulty and meaningfulness, followed by choices between different media content. Results partially supported the MAC model's hypotheses. Assigning meaning to a boring task had a significant positive effect on attentional focus indexed via EEG alpha and theta frequencies, as well as on arousal indexed via phasic skin conductance. Furthermore, both phasic and tonic skin conductance were significant predictors of media choices, but with opposite effects, underscoring the importance of separating these two measures. Finally, we found that media use had a restorative effect on boredom-affected attention and arousal. The findings support MAC model's utility in predicting boredom-related behavior, highlighting the role of meaningfulness as a moderator of physiological responses.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.7 Skin responses, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.19 Motivation, 4.20 Attention, 4.23 Emotion/affect

POSTER SESSION III-071 | FRONTAL AND TEMPORAL LOBE EPILEPSY DIFFERENTLY IMPACT STIMULUS DRIVEN EMOTION PROCESSING AND EMOTION REGULATION: HEMODYNAMIC EFFECTS OF FOCUS LOCALIZATION AND LATERALIZATION

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When confronted with negative events, regulating emotional responses is essential for psychological functioning and mental health. Epilepsy patients often have lesions in the medial temporal or frontal lobes which could impair their emotion processing and regulation. Particularly right temporal lobe epilepsy (rTLE) patients might show altered responses to emotional stimuli, whereas those of frontal lobe epilepsy (FLE) seem largely normal. Here, we used functional magnetic resonance imaging to assess processing and up- and downregulation of emotions towards negatives scenes through reappraisal in 21 left (l) and 18 right TLE patients and compared their activation to 17 controls and 18 frontal lobe epilepsy (FLE) patients. Given that epilepsy is a network disorder, voxel-based analyses were complemented by network analyses. During stimulus-driven emotion processing, rTLE patients had less activation than lTLE patients, FLE patients and controls. Regions of reduced activity were mostly part of the frontoparietal control network and the default mode network and included the frontal pole, the superior frontal gyrus, parietal regions, the middle temporal gyrus and the cerebellum. Activation patterns during emotion regulation were highly similar between controls and left and right TLE patients who displayed higher activity than FLE patients. Our results reveal diminished activity towards aversive stimuli in rTLE and show that in the same patients, neural underpinnings of emotion regulation are intact. The pattern points to a double dissociation between rTLE and FLE patients.

FUNDING: Gerd Altenhof Foundation.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION III-072 | SPEECH RELATED CONFOUNDING OF RESPIRATORY SINUS ARRHYTHMIA: INFLUENCE OF RESPIRATORY RATE AND TIDAL VOLUME

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Parasympathetic nervous system (PNS) facilitates recovery following stress, downregulates cardiovascular inflammation, and is linked to depression and heart failure. Parasympathetic activity is mediated by the vagus nerve, whose cardiac modulation can be non-invasively measured with respiratory sinus arrhythmia (RSA). However, speaking confounds RSA readings, for instance by masking the true drop in vagal activity under stress. Thus, tracking RSA in daily life in relation to psychosocial constructs is compromised. Changes in respiration are the most likely cause of speaking effects on RSA. We, therefore, examined whether speaking related RSA changes can be attributed to effects of changes in tidal volume (VT) and total breath cycle time (Ttot). Wearing an electrocardiogram to extract heart periods and thoracic impedance monitor to obtain the respiration signal, participants (N = 43) completed tasks (exercise, mental stress, conversation, reading) in different postures, performing them while speaking and silent. Per task, we obtained the within-person regression slope for "RSA/VT vs. Ttot" using the spontaneous variation in these parameters within both conditions. Pairwise t-tests were run on the silent and speaking slopes (B) for all tasks. These were not different, with the exception of the exercise block ($p = .008$). Most tasks had a median Pearson's r close to zero, unlike studies using calibration with paced breathing at different frequencies, which show positive r values. The next step entails correcting RSA values for speaking conditions using this calibration method.

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Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.10 Stress, 4.13 Speech/language

POSTER SESSION III-073 | FIDELITY TO PEDIATRIC AMBULATORY BLOOD PRESSURE MEASUREMENT GUIDELINES: SYSTEMATIC REVIEW

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From 2000 to 2015, pediatric hypertension increased globally from 2-3% to 5-8% in youth aged 6 to 19. Ambulatory blood pressure monitoring (ABPM) has been used for decades; yet, youth-specific guidelines only emerged in 2008. In 2020, the Global Hypertension Practice Guidelines outlined ABPM measurement for youth. This systematic review evaluated fidelity with ABPM pediatric guidelines. Following PRISMA criteria, 41 cohorts (N = 9,535) of children and adolescents were identified. Coded variables included: ABPM device selected, recording specifications (duration, frequency, period), and data reporting. Compliance with guidelines was moderate. Half used an appropriately sized-cuff (51.2%) and non-dominant arm placement (61.0%). Most used oscillometric ABPM (73.2%) with defined day (07:10-21:56) and night (22:33-06:34) periods, fixed sampling intervals (day 22.23min, night 38.99min), and 24-hour duration (95.1%). Few studies met the minimum recording standards (40 samples/24 hours; 9.76%) or successful recording percentage (70%; 14.6%). Only 19.5% detailed data handling procedures (e.g., decisions for values outside normal range). While omitted measurement details may be due to space limitations, articulating technical information is crucial. Current practices should align with pediatric ABPM guidelines. Furthermore, it would be advantageous to revise and extend the Psychophysiology (1996) blood pressure measurement guidelines with more stringent ABPM specifications and a consensus statement that could be adopted to enhance data accuracy, transparency, and interpretation.

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Topics: 1.2 Human Studies: General Population - Children/Adolescents, 2.5 Hemodynamic (BP), 3.5 Secondary Analysis, 4.2 Development, 4.5 Population-specific health, 4.26 Other

POSTER SESSION III-074 | USE OF WORKING MEMORY DURING REINFORCEMENT LEARNING AS REFLECTED IN FRONTAL THETA-BAND OSCILLATIONS

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Updating ones behavior based on the results of previous actions, or reinforcement learning (RL), has traditionally been attributed to striatal prediction-error-based learning. However, more recent evidence shows that working memory (WM) also supports such learning when delays between learning experiences are short. Here, we investigated how WM use during RL is reflected in lateral prefrontal and medial frontal theta-band oscillations, which are known to be involved in WM and feedback processing, respectively. To this end, we measured EEG while young adults (19-25 y) performed a RL task in which they learned stimulus-response associations by trial-and-error. Stimulus repetitions were separated by either short or long delays. We replicated the behavioral results that we previously found in older adults: learning was faster with short than long delays, while consolidation was better in the long-delay condition. Similarly, theta power during the choice period was larger in the short-delay than the long-delay condition at bilateral lateral prefrontal electrodes. However, post-feedback theta power did not differ between delay conditions at either lateral or medial frontal electrodes. Thus, although choice-related theta power may reflect WM usage, so far we did not find evidence of post-feedback WM updating. Additional analyses will focus on comparing theta-band dynamics between different learning phases, connectivity between lateral prefrontal cortex and other task-relevant brain areas, and the relation with consolidation success.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.22 Learning/conditioning, 4.25 Cognitive control/executive functions

POSTER SESSION III-075 | SOCIAL EVALUATION ELICITS A TRAJECTORY OF INCREASING ERROR MONITORING ACROSS TRIALS: EVIDENCE FROM TRIAL-LEVEL ESTIMATES OF THE ERN

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The Error-Related Negativity (ERN) reflects an index of error monitoring, sensitive to the motivational significance of errors. Condition-averaged ERN magnitudes are larger (more negative) for errors committed within social-evaluative (vs. nonsocial) conditions. However, prior work typically quantifies the ERN as a condition average, removing trial-level variability. Thus, it's unknown how social evaluation might impact the trajectory of error monitoring over time and across trials. Does social evaluation drive a uniform increase in error monitoring at the trial level, a trajectory of increasing error monitoring across trials, or simply the absence of decreasing error monitoring across trials that may be more prevalent in nonsocial conditions? To investigate, we analyzed EEG data from 44 young adults that performed a flanker task twice: once under social evaluation and once alone. Within a mixed-effects modeling framework, we identified a three-way interaction between response accuracy (error, correct), evaluation condition (social, nonsocial), and trial number in predicting trial-level ERP amplitudes within the ERN/CRN time window ($p = .005$). ERN magnitudes were found to decrease across trials within the nonsocial condition, whereas ERN magnitudes increased across trials in the social condition. Thus, in the absence of social evaluation the ERN exhibits a pattern decreasing error monitoring across trials. In contrast, social evaluation elicits a trajectory of increasing error monitoring across trials. Theoretical relevance will be discussed.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.24 Social factors, 4.25 Cognitive control/executive functions

POSTER SESSION III-076 | BILATERAL HEMISPHERIC INTERPLAY WITH ADAPTIVE GABA AND GLX MODULATION SUPPORTS EFFECTIVE STRUCTURE LEARNING

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Structure learning (SL) training has been shown to influence cognitive flexibility (CF). However, relationships between neurochemical influence (GABA), shown to be related to learning with performance is less understood. We hypothesized shift in GABA levels post SL training and changes are correlated to cognitive flexibility. 108 matched participants assigned to control (C:54) and training (T:54) groups underwent GABA+ and Glx quantification on L- and R- DLPFC using MEGA-PRESS sequence in 3T-scanner and were administered colour shape task (CST) at pre- and post-training 2 weeks apart. Participants employing random strategies in SL (T:34) were excluded in this analysis. Post-training Glx was significantly (p=0.013) reduced in R-DLPFC of Treatment as compared to Control-group. Significant reduction in post-training GABA+ (p=0.033) was also only found in the T-group. The reduced Glx in R-DLPFC in T-group showed positive correlation (r=0.395, p=0.038) with switch cost in reaction time (RT) of CST. While in C-group, GABA+ in the R-DLPFC showed significant negative correlation (r= -0.303,p=0.045) with RT. GABA+ (r=0.413,p=0.026), Glx (r=0.526,p=0.002) in L-DLPFC showed significant relation with switch cost in accuracy(ACC) of CST in T-group. Relative change in(Δ) GABA+/Glx in R-DLPFC also had significant positive correlation (r=0.451,p=0.024) with ΔACC in T-Group, while ΔGABA+/Glx in L-DLPFC correlated positively (r=0.329,p=0.049) with ΔRT of C-group. Our findings showing correlation between neurochemical changes with improved CF further supports SL training to improve CF.

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Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.22 Learning/conditioning, 4.25 Cognitive control/executive functions

POSTER SESSION III-077 | APPLICATION OF A SHIELDING CARD REDUCES EFFECTS OF SMARTPHONE-EMITTED RADIATION ON EEG BRAIN ACTIVITY

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Research shows that electromagnetic fields (EMFs) emitted by mobile phones induce systematic changes in EEG brain activity. In the present study, we investigated the effects of a shielding card (8.2 cm x 5.0 cm) that was placed on the surface of a smartphone when subjects were exposed to EMFs in the 5G range. Subjects were exposed to EMFs in the 5G range emitted by a smartphone (Apple iPhone 15) call for 30 minutes. We tested three experimental conditions in a randomized double blind design: (1) smartphone with shielding card (Gabriel-Tech GmbH, Germany), (2) smartphone without shielding card, (3) control condition without EMF exposure. High-density EEG was recorded from 256 electrodes before, during, and after each experimental condition, as well as mood assessed by POMS. EEG data showed increases in the beta and gamma bands in frontal, temporal, and occipital areas as well as in the hypothalamus and pineal gland with increased negative mood when subjects were exposed to smartphone-emitted 5G radiation compared to the control condition. EEG beta and gamma activity decreased significantly in frontal, temporal, and occipital areas as well as in the hypothalamus and pineal gland accompanied by improved mood scores when the shielding card was applied. Results indicate that application of an electromagnetic shielding card reduces effects on psychophysiological measures induced by smartphone-emitted EMFs in the 5G range.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.26 Other (Ergonomics)

POSTER SESSION III-078 | IS SAVORING EFFECTIVE FOR BOTH LOW- AND HIGH-AROUSING POSITIVE STIMULI? AN ERP STUDY

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Savoring is a present-moment focused emotion regulation technique that involves increasing and sustaining positive emotion, by attending to and amplifying the pleasurable aspects of stimuli. Prior work has shown that savoring increases the late positive potential (LPP) and subjective ratings elicited by positive and neutral pictures. To date,

it is unknown whether savoring's effectiveness is compromised by stimulus arousal level, though other emotion regulation techniques (i.e., cognitive reappraisal) appear to be less effective for highly arousing stimuli. Participants in the current study (N = 90; 64 female; M = 18.91, SD = 1.87) viewed or savored positive pictures that were either low (i.e., sunset) or high (i.e., erotic couple) in arousal, while EEG was recorded and participants rated pictures on valence and arousal. As in prior work, savoring increased the elicited LPP, $F(1, 89) = 9.08$, $p = .003$, and subjective ratings of picture pleasantness, $F(1, 89) = 201.65$, $p < .001$, and arousal, $F(1, 89) = 101.70$, $p < .001$. The LPP was also larger for high- compared to low-arousing pictures, $F(1, 89) = 20.97$, $p < .001$. Critically, savoring was not modulated by picture arousal level, as measured using the LPP, $F(1, 89) = .78$, $p = .379$; BFincl = .902; valence, $F(1, 89) = .23$, $p = .635$; BFincl = .642; and arousal ratings, $F(1, 89) = 2.37$, $p = .127$; BFincl = 2.146. Therefore, savoring appears to be effective for both low- and high-arousing stimuli, underscoring its utility for up-regulating positive emotions in response to a variety of stimuli/contexts.

FUNDING: NIMH R01MH125083 (MacNamara).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.23 Emotion/affect

POSTER SESSION III-079 | LISTENING TO YOUR ERRORS: OWN VOICE CAN BE USED AS FEEDBACK FOR ERROR MONITORING IN SPEECH PRODUCTION

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While there is a consensus among theories of speech production that pre- and post-articulatory forms of error monitoring share a common mechanism, opinions differ on the importance of comprehending one's own voice. The error-related negativity (ERN) and error positivity (Pe) are indices of early and late error monitoring respectively, that offer promising insights into speech error monitoring processes. We investigated these event-related potentials following errors in overt speech production and focused on the dependence of late error monitoring on the availability of auditory feedback (i.e. comprehension). In a Stroop color naming task, participants' speech was masked with pink noise in half of the trials. Speech errors evoked both an ERN and a Pe. However, the Pe amplitude was significantly reduced in noise trials, suggesting that late speech error monitoring strongly relies on comprehension. In addition, two specific error types occurred particularly often, (uncorrected) full errors and (corrected) partial errors. Full errors elicited only a Pe, whereas partial errors elicited only an ERN, which highlights the importance of error correction in speech error monitoring processes.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.25 Cognitive control/executive functions

POSTER SESSION III-080 | AUTOMATIC PROCESSING OF REGULARITY VIOLATIONS DURING VISUOSPATIAL NEGLECT: A VISUAL MISMATCH NEGATIVITY STUDY

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Visuospatial neglect (VSN) primarily induces attentional deficits. In this study our first research question was if VSN also affects the automatic registration of the violation of sequential regularities compared to stroke patients and healthy participants, as signalled by the ERP component vMMN. Secondly, how does it change during and after rehabilitation? To test these questions, we applied a passive oddball paradigm, where we presented diamond patterns with periodically vanishing (OFF events) and reappearing (ON events) diagonals to the lower left and right sides of the screen as task-irrelevant stimuli, creating two simultaneous but independent sequences with standard and deviant events. The study involved a VSN group (N=17; M=53.88 yrs), and two control groups: one comprising stroke patients (N=16; M=56.81 yrs) and the other consisting of healthy participants (N=18; M=53.89 yrs). The VSN group underwent measurements three times: at the beginning, and at the end of rehabilitation, and at a 3-month follow-up. Our results show that VSN patients, at all three measurements, failed to produce reliable vMMN for either left or right-sided stimuli. In contrast, vMMN was elicited for OFF events at left side for stroke patients, and for both OFF and ON events at both the left and right sides in the healthy control group. Our results suggest that both stroke and VSN hinder the ability to automatically registrate regularity violations underlying vMMN, but the latter does so in a more substantial way.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized

Tasks (e.g. neuropsychology), 3.2 Observational Study: Longitudinal, 4.14 Unconscious processes, 4.16 Neurological disorders / Neuropathology

POSTER SESSION III-081 | SEMANTIC AND EMOTIONAL PROCESSING IN EARLY VISUAL CORTEX

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Facilitated processing of salient emotional visual cues has been systematically reported in the literature. Nevertheless, to what extent emotional facilitation relies on preattentional processes preceding semantic analysis remains controversial. In three experiments, we tested temporal dynamics of semantic and emotional cue extraction making use of meaningful and meaningless complex emotional scenes presented in a 4 Hz Rapid Serial Visual Presentation (RSVP) fashion, enabling to analyze frequency-tagged Steady-State Visual Evoke Potentials (SSVEP). Besides passive-viewing-like scenarios, we additionally tested the consequences of bottom-up capture of attention driven by concrete images under competition, with a concurrent foreground task of a Random Dot Kinematogram (RDK) flickering at a higher frequency that enabled the monitoring of top-down selective attention. Finally, we tested top-down modulation under competition by introducing a 100% predictive emotional cue. Aligned with the semantic primacy hypothesis, our results provide solid evidence of an initial rapid capture of attention driven by objecthood followed by affective facilitation, evidencing that prioritized processing of visual emotional items relies on semantics. Moreover, the fast increase of the RSVP-SSVEP amplitudes followed by the later-in-time RDK-SSVEP amplitude decrement, replicating a time-delayed shift of attentional resources from the foreground task to emotionally salient stimuli.
FUNDING: Deutsche Forschungsgemeinschaft.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.20 Attention, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION III-082 | N400 RESPONSES TO PROVERB VIOLATIONS: THE CHALLENGE OF FINDING INDIVIDUAL INDICATORS FOR INTACT SEMANTIC PROCESSING

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Proverbs are commonly known statements that express an advice or perceived truth. Because they are frequently encountered, proverb endings are highly predictable for participants with intact long-term memory. Hence, they could be well-suited to study semantic processing in clinical populations where single-subject results can be highly relevant. Nevertheless, very few studies have investigated electrophysiological correlates of proverb processing, even in healthy populations. Here, we recorded ERPs while 18 healthy participants listened to common German proverbs. We varied proverb endings in three conditions: 1) the correct proverb endings, 2) a different, but semantically adequate ending, and 3) a semantically and syntactically inadequate ending. We predicted that, in the N400 interval (300 to 500 ms), activations to semantically adequate but incorrect endings are more negative-going than activations to the correct endings, which our data confirmed. We also predicted that the entirely inadequate endings would yield even more negative-going activations than semantically adequate different endings, which surprisingly was not the case. In addition to a typical group-level analysis, we also assessed N400 presence on the single-subject level. Here, only about half of the participants showed a significant N400. This shows that proverb-violations reliably elicit an N400 at the group level, but that, even in healthy adults, intact semantic processing is not always statistically detectable with this method at the individual level, challenging an easy transfer into clinical settings.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.13 Speech/language, 4.18 Memory

POSTER SESSION III-083 | INFANTS' SMART HEARTS: PARENTING BEHAVIORS AND INFANT CARDIOVASCULAR REACTIVITY TO A LABORATORY STRESSOR

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Across animal and human studies, early caregiving experiences have been shown to modulate offspring response to stress. Cardiovascular reactivity may be one pathway or

indicator of this effect. The present study aimed to investigate whether individual differences in parenting behavior moderate infants' heart rate (HR) responses to a stranger approach task. Data were collected from 65 mother-infant dyads (infant mean age = 29 weeks). Heart rate (HR) and vagally-mediated heart rate variability (HRV) were recorded from infants before, during and after a stranger approach task. Parenting behavior was coded during a mother-infant free play session. Infants showed significant HR increase during the stranger approach, followed by HR decrease at reunion with their mothers, and an inverse pattern in HRV. Maternal intrusiveness, or adult-centered and over-controlling behavior, was associated with higher infant HR and HRV across all measurement points. However, maternal positive and negative regard — captured respectively in the expression of positive accepting feelings or negative judging feelings toward the child — interacted with the task. Specifically, infants of mothers who displayed more positive regard showed a greater drop and reduced HRV recovery to the stressor, while infants of mothers who displayed more negative regard demonstrated a smaller decrease and greater recovery in HRV to the stressor. These findings suggest that even modest differences in parenting behaviors may be associated with individual differences in cardiovascular reactivity in young infants.

FUNDING: Natural Sciences and Engineering Research Council of Canada Funding awarded to Anna Weinberg, PhD.

Topics: 1.2 Human Studies: General Population - Children/ Adolescents, 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.2 Development, 4.10 Stress, 4.24 Social factors

POSTER SESSION III-084 | THE TRIAL-LEVEL RELATIONSHIP BETWEEN ERROR-RELATED NEGATIVITY AND DEFENSIVE ACTIVATION ACROSS VARYING DEGREES OF OBSESSIVE-COMPULSIVE CHARACTERISTICS

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Elevated neural responses to errors, as indicated by heightened error-related negativity (ERN) amplitudes, are regarded as a neural risk marker for psychopathological conditions characterized by heightened worry, harm avoidance, and overestimation of threat, including obsessive-compulsive disorder (OCD) and anxiety disorders. Despite this understanding, the mechanisms underlying clinical variations in ERN amplitude remain unknown. One prevailing framework suggests that such variation might be attributable to individual differences in defensive reactivity, referring to an individual's sensitivity to threat. However, no study has yet examined the intraindividual association of the ERN with defensive reactivity in the context of anxious psychopathology. Therefore, this study investigated the trial-by-trial association between ERN and skin conductance response—an index of defensive mobilization—assessed during a flanker task in a sample of healthy participants with varying degrees of obsessive-compulsive characteristics ($n = 74$) and patients with OCD ($n = 26$). Results showed heightened ERN amplitudes in patients with OCD compared to healthy participants. Moreover, first analyses revealed that ERN amplitudes predicted magnitude of the skin conductance response at trial-by-trial level. This association seemed to emerge across all participants as well as in the OCD subsample alone. Results of these first analyses substantiate an association between ERN and defensive reactivity, underscoring the presumed role of elevated threat sensitivity in amplifying neural responses to errors.

FUNDING: German Research Foundation, Grant/Award Number: KA 815/7- 1; Humboldt- Universitaet zu Berlin.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.7 Skin responses, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.25 Cognitive control/executive functions

POSTER SESSION III-085 | PREDICTING THE PERCEPT OF MONOMOLECULAR ODORANTS FROM PHYSIOLOGY: A GAM-BASED TIME-SERIES ANALYSIS

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In recent years, several attempts have been made to predict the perceptual qualities of odorants by analyzing their molecular structure. These emerging models have shown remarkable performances, sometimes even comparable to human raters. However, most of these models handle the neural processing of the odorants as a 'black box'. We aim to investigate if including correlates of this 'black box' activity, specifically peripheral physiological measurements, can further enhance the predictability of the olfactory percept. Based on a large rating study, we chose six odorants that represent diverse patterns of pleasantness, disgust, irritability, and familiarity. Those odorants were presented multiple times to 60 healthy participants via olfactometer while we recorded ECG, respiration, and facial

EMG (Zygomaticus Major and Corrugator Supercilii). After each odor presentation, the participants rated the perceived pleasantness, disgust, irritability, familiarity, intensity, edibility, warmth, and cold. Exploratory factor analysis reduced these dimensions to three factors representing valence, temperature, and intensity. Those factors were predicted with Generalized Additive Models using information about the perceived odorant and time series data of all peripheral physiological measures. The fit of the models improved significantly when physiological measurements were included, indicating that the inclusion of reasonably easy-to-record physiological measurements can further improve the prediction of the olfactory percept beyond knowledge about the perceived odor.

FUNDING: Funded by the VolkswagenStiftung.

Topics: 1.1 Human Studies: General Population - Adults, 2.2 Myography (EMG etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.23 Emotion/affect

POSTER SESSION III-086 | INFLUENCE OF SUBLIMINAL PHOBIC STIMULI ON SACCADIC INHIBITION WHEN FACED WITH EXPRESSIONS OF FEAR IN PEOPLE WITH SPECIFIC PHOBIA

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Specific phobia is characterized by disproportionate fear towards a particular stimulus or event, manifesting as an intense anxious response and avoidant behavior. Inhibitory control is essential in moderating the emotional impact on oculomotor control associated with hyper-vigilance and avoidance of the feared stimulus. This study aimed to understand the influence of phobic subliminal stimuli on attention orientation and the inhibition of reflexive saccades in response to fearful faces in individuals with a specific phobia of cockroaches (FO), compared to a control group (CO). Ocular movements and presaccadic brain electrical activity were analyzed in 22 adult women per group. The task involved presenting a subliminal stimulus (an image of a cockroach or a plate) before a signal indicating whether to perform a saccade or an antisaccade in response to a neutral or fearful face. Additionally, saccade-related potentials, including presaccadic positive slope (PPP) and spike potential (SP) were calculated. There were no effects on ocular movements. FO exhibited greater amplitude of PPP and SP in prosaccades and, higher SP in the antisaccades in response to phobic subliminal stimuli than CO. These findings indicate that, although phobic subliminal stimuli activate the fear circuit and generate an increased alert response in FO, cognitive control mechanisms, particularly attentional and inhibitory ones, intervene to compensate for the activation of the fear and alert systems, allowing for adequate eye movements.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.14 Unconscious processes, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION III-087 | UNDERSTANDING COGNITIVE AGING THROUGH WHITE MATTER: A FIXEL-BASED ANALYSIS

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Diffusion-weighted imaging (DWI) has been used to examine age-related deterioration of white matter microstructure and its relationship to cognitive decline. However, typical tensor-based analytical approaches are often difficult to interpret due to the challenge of decomposing and (mis)interpreting the impact of crossing fibers within a voxel. We predicted that a novel approach capable of resolving fiber-specific changes within each voxel would show greater sensitivity to relationships with age and cognitive performance compared to a traditional tensor-based analytical approach. We analyzed 636 low-fit, cognitively unimpaired adults aged 65-80 as a part of a larger exercise intervention study. We analyzed 'fixels' – fiber bundle elements – to test our hypotheses. A fixel provides access to individual fiber populations in each voxel in the presence of multiple crossing fiber pathways, allowing for increased specificity over other diffusion measures. Linear regression was used to investigate associations between fixel metrics and tensor based metrics and age and cognitive performance. In a whole brain analysis, significant associations were found between fixel-based metrics and age. No significant results were found in tensor-based metrics. Moreover, characteristics in microstructure associated with individual difference in cognitive tasks. These results suggest that fixel-based analyses of DWI data are more sensitive for detecting age-related white matter

associations in an older adult population and relationships to some aspects of cognition.

Topics: 1.3 Human Studies: General Population - Elderly/ Geriatric, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.1 Observational Study: Cross-Sectional, 4.1 Aging, 4.18 Memory, 4.25 Cognitive control/executive functions

POSTER SESSION III-088 | FUNCTIONAL AND EFFECTIVE EEG CONNECTIVITY PATTERNS IN ALZHEIMER'S DISEASE AND MILD COGNITIVE IMPAIRMENT: A SYSTEMATIC REVIEW

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Alzheimer's disease (AD) has been described as a disconnection syndrome, suggesting that its symptoms may be largely attributable to disrupted communication between brain regions, rather than deterioration within discrete systems. EEG research on connectivity in AD and its precursor, mild cognitive impairment (MCI) is mixed and has yet to be synthesized for comprehensive review. Thus, the current systematic review included 98 studies of functional and effective EEG connectivity in MCI and AD, which primarily analyzed coherence, phase-locked, and graph theory metrics. Notable variability was evident, and the roles of connectivity approach (e.g., sensor vs. source space), study design (e.g., rest vs. task), and demographics (e.g., age, education, global cognitive functioning) are integrated. Despite variability, an overarching pattern emerged of lower and disrupted connectivity in both MCI and AD compared to healthy controls. This pattern was most robust in the alpha band for both groups, with overall most consistent results using coherence in AD and graph theory metrics in MCI. In MCI, contrary patterns of greater connectivity were primarily reported during task engagement, which may indicate remaining compensatory resources. In AD, greater connectivity was most common in delta and theta bands, consistent with greater neural slowing. We highlight a need for more studies in source space, with specific, a *priori* hypotheses, and advocate for research in asymptomatic risk for AD to advance early detection of future cognitive decline and facilitate successful early intervention.

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Topics: 1.6 Human Studies: Clinical Samples - Elderly/ Geriatric, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.5 Secondary Analysis, 4.1 Aging, 4.16 Neurological disorders/ Neuropathology

POSTER SESSION III-089 | CAN CARICATURES HELP US UNDERSTAND THE OTHER-"RACE" EFFECT IN FACE RECOGNITION? A PCA-BASED APPROACH USING EVENT-RELATED BRAIN POTENTIALS

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Why do we struggle to recognize faces from other racialized groups? Our study investigates the role of facial distinctiveness in the other-"race" effect (ORE). We suggest that distinctiveness is helpful for recognition when it is based on multidirectional norm-deviation (as for same-"race" caricatures), but deceptive when unidirectional (as for other-"race" faces). Using innovative Principal Component Analysis-based techniques, we generated multidirectionally distinctive Caricatures, unidirectionally distinctive "Shifts" (simulating OR faces) and Veridicals from White female faces. Participants experienced with White faces (N=24) performed an old/new recognition task while we recorded accuracy, RTs and EEG. As expected, participants were able to recognize Caricatures well while showing a recognition deficit for Shifts, thus demonstrating that same-"race" faces can elicit a behavioral ORE through manipulating distinctiveness directionality alone. A late positive component (LPC) supported the idea that multidirectional distinctiveness aids recognition (enhanced amplitudes for Caricatures compared to Shifts and Veridicals). Surprisingly, a larger occipitotemporal P200 amplitude for Shifts than Caricatures contradicted expectations in being opposite to the one seen for OR faces, and resembling one usually elicited by (more typical) anticaricatures. This discrepancy between behavioral and neuronal markers in unfamiliar face processing raises important questions regarding the possibility of multiple category-specific perceptual prototypes within a norm-based face space framework.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.6

Racism/prejudice, 4.12 Sensation/perception/interoception, 4.18 Memory

POSTER SESSION III-090 | DO EEG/CARDIAC-BIOFEEDBACK DEVICES USED IN MEDITATION PRACTICE HELP IMPROVE INTEROCEPTIVE AWARENESS AND ACCURACY?

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Meditation is thought to enhance interoceptive awareness. Many commercial meditation programs and biofeedback devices claim to boost interoceptive awareness, but evidence of their effectiveness is scarce. This study evaluates the impact of biofeedback assisted meditation on interoceptive accuracy (i.e., objective performance in an interoceptive task), interoceptive sensibility (i.e., the subjective sense of confidence in one's interoceptive accuracy) and interoceptive awareness (i.e., the congruence between objective performance and confidence), using Muse 2 as a consumer-grade EEG/CARDIAC-biofeedback device. We compare meditation with biofeedback to unassisted meditation and a control group, over a two-week intervention period. Participants were asked to meditate at least once a day for 10 minutes and received regular reminders. User experience and total length of meditation sessions was collected throughout the intervention. The study focused on young women aged 18-29 (N = 60). Interoceptive awareness, sensibility and accuracy were assessed using the Heart Rate Discrimination (HRD) task. The results found no support for the hypothesis that EEG-biofeedback offers any advantage in improving interoception, regardless of user experience. Neither biofeedback group, nor unassisted meditation group showed improvements in any HRD metric. However, length of the meditation practice was significantly, positively related to improvements in interoceptive accuracy in the biofeedback group, indicating the possibility of benefits over longer intervention periods.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.2 Observational Study: Longitudinal, 4.12 Sensation/perception/interoception, 4.15 Biofeedback

POSTER SESSION III-091 | CREATING STRONG AND CONTEXT-INDEPENDENT EXTINCTION MEMORIES WITH PHYSICAL EXERCISE VS. PSYCHOSOCIAL STRESS

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Exposure to stress hormones before extinction learning leads to a strong and less context-dependent extinction memory (STaR model, Meir Drexler et al., 2019). However, laboratory stress induction protocols have disadvantages, e.g., increases in negative affect. In the present study, we tested physical exercise as a potential modulator of fear extinction memories through its effects on the two major stress systems, the hypothalamus-pituitary-adrenal (HPA) axis and the sympathetic nervous system (SNS). We compared the effects of exercise (treadmill running) and psychosocial stress (TSST) before extinction learning on contextual retrieval and generalization, measured by skin conductance responses (SCRs) and pupil dilation. Healthy participants (N = 120) underwent fear acquisition on day 1, the exercise, stress, or control intervention followed by extinction on day 2, and a retrieval and reinstatement test on day 3. HPA axis (salivary cortisol) and SNS (alpha-amylase and heart rate) activity were measured throughout the study. The stress and exercise intervention both significantly elevated heart rate compared to the control intervention. Fear acquisition was successful, as measured by SCRs, and did not differ between groups. During extinction learning, fear responding decreased over time. The stress and exercise intervention both seemed to reduce fear renewal on day 3. Physical exercise, like psychosocial stress, before extinction learning may therefore reduce the context-dependency of extinction memories and thereby prevent fear relapse in new contexts.

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Topics: 1.1 Human Studies: General Population - Adults, 2.6 Eye Tracking (blink, movement, size), 2.7 Skin responses, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.10 Stress, 4.18 Memory, 4.22 Learning/conditioning

POSTER SESSION III-092 | FAMILIARITY SUPPRESSES THE OTHER-"RACE" EFFECT (ORE) IN FACE MEMORY AND EVENT-RELATED BRAIN POTENTIALS

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Few studies on differences between same and other ethnic appearance ("race") face memory investigated familiar faces. Here we report behavioural and event-related potential (ERP) data from European participants performing an old/new task with famous and unfamiliar faces of White European or African appearance. Participants also completed the Cambridge Face Memory Test (CFMT). For sensitivity (d'), the other-"race" effect (ORE) for unfamiliar faces was strikingly absent for famous faces, with no ORE for criterion C, and only very small ORE costs in response times irrespective of familiarity. In the ERPs, effects of "race" started in the time ranges of P100 and N170, presumably reflecting differences in early visual and configural processing. These early OR effects were not modulated by familiarity. In striking contrast, the occipitotemporal components P200 (196–226ms) and N250 (250-400ms), which are associated with the perception of face typicality and identity, respectively, exhibited prominent and common OREs for unfamiliar faces. These effects were substantially suppressed for familiar faces. For LPC, an interaction between "race" and familiarity was limited to the test phase. CFMT scores did not correlate with ORE magnitude. Overall, our findings emphasize a moderating role of familiarity for the ORE which hitherto has been largely neglected. Our results suggest that familiar other-"race" faces are processed very similarly to familiar same-"race" faces, arguing against the notion of qualitative differences between same and other-"race" face identity recognition.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.6 Racism/prejudice, 4.12 Sensation/perception/interoception, 4.18 Memory

POSTER SESSION III-093 | A TEMPLATE MATCHING ALGORITHM FOR AUTOMATIC EXTRACTION OF P3 LATENCIES

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In the face of increasingly large datasets and the quest for greater replicability, ERP latency extraction should prove reliable, valid, efficient, and objective. Manual extraction of ERP component latencies has so far led to the most reliable measurements, but suffers from low efficiency and poor objectivity. Algorithms based on jackknifing, peak latency, or area latency, allow automatic and objective latency extraction but often suffer from low reliability or validity. Here, we introduce a novel algorithm for ERP latency extraction based on template matching. The algorithm uses the grand average to generate an experiment-specific template of the component of interest and then matches that template to subject-level ERPs to recover the latency of the component. In addition, the algorithm provides a fit statistic for each subject-level ERP indicative of the quality of parameter extraction. This fit statistic allows researchers to automatically discard or manually review latencies extracted by the algorithm. Reanalysis of existing data shows high correlation between latencies extracted by the algorithm and manual extraction, indicating that this algorithm is able to closely match human performance. Additionally, results from a simulation study reveal that template matching algorithms better recover latency shifts than previous algorithms. Benefits and drawbacks of this new algorithm and its fit statistics will be discussed. Lastly, we will provide a short outlook on potential further developments in applying template matching algorithms to ERPs.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.15 Computational / Simulation, 3.5 Secondary Analysis, 4.26 Other (Methods Development)

POSTER SESSION III-094 | THE EFFECT OF NON-INVASIVE TRANSCRANIAL FOCUSED ULTRASOUND ON DEPRESSION AND THE DEFAULT MODE NETWORK

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Up to 50% of depressed individuals fail to respond to existing treatments, underscoring the need for novel treatments deriving from a mechanistic understanding of this costly disorder. The default mode network (DMN), responsible for self-referential processing, is a putative neural mechanism in depression, with greater DMN resting-state functional connectivity associated with greater repetitive negative thought and greater depression symptom severity. Transcranial Focused Ultrasound (tFUS) is a neuromodulation technique with the ability to directly target

nodes in the DMN with spatial precision. The present open-label, single group study assessed whether tFUS to a hub of the DMN, the anterior medial prefrontal cortex, reduces depressive symptoms, and whether changes in DMN connectivity will track changes in symptom severity. Twenty depressed participants completed up to three weeks of tFUS targeting the anterior medial prefrontal cortex, with depression severity assessed using the Beck Depression Inventory – II before and after the course of treatment. Nineteen were included in the final MRI analysis. Changes in resting-state functional connectivity within the DMN (between the right prefrontal cortex and bilateral retrosplenial cortex) were associated with changes in symptom severity, with greater decreases in depression symptoms associated with greater reductions in DMN connectivity. These findings support the important role of the DMN in depression and demonstrate the promise of transcranial ultrasound as an effective and fast-acting intervention when targeting the DMN.

FUNDING: John J.B. Allen received an investigator-initiated grant from Openwater.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.18 Brain stimulation, 3.6 Other (open-label case series), 4.7 Psychopathology

POSTER SESSION III-095 | IMPACT OF OPTIMIZING MORLET WAVELET TRANSFORM PARAMETERS ON DEEP NEURAL NETWORKS FOR ELECTROCARDIOGRAM SIGNAL CLASSIFICATION

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Electrocardiogram signals reveal critical insights into psychophysiological processes. This study focuses on introducing a novel approach to Electrocardiogram signal classification leveraging wavelet transforms combined with deep learning methodologies. This research classifies Electrocardiogram signals (N=60; 3*20 per group) into three critical categories: Arrhythmia, Normal Sinus Rhythm, and Congestive Heart Failure. The study employed optimized continuous wavelet transforms for feature extraction, capturing both time and frequency information from Electrocardiogram signals. Subsequently, a deep learning model was developed and optimized demonstrating the feasibility of deploying advanced machine learning model for diagnostics on low-power, portable devices. The Deep learning neural network has three 2D convolution layers, and three dense layers, in which model is trained by grey scale datasets. Results indicate (1) a significant improvement in efficiency, with data processing time decreased by a factor of 10; (2) the model classification accuracy was excellent with test accuracy of 99.1%, validation accuracy of 99.5%, and train accuracy of 99.0%, showcasing the potential of this approach for more robust analysis of Electrocardiogram signals with respect to the time efficiency. These results add to the understanding the Electrocardiogram signal by advancing signal processing techniques and may be of assistance to real-world applications in remote health monitoring and diagnostic systems.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.17 Machine Learning/ Deep Learning, 3.1 Observational Study: Cross-Sectional, 4.5 Population-specific health, 4.26 Other

POSTER SESSION III-096 | HEART RATE VARIABILITY FOLLOWING COMBAT INJURY IN BRITISH MILITARY SERVICEMEN- IS THERE AN ASSOCIATION?

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Combat-related traumatic injury (CRTI) can adversely affect psychophysiological well-being. The association between CRTI and short-term heart rate variability (HRV) remains unexamined within a military cohort and was the aim of this study. This study (n=975) undertook the analysis of the first follow-up data from the ArmeD serVices trAuma rehabilitatioN outComE (ADVANCE) cohort study, UK. The participants were frequency-matched (age, rank, role-in-theatre, and deployment period: Afghanistan 2003-2014) at recruitment and were divided into injured and uninjured groups. HRV data were acquired using a 5-minute electrocardiogram with participants breathing normally in a supine and fully-rested state. Root-mean-square-of-successive-differences (RMSSD) was reported to measure parasympathetic tone (HRV). A multiple regression model was run to report the CRTI-RMSSD association, adjusting for age, rank, and ethnicity. Participants' median age was 37.5 (IQR 34.2, 41.2) years. Of 975 participants, 469 had CRTI whereas 506 were uninjured. The time since injury/deployment was approximately 11 years. Median RMSSD was significantly lower in injured than uninjured [37.7ms, (IQR 25.3,

55.9) vs 41.9ms (IQR 27.7, 62.2); p<0.05]. An 8% reduction in the geometric mean of RMSSD was observed relating to CRTI after confounder adjustment (Geometric Mean Ratio: 0.92 (95%CI:0.85,0.99);p<0.05). The findings indicate that even several years past, the CRTI associates with lower parasympathetic tone in injured than uninjured servicemen. Our findings may help understand the recovery pathway following CRTI.

FUNDING: This study is a part of RM's PhD studentship- jointly funded by Bournemouth University and the ADVANCE charity, UK. The ADVANCE study is funded through the ADVANCE Charity. Key contributors to this charity are the Headley Court Charity (principal funder), HM Treasury (LIBOR Grant), Help for Heroes, Nuffield Trust for the Forces of the Crown, Forces in Mind Trust, National Lottery Community Fund, Blesma - The Limbless Veterans and the UK Ministry of Defence.

Topics: 1.8 Other (Human Studies: Military veterans and personnel (with combat injury and without combat injury)), 2.3 Cardio (HR, HRV, LVET, PEP), 2.5 Hemodynamic (BP), 2.11 Questionnaires/Interviews, 3.1 Observational Study: Cross-Sectional, 4.5 Population-specific health, 4.15 Biofeedback, 4.26 Other

POSTER SESSION III-097 | ISOLATING THE KONIOCELLULAR CONTRIBUTION TO AVERSIVE LEARNING IN HUMAN VISUAL CORTEX

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Steady-state visual evoked potentials (ssVEPs) have been instrumental in characterizing the neurophysiology of the human visual system. The tritanopic technique leverages the selective activation of short-wave cones to isolate one of three major retino-cortical streams—the koniocellular pathway. This pathway has been hypothesized to support the early detection of threat cues based on animal-model work, but this notion is still to be tested in humans. The present study (n=40) used a differential aversive conditioning task with tritan and luminance stimuli, measuring ssVEPs and pupil diameter. Trials included a pre-stimulus adaptor period containing a central fixation point over a uniform yellow background (tritan condition) or a uniform black background (luminance condition). Following the adaptor, a white grating was superimposed on the adaptor and flickered at a frequency of 7.5 Hz. The grating was oriented at 45 or 135 degrees, signaling the presence (CS+) or absence (CS-) of the unconditioned stimulus (electric shock). Tritan stimuli elicited more robust ssVEPs than luminance stimuli. This effect increased during the acquisition phase, aligning with the idea that arousal influences koniocellular processing. Pupil diameter decreased after tritan adaptor presentation; the subsequent pupil re-dilation was greater for CS+ cues than CS- in both the tritan and luminance conditions. Findings replicate work showing heightened ssVEP responses to tritan stimuli and align with theories suggesting that the koniocellular pathway plays a role in processing emotional significance.

FUNDING: Research was supported by NIH grant R01MH125615 to Dr. Andreas Keil.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.6 Eye Tracking (blink, movement, size), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.22 Learning/conditioning, 4.26 Other

POSTER SESSION III-098 | CORTISOL AND LONG-TERM STRESS ASSOCIATED WITH CHRONIC PAIN INDUCE AN ADAPTATION OF HEMODYNAMIC REGULATION TO DOMINANT VASCULAR INFLUENCES

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Exposure to long-lasting laboratory stressors lead to a rearrangement of cardiovascular control, with a shift of regulation from dominant cardiac to dominant vascular influences. This study investigated whether this change also occurs during life stress accompanying chronic pain and analyzed associations between cortisol and cardiovascular variables in patients with fibromyalgia (FM). In women with FM and healthy women (HW), hair cortisol concentration (HCC) and cardiovascular recordings were taken during sitting, lying down and standing. FM patients showed higher levels of stress than HW. Severity and chronicity of FM were positively and negatively, respectively, associated with HCC. During standing (orthostatic challenge), FM patients showed higher total peripheral resistance (TPR) but lower stroke volume (SV) and cardiac output (CO) than HW. During sitting and lying down, TPR was more closely related to blood pressure (BP) than CO in FM patients; in contrast, CO was more closely related to BP than TPR in HW. HCC correlated positively with TPR and BP in FM patients, but negatively with TPR and BP and positively with SV and CO in HW. Results suggest that chronic pain-related stress

could alter cardiovascular regulation toward greater vascular than cardiac influences in BP control. Stress-related cortisol release may contribute to epigenetic reprogramming the long-term rearrangement of autonomic regulation. The dominance of vascular over cardiac control may also relate to reduced somatic mobilization during stress in favor of passive and behaviorally immobile coping.

FUNDING: This research was supported by a grant from the Spanish Ministry of Science, Innovation and Universities (PID2022-139731OB-I00).

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.5 Hemodynamic (BP), 3.1 Observational Study: Cross-Sectional, 4.9 Pain, 4.10 Stress

POSTER SESSION III-099 | ERROR AWARENESS WITHOUT AN NE/ERN

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Errors in choice tasks lead to a cascade of error-related brain activity in event-related potentials. While the early error negativity (Ne/ERN) reflects a fast evaluation of errors, the late error positivity (Pe) has been attributed to the emergence of error awareness. We recently dissociated both components by showing that a Pe can be observed even if no Ne/ERN is elicited. Here, we ask whether also error awareness can emerge without an Ne/ERN. We used a three-choice Eriksen flanker task, in which a target had to be classified while incongruent flankers had to be ignored. Participants provided metacognitive judgments to indicate whether an error has occurred on each trial. Crucially, targets were masked and were either easily visible or fully invisible. In the invisible-target condition, no correct response was available which should prevent that an Ne/ERN was obtained. However, because responses to the incongruent flankers were always errors, these flanker errors should lead to a Pe and error awareness. Our results confirmed these predictions for the majority of participants, demonstrating that error awareness and the Pe can emerge in the absence of an Ne/ERN. Only a smaller subgroup of participants almost fully failed to detect flanker errors and these participants also had a reduced Pe. Our findings show that error awareness and the Pe do not depend on the fast error evaluation underlying the Ne/ERN, and thus dissociate two independent systems of error monitoring.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.21 Decision making, 4.25 Cognitive control/executive functions

POSTER SESSION III-100 | INTRAINDIVIDUAL VARIABILITY OF MISMATCH NEGATIVITY AND P300 IN PSYCHOSIS

Amanda Holbrook[1], Bohyun Park[1], Steven Tsang[1], Elizabeth Nicklis[1], Ashlee Ross[1], Wesley Svenson[1], Philippe Rast[2], Gregory Light[3,4], Peter Clayson[1]
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Event-related potential (ERP) techniques have yielded valuable insights into the pathophysiology and treatment of psychosis. However, studies using ERPs primarily focus on mean scores and neglect within-person variability of ERP scores. The neglect of within-person variability of ERPs in the search for biomarkers might result in missed crucial differences related to psychosis. Publicly available data posted to the NIMH Data Archive for 1R01MH110434-01 was obtained for 162 patients with psychosis and 178 people without psychosis. Participants completed an auditory oddball and mismatch negativity task. Bayesian location-scale multilevel models were used to determine whether patients show greater intraindividual of mismatch negativity (MMN) and P300 scores than controls. Group differences in within-person variability were not found for P300 and MMN to frequency deviant trials (MMN-F), The opposite of the expected pattern was found for MMN to duration deviant trials—patients showed 2% less variability than controls. When including only a subset of patients with schizophrenia, patients showed 11% more variability than controls for MMN-F. Higher thought disorder symptoms were related to MMN-F. Our findings suggest a schizophrenia diagnosis and specific dimensions of psychosis symptoms, rather than psychotic disorders broadly, are associated with higher intraindividual variability of MMN, which might represent an index of stability of auditory information processing.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.25 Cognitive control/executive functions

POSTER SESSION III-101 | ADVERSE CHILDHOOD EVENTS AND INTERNALIZING SYMPTOMS: THE MODERATING ROLE OF NEURAL RESPONSES TO THREAT

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Adverse childhood events (ACEs) represent an established vulnerability condition for internalizing disorders. Indeed, experiencing prolonged stress and trauma may increase the processing of threats and unpleasant cues even outside the context of the maltreatment. This study investigated the interaction between ACEs and neural correlates of emotional processing in predicting internalizing symptoms in a sample of university students (n = 38). Participants completed the Adverse Childhood Experiences Questionnaire to assess self-reported childhood maltreatment, and the Brief Symptoms Checklist to assess depression and anxiety. Electroencephalography (EEG) was recorded while they viewed pleasant, neutral, and unpleasant pictures from the International Affective Pictures System (IAPS), employing the Late Positive Potential (LPP) as a neural measure of affective processing. ACEs correlated positively with the LPP amplitude to unpleasant images, indicating that childhood maltreatment might be related to increased elaboration of threatening information in adulthood. Interestingly, the interaction between the LPP to unpleasant stimuli and ACEs significantly predicted greater symptoms of anxiety, but not depressive symptoms. ACEs were associated with increased anxiety symptoms when the LPP to unpleasant pictures was potentiated, and with decreased anxiety symptoms when the LPP to unpleasant pictures was reduced. These findings suggest that the LPP to unpleasant pictures may help to identify individuals at risk of experiencing anxiety symptoms following adverse childhood events.

FUNDING: NATIONAL RECOVERY AND RESILIENCE PLAN (PNRR) - European Union and NextGenerationEU initiative.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.23 Emotion/affect

POSTER SESSION III-102 | MONEY MATTERS - DISTINCT PROCESSING OF MONETARY AND POINT REWARDS AND PUNISHMENTS DURING FEEDBACK-BASED LEARNING

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P2, feedback-related negativity (FRN), and P300 in the event-related potential are sensitive to various properties of the outcome, e.g., probability of occurrence, size, and valence. The present study examined if the type of feedback affects neural processing and learning performance. Two versions of a probabilistic learning task were used in which participants chose between abstract visual stimuli and received trial-by-trial feedback about wins or losses. Crucially, monetary wins and losses were used in one task version (n=27) and point wins and losses (n=38) in the other. Three different stimulus pairs with different reward contingencies (80/20, 70/30, 60/40) were used. Contrary to expectations, no difference in overall learning performance was observed between the groups, although monetary feedback did facilitate learning of the 70/30 and 60/40 pairs, particularly early in the task. Generally, the P300 was more pronounced for negative compared to positive feedback, while the opposite was found for the P2. FRN and P2 were not sensitive to feedback type. In contrast, valence coding in the P300 was affected by feedback type, with particularly pronounced positivity for monetary losses. Valence coding in the P300 was also more pronounced frontally than parietally. The present results demonstrate only subtle effects of feedback type on learning performance. EEG results revealed that effects of feedback type only emerged in later, evaluative processing stages indexed by the P300, possibly indicating increased involvement of top-down processes particularly for monetary losses.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.21 Decision making, 4.22 Learning/conditioning, 4.25 Cognitive control/executive functions

POSTER SESSION III-103 | USING ASSR FREQUENCY-TAGGING AND SIGNAL EXTRACTION ALGORITHMS FOR ISOLATING SPECIFIC AUDITORY STREAM RESPONSES UNDER COMPETITION

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It is still unclear how the auditory system resolves competition between concurrent streams of information, largely due to methodological challenges when separating neural responses to multiple, concurrent streams. In this study, we used the Auditory Steady-State Response (ASSR) approach to extract a neural response evoked by a 440 Hz sine wave that was rhythmically modulated at 41.2 Hz, while a naturalistic sound was also presented simultaneously. Sounds were classified as pleasant, neutral, unpleasant (taken from the International Affective Digitized Sounds), and unpleasant orofacial (chosen to trigger misophonia symptoms). EEG data from 35 university students were collected during a total of 72 trials (18 per condition). To isolate the 41.2 Hz ASSR, the Rhythmic Entrainment Source Separation (RESS) algorithm proposed by Cohen and Gulbinaite was applied to the EEG. Results showed that RESS was more sensitive than a standard Fast Fourier Transform (FFT) in recovering the 41.2 Hz ASSR from the concurrent stream stimulus. Regarding the modulatory effect of the natural sounds, there was an increase in the ASSR power for the unpleasant sounds (including orofacial sounds) compared to pleasant and neutral. Findings suggest that the negative content of the sounds enhanced the encoding of the concurrent tone, consistent with findings from attention manipulations. Thus, ASSR tagging and signal extraction methods such as RESS allow researchers to quantify responses to multiple streams, enabling the assessment of stimulus competition and emotional modulation in the auditory system.

FUNDING: Misophonia Research Fund.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.20 Attention, 4.23 Emotion/affect

POSTER SESSION III-104 | INHIBITORY CONTROL IN YOUNG ADULTS WITH ANXIOUS TRAITS: AN EYE TRACKING STUDY

Chae Lynn Bush[1], Yasaman Zahed[2], Bernard Nwapa[3], Ayda Tekok-Kilic[4]
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Inhibitory control (IC) is a cognitive process that involves suppressing task-irrelevant information and allocating cognitive resources. Anti-saccade eye-tracking studies that use emotionally evocative stimuli, such as angry faces, show that IC is impacted by anxiety. The current study aimed to test whether these anti-saccade results persist using neutral stimuli (coloured squares). One-hundred and four second-year university students (ages 17-27, 78% female) completed an anti-saccade eye-tracking task and the State Trait Anxiety Inventory (STAI) among other self-report questionnaires assessing impulsivity, sensory sensitivity, and affect. A 2x2 repeated measures ANOVA was conducted to test the impact of trait anxiety (low-trait group, high-trait group) on pro- and anti-saccade reaction times (latency of initial eye movement) and performance accuracy (percent correct). Preliminary analyses show a significant main effect of saccade type, $F(1, 102) = 21.206$, $p < .001$, partial $\eta^2 = .172$, indicating that participants had slower responses to anti-saccade trials than pro-saccade trials. The main effect of trait anxiety was not significant, $F(1, 102) = .009$, $p = .92$, suggesting that anxiety does not have a differential effect on saccade type. These results show that anxiety's effect on IC may not occur with neutral stimuli. We conclude that there are other factors that amplify anxiety's effect on physiological responses. Future research must examine potential moderators (e.g., impulsivity) with an equal representation of gender to understand anxiety's effect on behaviour.

Topics: 1.2 Human Studies: General Population - Children/Adolescents, 2.6 Eye Tracking (blink, movement, size), 2.11 Questionnaires/Interviews, 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.20 Attention, 4.25 Cognitive control/executive functions

POSTER SESSION III-105 | NARCISSISM IS ASSOCIATED WITH A BLUNTED REWARD POSITIVITY

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Narcissism's paradoxical appeal has fascinated laypeople and scholars alike, yet little is known about the neural mechanisms underlying narcissists' socially maladaptive behavior. The neurocognitive model of proposes that narcissism is underpinned by weakened cognitive control and reinforcement learning signals that originate from the anterior cingulate cortex. Insofar as the anterior cingulate cortex is generator of the error-related negativity and the reward-positivity, the neurocognitive model predicts that higher levels of narcissism will be associated with reduced error-related negativity and the reward-positivity amplitudes. In support of this model, a small literature indicates that higher levels of narcissism are associated with blunted (less negative) error-related negativity amplitudes. In the current study, we examine the neurocognitive model's proposed link between narcissism and a blunted reward positivity. We assessed participants' ($N = 65$) reward positivity amplitudes in response to feedback in a social incentive delay task while EEG was recorded. We then assessed narcissism with the Narcissistic Admiration and Rivalry Questionnaire. Consistent with hypotheses derived from the neurocognitive model of narcissism, higher levels of admirative and rivalrous narcissism were associated with a blunted Reward Positivity. This effect emerged on both social and non-social trials. In conclusion, narcissists seem to have difficulty learning from their mistakes and feedback from their social world.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.11 Personality, 4.24 Social factors, 4.25 Cognitive control/executive functions

POSTER SESSION III-106 | PSYCHOPHYSIOLOGICAL AND BEHAVIORAL SIGNATURES OF THE INTERPLAY BETWEEN CONJUNCTIVE AND ELEMENTAL CONTEXT REPRESENTATIONS

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The inability to adapt one's behavior to contextual information underlies various psychopathologies such as anxiety disorders. Animal research supports the importance of the interplay between an elemental and a conjunctive context representation (dual-process theory) in guiding behavior. How these representations might regulate human behavior remains unclear. To address this issue, we designed a virtual reality cue-in-context conditioning paradigm divided into three stages. During the first phase (context encoding), participants actively explored three virtual offices two minutes each. The contexts were furnished differently except for two lamps (one yellow and one blue). During the second phase (fear acquisition), participants were teleported into two of the three offices alternately multiple times. In one office, one lamp was associated with an aversive electrotactile stimulation, while the other lamp was not. In the other office, contingencies were reversed. In the third phase (behavioral test), participants actively explored the three contexts again. Ratings, autonomic responses (skin conductance, heart rate and pupil dilation), movement trajectories and gaze behavior were recorded. Results indicate successful contingency learning. We observed physiological signatures indicative of a shift from an elemental towards a configural representation during fear acquisition. This finding is substantiated by context-dependent avoidance of the aversively conditioned lamp during test. These observations help clarify how contextual representations interplay guide human behavior.

FUNDING: The study was founded by the DFG (RTG 2660).

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.6 Eye Tracking (blink, movement, size), 2.7 Skin responses, 3.3 Lab Based Experiment, 4.22 Learning/conditioning, 4.23 Emotion/ affect

POSTER SESSION III-107 | INHIBITORY TDCS STIMULATION TO THE BILATERAL DLPFC DISRUPTS IMPLICIT EMOTIONAL CONTROL

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The present study examined the causal role of the DLPFC in implicit induction of emotional control. To this end, activity of the left and right DLPFC was inhibited using tDCS before implementation of emotional control in a double-blind, sham-controlled, within-subject study design. Thirty-five participants unscrambled sentences of either neutral (no-regulation condition) or neutral and self-control-related content (implicit emotional control condition) before passively viewing negative and neutral pictures. EEG source-based effective connectivity was measured in the frontoparietal and cinguloopercular cognitive control networks, and the perceptual/attentional brain networks. Replicating previous findings (Adamczyk & Wyczesany, 2023), implicit induction of emotional control increased connectivity within both cognitive control networks compared to the no-regulation condition in the sham session. Enhanced connectivity was observed in the theta-band (3-7Hz) from right DLPFC to left intraparietal sulcus (IPS; frontoparietal network), and from dorsal anterior cingulate cortex to right insula/frontal operculum (cingulo-opercular network). Moreover, implicit emotional control increased influence from the frontoparietal network towards visual system in the beta-band (15-30 Hz). These effects were abolished after stimulation of both right and left DLPFC. Our findings show the causal role of the bilateral DLPFC in implicit emotional control and suggest neural targets for stimulation-based therapies aiming to improve automatic emotional control in affective psychopathologies.

FUNDING: This work was supported by a grant from the National Science Centre in Poland, grant number: 2019/35/B/HS6/03687.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.18 Brain stimulation, 3.3 Lab Based Experiment, 4.14 Unconscious processes, 4.23 Emotion/affect

POSTER SESSION III-108 | IMPLEMENTATION OF AN AI GENERATED AFFECTIVE PICTURE SET: SELF-REPORT AND PSYCHOPHYSIOLOGICAL VALIDATION

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One of the most prevalent ways for studying the psychophysiology of emotion is through affective picture viewing. However, picture selection and curation present challenges as pictures become outdated, or may be limited in number, variety, and content-specificity. The present study seeks to address these challenges by comparing psychophysiological responses to AI generated affective pictures and to original standardized pictures. Text and prompt descriptions of original pictures were utilized as inputs in a stable-diffusion model to generate new pictures. Adding to an initial study, participants in the present sample (N=46) viewed exemplars from the International Affective Picture Set (IAPS) as well as pictures used in a series of studies from the University of Georgia (UGA). Each set (UGA and IAPS) contained 20 pleasant, neutral, and unpleasant pictures, and all original pictures were matched with AI counterparts, resulting in a total of 240 pictures. To assess physiological and behavioral responses, EEG and pupil dilation were measured along with ratings of valence and arousal. Bayesian statistics on the late positive potential and pupil dilation showed consistent responses between the original and AI sets, both showing greater responses for emotional relative to neutral content. Affective ratings also showed no substantial differences between AI and original pictures. The results suggest that AI picture generation presents a promising avenue for addressing current limitations and concerns with affective picture sets.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.6 Eye Tracking (blink, movement, size), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.20 Attention, 4.23 Emotion/affect, 4.26 Other

POSTER SESSION III-109 | INVESTIGATING THE EFFECTS OF CENTELLA ASIATICA WATER EXTRACT ON CEREBROVASCULAR FUNCTION IN MICE

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Scientific evidence has supported the ability of the botanical *Centella asiatica (CA)* to promote healthy cognitive function in aging. However, the biological mechanisms mediating these beneficial effects are not well understood. One potential mechanism underlying the benefit of *CA* is through acute or longer-term effects on the tone of cerebral small vessels, which could support cognition by increasing cerebral blood flow. We treated 2-month old or 17-month old C57BL/6 mice with an aqueous extract of *CA* for five weeks and then assessed cerebrovascular function *in vivo* using arterial spin labeling MRI to measure resting brain perfusion and cerebrovascular reactivity to a hypercapnic challenge. Control mice received drinking water. In the same mice, we assessed the vasomotor response of capillaries to an oxidative stress challenge *ex vivo* using brain slice preparations. We applied 1 mM H_2O_2 and assessed the resultant change in diameter of capillaries. Finally, in separate experiments, we examined whether *CA* exhibits acute vasodilatory effects *ex vivo*. We found that *CA* treatment resulted in a significant increase in hypercapnia-evoked cerebrovascular reactivity compared to control animals. We observed both age and treatment effects in the capillary responses to H_2O_2. However, capillaries showed no significant acute dilation in response to *CA* in brain slices. Overall, *CA* appears to exert some beneficial effects on cerebrovascular function, which may be mediated through resilience to oxidative stress rather than acute vasodilatory effects on the cerebral microvasculature.

FUNDING: NIH National Center for Complementary and Integrative Health (5R90AT008924, 5U19AT010829) NIH National Institute on Aging Aged Rodent Colonies (RRID:SCR_007317) OHSU Department of Neurology BENFRA Pilot Funds.

Topics: 1.7 Animal Studies (e.g., rodent models), 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.5 Hemodynamic (BP), 2.19 Other, 3.3 Lab Based Experiment, 4.1 Aging, 4.26 Other

POSTER SESSION III-110 | ERP-BEHAVIOR RELATIONSHIPS MODERATED BY TASKS: ERN AND PE FROM FLANKER, STROOP, AND GO/NOGO TASKS

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Different forced-choice response tasks are interchangeably used in studies of performance monitoring. The relationships between event-related potential (ERP) indices of performance monitoring (error-related negativity [ERN], error positivity [Pe]) and behavior (response times [RTs], accuracy) are inconsistent across studies, possibly due to task-specific effects. This study investigated how tasks moderate ERP-behavior relationships and tested the consistency of these relationships. We recorded ERPs from 180 healthy undergraduates (116 women) during three tasks: a modified Eriksen flanker task, a Stroop task, and a Go/Nogo task. Multilevel models were used to predict RTs and accuracy. A larger previous-trial ERN predicted longer RTs and increased accuracy on the subsequent trial during flanker and Stroop tasks. A larger previous-trial Pe predicted shorter RTs and reduced RT variability during Stroop and Go/Nogo tasks. Taken together, only the Stroop task showed ERP-behavior relationships for ERN and Pe. These results suggest that ERP-behavior relationships are moderated by task, reflecting the possibility that different cognitive strategies are required for each task, such as ignoring irrelevant stimuli or inhibiting dominant responses. Future research should account for the tasks used to examine performance monitoring indices when considering across-task interpretations. Focusing on how tasks account for inconsistencies in ERP-behavior relationships across studies might elucidate unique task features that influence performance monitoring.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.5 Secondary Analysis, 4.21 Decision making, 4.25 Cognitive control/executive functions

POSTER SESSION III-111 | INFLUENCE OF THE DIVING REFLEX ON EMOTIONAL IMPULSE CONTROL, CARDIAC VAGAL AND SYMPATHETIC ACTIVITY

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Based on the neurovisceral integration model and previous work, we investigated the diving reflex as a potential intervention to improve emotional impulse control. Furthermore, since research about the role of cardiac sympathetic activity regarding both the neurovisceral integration model and the diving reflex is scarce, a second aim of this study was to explore the relation between cardiac sympathetic activity, emotional impulse control and the diving reflex. In a between-subjects-design, a total of 70 participants were randomly assigned to either the intervention (snorkel-breathing with face immersion in 13 degrees celsius cold water for 5 minutes) or the control condition (snorkel-breathing in an empty bowl for 5 minutes). Before and after the respective condition, both groups completed an emotional stop signal task (ESST). Meanwhile, heart rate and cardiac vagal activity (Root mean square of successive differences, RMSSD via electrocardiography), cardiac sympathetic activity (Pre-ejection Period, PEP via impedance cardiography) and breathing frequency (via breath belt) were measured using a BIOPAC device.
The linear mixed model showed a significant main effect on RMSSD for the condition. Compared to the baseline, RMSSD significantly decreased during each ESST in both groups as expected, and increased during face immersion. However, there were no differences between groups in ESST performance. No effects were found regarding PEP. Future work should also investigate breath-hold face immersion and the effect of long-term interventions on RMSSD, ESST and other variables.
FUNDING: This study was funded by the German Sport University Cologne (HIFF FL2).
Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

POSTER SESSION III-112 | WOULD'VE, COULD'VE, SHOULD'VE: CARDIAC AND BRAIN CONCOMITANTS OF REGRET IN RELATION TO DEPRESSIVE SYMPTOMS

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Risky decisions are often accompanied by unfavorable outcomes, followed by feelings of regret. Previous studies have shown that increased subjectively reported regret and neurobiological reflections of regret are associated with clinical depression. This study aimed at extending these findings to depressive symptoms in healthy participants and examined the association between depressive symptoms and neurobiological, behavioral, and subjective reflections of regret in a sample of healthy, female, undergraduate psychology students (N=93). Participants performed a sequential risk-taking task, in which they were confronted with optimal, suboptimal, and non-optimal (loss) outcomes. Higher depression scores were associated with more subjectively reported regret. Less favorable outcomes were associated with more risk taking in subsequent trials and stronger cardiac deceleration, but both were not associated with higher depression scores. The largest P3 amplitude was found for the infrequent optimal outcomes and this P3 amplitude was positively associated with depressive symptoms. Outcomes can be interpreted in terms of depressive symptoms being associated with more negative thoughts after negative outcomes and a stronger prediction error after unexpected positive outcomes.
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.21 Decision making

POSTER SESSION III-113 | CONTEXT-SPECIFIC AUTONOMIC RESPONSE PROFILES ASSOCIATED WITH ADOLESCENTS' SUICIDE RISK

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Autonomic nervous system (ANS) responses may facilitate situationally appropriate self-regulation but can be

maladaptive when atypical. We tested whether patterning of adolescents' ANS responses during clinically relevant interpersonal interactions helps explain their risk for suicide. Participants were 162 adolescents (M_{age} = 12.03, SD = 0.92 yrs; 47% female; 60% minoritized race/ethnicity). Of these 61% (n = 99) were at elevated suicide risk based on history of suicide/self-harm thoughts or behaviors on any measure (self-report, interview, ecological momentary assessment). Adolescents completed 3 parent-child interaction tasks with differing self-regulation demands: a conflict discussion, a positive discussion, and a reading challenge. ANS responses were measured comprehensively using parasympathetic (*respiratory sinus arrhythmia [as HF-HRV]*) and sympathetic responses (*cardiac pre-ejection period [PEP]*; *skin conductance level [SCL]*). Task-related change in each index (reactivity) was considered in the context of (i.e., as moderated by) baseline activity. In multivariate logistic regressions, elevated suicide risk was linked with context-specific ANS patterns (*ps* > .023), specifically: threat-like response to conflict (PEP reactivity-baseline interaction); disengagement-like SCL response to the positive discussion (SCL reactivity-baseline interaction); an amotivation-like response to the reading challenge (PEP reactivity main effect). No parasympathetic effects emerged. Findings implicate interpersonally/contextually bound sympathetic dysregulation in youth suicide risk.

FUNDING: This research was aided by grants from the National Institute of Mental Health (R01 MH101088, K01 MH119216, K01 MH131755) and American Foundation for Suicide Prevention (YIG 1-178-19).

Topics: 1.5 Human Studies: Clinical Samples- Children / Adolescents, 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.23 Emotion/affect, 4.24 Social factors

POSTER SESSION III-114 | EXPLORING THE PHENOMENON OF CHEST PAIN FOLLOWING A SIGNIFICANT LOSS: A CONCEPTUAL ANALYSIS

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Bereaved spouses face heightened mortality risk within six months of loss, primarily due to cardiovascular complications. "Broken heart syndrome," or Takotsubo cardiomyopathy, occurs post significant emotional stress. This conceptual paper explores the association between chest pain as a manifestation of emotional loss and potential physiological markers including organismic and chest specific ANS activity, vasoconstriction of coronary arteries, respiratory dysregulation, and chronic chest muscle tension. Hypotheses: Bereaved individuals will report the onset of chest pain shortly following a significant loss; Chest pain as a sign of emotional loss will be related to 1) lower high-frequency HRV, indicating reduced vagal control of the heart; 2) peripheral sympathetic activation, indexed by reduced finger pulse amplitude and transit time; 3) coronary artery sympathetic activation causing vasoconstriction, indexed by electrocardiographic ST segment depression; 4) labored breathing, indexed by irregular breathing patterns, reduced coherence of thoracic and abdominal excursions and thoracic dominant breathing; 5) chronic tension of external intercostal chest muscles. This conceptual paper adopts a theoretical framework that integrates concepts from bereavement literature, psychophysiology, and cardiology. It involves a comprehensive review and synthesis of existing research findings, theoretical models, and clinical observations, contributing to a better understanding of the psychophysiological mechanisms of increased morbidity and mortality in bereaved individuals.

FUNDING: Swiss Cancer League (KLS-5643-08-2022).

Topics: 1.1 Human Studies: General Population - Adults, 2.2 Myography (EMG etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 3.6 Other (Conceptual Analysis), 4.7 Psychopathology, 4.9 Pain, 4.10 Stress

POSTER SESSION III-115 | PSYCHOPHYSIOLOGICAL CORRELATES OF CHILDHOOD SEXUAL ABUSE: INFERRING CAUSALITY USING THE CO-TWIN CONTROL APPROACH

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Childhood sexual abuse (CSA) is associated with a range of adverse outcomes such as mood disorders, earlier onset of alcohol and other substance use, and heightened risk for developing substance use disorders. However, neurobehavioral mechanisms mediating the link between childhood trauma and adult problems are not fully understood. This study investigated psychophysiological correlates of CSA history in adult female twins with and without history of CSA (n=184, including 34 CSA-discordant monozygotic twin pairs). CSA-exposed (CSA+) twins from discordant pairs showed reduced EEG alpha-band power as well as slowing of the dominant alpha frequency and blunted P3 ERP responses to unpleasant pictures from

the International Affective System (IAPS) relative to their non-exposed (CSA-) co-twins, suggesting a causal effect of CSA. In a reinforcement learning task, CSA+ participants showed reduced ERP responses to reward feedback (reward positivity) compared with CSA- individuals, however, within pair comparison in CSA-discordant pairs was non-significant, suggesting that blunted reward response may be related to factors associated with risk for victimization. Follow-up analyses suggested that this link is mediated by socioeconomic disadvantage and environmental adversity at family and neighborhood levels. In conclusion, a combination of between-pair and within-pair (co-twin control) analyses allowed us to distinguish between psychophysiological correlates of CSA related to the consequences of CSA exposure and those related to environmental adversity.

FUNDING: This study was funded by a grant R01AA025646 from the National Institute on Alcohol Abuse and Alcoholism (NIAAA) to Andrey Anokhin.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.10 Stress, 4.23 Emotion/affect, 4.24 Social factors

POSTER SESSION III-116 | ELECTROPHYSIOLOGICAL MEASURES OF EMOTIONAL REACTIVITY AND EMOTION REGULATION IN HEALTHY INDIVIDUALS AND PATIENTS WITH INTERNALIZING DISORDERS

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Introduction: The late positive potential (LPP) provides electrophysiological measures for emotional reactivity and emotion regulation. While reappraisal of negative stimuli has repeatedly been shown to reduce LPP amplitude, savoring of positive stimuli has only recently been reported to enhance the LPP. In this study, we aimed to investigate clinical differences in LPP-based measures of emotional reactivity and emotion regulation in a novel combination of up- and down-regulation conditions. Our sample encompasses a healthy control group and a trans-diagnostic group of patients with internalizing disorders from a larger research project dedicated to predicting response to cognitive behavioral psychotherapy. Method: Event-related potentials were assessed relative to the presentation of neutral, threatening, and pleasant pictures from the International Affective Picture System while participants were instructed to maintain, reduce, or enhance emotional responding during passive viewing, reappraisal, or savoring, respectively. Results: We will report unexpected findings from 54 healthy participants and 180 patients showing a reduced late LPP component not only in the reappraisal but also in the savoring condition. While visible in both samples, these reductions are only significant in the patient sample. Additionally, both samples exhibit an enhanced early LPP component in both regulation conditions, which, in the case of reappraisal, is also significant in both samples. Outlook: We will discuss the LPP modulations with respect to methodological and clinical implications.

FUNDING: This study is supported by the German Research Foundation (Forschergruppe 5187).

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.23 Emotion/affect

POSTER SESSION III-117 | THE CURVILINEAR DECLINE IN TRIAL-LEVEL ERN WITH REPEATED ERRORS INCREASES WITH AGE DURING LATE CHILDHOOD

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The ability to detect and respond to mistakes enables us to maintain optimal performance across various tasks and situations. One neural index of such performance monitoring processes is the error-related negativity (ERN), a fronto-central negative deflection that peaks between 0 - 150 ms following an erroneous response. A larger ERN reflects heightened compensatory responses toward errors. Most work in this literature has looked at between-person variations of the ERN. Recent studies examining adults' within-person ERN levels found a decrease in ERN amplitude following repeated errors, reflecting flexible adjustments towards errors. However, no work has investigated these within-person, trial-level ERN patterns in youths and to what extent they vary with age. A community sample of 115 nine-to-12-year-olds (66 girls; Mean age/SD =11.00/1.16 years) completed an EEG Go/No-Go task. We conducted multilevel growth analyses on the trial-level data of the ERN and observed a quadratic effect of time on the ERN amplitude. Specifically, youths' single-trial ERN increased (i.e., became more negative) at the beginning of the task and gradually decreased later with subsequent errors. Additionally, this curvilinear pattern was moderated by age: older youths showed greater declines in ERN amplitude over time, similar to the patterns found in adults.

These findings suggest that the ability to adapt to repeated errors in youths matures with age. Future work should consider these within-person, trial-level differences in understanding the development and psychophysiology of the ERN.

FUNDING: NIGMS Centers of Biomedical Research Excellence (P20 GM103505) pilot grant to Pan Liu.

Topics: 1.2 Human Studies: General Population - Children/Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.14 Computerized Tasks (e.g. neuropsychology), 3.1 Observational Study: Cross-Sectional, 4.2 Development, 4.25 Cognitive control/executive functions

POSTER SESSION III-118 | IDENTIFYING MOVEMENT-INDEPENDENT EVIDENCE ACCUMULATION SIGNALS IN THE EEG OF NON-HUMAN PRIMATES

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Neural signals that trace the evidence accumulation process underpinning perceptual decision-making have been identified across various species and brain regions. Thus far, single-unit recording studies in the monkey brain have identified such signals exclusively in areas involved in planning decision-reporting actions. In parallel, previous human electroencephalogram (EEG) studies have pinpointed a decision-related signal which indexes evidence accumulation irrespective of task-specific motor requirements. It remains uncertain whether motor-independent signatures of evidence accumulation are uniquely human or have simply been overlooked in animal research. Here, we analysed two Rhesus macaque EEG datasets, who performed auditory oddball and random dot motion discrimination tasks, the latter on which they were cued to report choices either via saccades or reaching movements. Auditory oddball dataset analysis isolated a centroparietal electrode cluster that exhibited gradual amplitude build-ups at 300ms post-stimulus presentation and peaking close to response execution. This signal slope was modulated by evidence strength and reaction time, increasing for target versus standard tones, presenting a potential monkey homolog of Centroparietal Positivity (CPP) demonstrated in human EEG studies. Further dot motion data analyses will establish whether this signal is observed irrespective of the decision-reporting effector. Overall, our work can help bridge gaps in our understanding of cross-species differences alongside linkages between single-unit and EEG activity.

FUNDING: Horizon 2020 European Research Council Consolidator Grant IndDecision 865474. Research Foundation Flanders, Belgium (FWO-Vlaanderen, Grant No. 1242924N, awarded to L.V.).

Topics: 1.7 Animal Studies (e.g., rodent models), 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.5 Secondary Analysis, 4.21 Decision making

POSTER SESSION III-119 | THE SOUND OR SILENCE. THE INFLUENCE OF ACOUSTIC STARTLE PROBES ON NPU-THREAT TEST EFFECTS IN RATINGS, SCR AND EVENT-RELATED POTENTIALS

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The startle reflex is commonly used in affective neuroscience to measure defensive responding. This requires delivering unpredictable acoustic startle probes during all conditions of the experiment. These startle probes are inherently aversive and within the volume range of aversive stimuli, which could increase responses to safe stimuli and thus dampen effects between experimental manipulations. In this preregistered study, $N = 87$ students completed two versions of the NPU-threat test. In one version, acoustic startle probes were included (NPU-sound), in the other version, no acoustic startle probes were delivered (NPU-silent). Outcomes included subjective ratings, skin conductance responses (SCR) and the event-related potential P2. Across both versions of the NPU-threat test participants showed increased ratings, SCR and P2 to the predictable und unpredictable conditions compared with the neutral condition. Participants showed increased ratings to the NPU-sound compared with the NPU-silent, irrespective of the experimental conditions. No differences in SCR emerged between NPU-sound and NPU-silent but increased P2 in the neutral and predictable condition in NPU-sound vs. NPU-silent. Acoustic startle probes increased ratings and attention, irrespective of shock predictability. Specifically, the inclusion of acoustic startle probes increased overall subjective fear and attention to the task. This implies that studies including the startle reflex may overestimate subjective fear and attentional engagement across experimental conditions.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.7 Skin

responses, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.20 Attention, 4.23 Emotion/affect

LATE BREAKING POSTER SESSION III-120 | INVESTIGATING THE INTERPLAY BETWEEN EMOTIONS, DEPRESSION, AND TIME PERCEPTION THROUGH CENTRAL AND PERIPHERAL MEASURES

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Subjective time perception is highly influenced by one's emotional state, with individuals suffering from depressive conditions often perceiving time as slower compared to their healthy counterparts. However, the mechanisms underlying the interplay between mood symptoms, emotions, and time perception remain unclear. Within the EXPERIENCE project, an emotional induction protocol combined with multi-signal (i.e., electroencephalographic, electrocardiographic and electrodermal) recording was conceived to assess time perception abilities in individuals with depressive symptoms and healthy controls. 60 participants with depressive symptoms and 60 healthy controls were presented short emotion-eliciting videos to induce sadness or a neutral emotional state. Afterwards, participants provided retrospective time estimations and rated the speed of subjective passage of time. Subsequently, participants were exposed to another set of emotion-eliciting videos and asked to perform a prospective time estimation task. Results show differences between the two groups regarding the influence of emotions on time perception, revealing that time perception is not significantly affected by emotional state in individuals with depressive symptoms. These findings suggest that individuals with depressive symptoms exhibit reduced sensitivity to emotional cues, leading to a diminished impact of emotions on their time perception. This investigation provides valuable insights into the psychophysiological underpinnings of the complex relationships between depressive symptoms, time perception, and emotions.

FUNDING: The EXPERIENCE project (European Union's Horizon 2020 Research and Innovation Programme under grant agreement No. 101017727.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.23 Emotion/affect, 4.26 Other

LATE-BREAKING POSTER SESSION III-121 | FACE PROCESSING IN AUTISM SPECTRUM CONDITIONS – A SIMULTANEOUS EEG-FMRI STUDY

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Autism Spectrum Conditions (ASC) are characterized by difficulties in social interactions, which were suggested to be based on alterations in (emotional) face processing due to reduced social motivation. In this simultaneous EEG-fMRI study, participants with ASC and matched controls ($N=46$) performed an emotion recognition task on faces of a personally relevant person and a matched stranger.
Both groups showed significantly increased hemodynamic activity for relevant vs. stranger's faces in the fusiform gyrus, medial prefrontal cortex and precuneus. Crucially, emotion effects in ASC were limited to relevant faces, while the control group showed emotion effects for both relevant and stranger's faces. In EEG data, increased P1 amplitudes to relevant vs. stranger's faces were observed only for the non-autistic group; furthermore, these amplitude differences were correlated with the degree of autistic traits. Finally, cross-modal representational similarity analyses (RSA) analyses revealed that significant shared representations between EEG and fMRI data at sensory stages were limited to the control group.
Our results indicate that face processing in ASC might be characterised by a higher specificity, rather than a general dysfunction. Furthermore, EEG and EEG-fMRI data suggest differences at early sensory stages, which might be related to the degree of autistic symptomatology. Our results speak to the importance of using individualized stimuli and multi-modal analyses in order to investigate real-life social motivation and information processing in clinical populations.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.23 Emotion/affect, 4.24 Social factors

LATE-BREAKING POSTER SESSION III-122 | MICROSTRUCTURAL LOCUS COERULEUS CHANGES IN ADOLESCENTS AND YOUNG ADULTS DEPEND ON PARTICIPANT´S AGE AND SEX – FINDINGS FROM LONGITUDINAL QUANTITATIVE MRI ANALYSES

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The brain's main noradrenaline supply, the locus coeruleus (LC), is a key regulator of sympathetic activity, arousal, and cognition. Making use of recent advancements in magnetic resonance imaging (MRI), accumulating research suggests LC microstructure as a biomarker in neurodegenerative diseases of older age. However, little is known about human early-life LC development. We investigated longitudinal changes in LC microstructure of adolescents and young adults using Multi Parameter Mapping quantitative MRI (qMRI) data of the "Neuroscience and Psychiatry Network" cohort study (n≈300 healthy participants, aged 14-24y.). qMRI maps were estimated using the hMRI toolbox and aligned using Advanced Normalization Tools before extracting LC values using a previously established consensus mask. Repeated measures ANOVAs revealed significant LC changes between baseline and follow-up (after ~1-2y.) for the qMRI parameters R1 (longitudinal relaxation rate, sensitive to myelin and tissue water content, p<.001) and R2s (effective transverse relaxation rate, sensitive to iron content, p=.013). In addition, there was a significant interaction between longitudinal LC changes and age for R1 (p=.029) and R2s (p=.033). For R1, LC changes also depended on participants' sex (p<.001). These findings provide first evidence for the feasibility of assessing microstructural LC changes in development. Given the onset of many psychiatric diseases in the first quarter of the lifespan and the prominent noradrenergic role therein, developmental LC changes may have clinical implications.

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Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.6 Other (Neuroimaging cohort study - secondary analysis), 4.2 Development, 4.18 Memory, 4.20 Attention

LATE-BREAKING POSTER SESSION III-123 | DYNAMICS OF PHYSIOLOGICAL RESPONSES TO EMOTIONAL STIMULI: FROM CONTROLLED LABORATORY EXPERIMENTS TO LARGE-SCALE SETTINGS

Ana Abreu[1,2], Ana Coelho[2], Pedro Moreira[1,2]
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Electrodermal activity (EDA), a reliable proxy for autonomic arousal, offers valuable insights into involuntary bodily responses to stimuli. Emotional stimuli often trigger measurable physiological reactions, which can vary considerably based on contextual factors. This study aims to enhance understanding of physiological reactivity to emotional content by bridging the gap between controlled laboratory environments and real-world settings. Two groups of participants were exposed to an emotional induction paradigm comprising emotional film clips while wearing EDA sensors: one in a laboratory setting and the other in a naturalistic environment. The influence of context on the intensity of responses was examined. Our results show no statistically significant differences between the phasic component of the two groups (lowest p value of .190). Moreover, equivalence tests confirmed that the results for each emotional video were statistically equivalent between the two groups. This consistency supports the feasibility of large-scale data collections comparable to those obtained in controlled environments. Furthermore, a similarity metric based on dynamic time warping reveals higher similarities during video clips displaying the same emotions compared to videos depicting contrasting emotions (e.g., anger vs neutral) for both groups, highlighting the importance of integrating laboratory precision with ecological approaches to fully understand the complexities of emotional reactivity.

Topics: 1.1 Human Studies: General Population - Adults, 2.7 Skin responses, 2.12 Ecological Momentary Assessment (EMA), 2.14 Computerized Tasks (e.g. neuropsychology), 3.6 Other (Lab based experiment + ecological experiment), 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION III-124 | DOES STIMULUS FAMILIARITY AFFECT THE AGE-RELATED ASSOCIATIVE MEMORY DEFICIT AND ITS NEURAL CORRELATES?

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Memory for associations is more strongly affected by aging than other aspects of episodic memory. To test the idea that this "age-related associative memory deficit" is linked to perceptual deficits, this study examined how facilitating perceptual analysis of during pair learning affects associative memory and its neural correlates in older versus young adults. Half of the participants were familiarized with the stimulus material 24 hours prior to an associative memory task, presumably decreasing the perceptual effort to encode item-specific details. We hypothesized that if perceptual deficits contribute to associative memory difficulties in older adults, prior familiarization with the stimuli would improve associative memory and enhance the frontal slow wave subsequent memory effect (SME) during encoding. Our results revealed a typical age-related associative memory deficit, with older adults performing disproportionately poorer on associative compared to item memory. This pattern was not influenced by prior familiarization. Young adults showed an SME that did not differ depending on prior familiarization. Older adults showed a trend for an SME with the typical polarity without prior familiarization, but a polarity reversal of the SME after the familiarization phase. Taken together, we found no evidence for a modulation of the age-related associative deficit by prior familiarization with the stimuli. However, the SME patterns suggest that elaboration during associative encoding may be differentially impacted by prior item familiarization in young and older adults.

Topics: 1.3 Human Studies: General Population - Elderly/Geriatric, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.1 Aging, 4.18 Memory

LATE-BREAKING POSTER SESSION III-125 | BRAIN-HEART INTERPLAY AND SELF-REGULATION: INSIGHTS FROM A BIOFEEDBACK STUDY

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The brain and heart constantly communicate, influencing most parts of human behaviour. Brain-Heart Interplay (BHI) provides a comprehensive measure of the reciprocal communication between the central and autonomic nervous systems, therefore it is supposed to reflect enteroception and be influenced by self-regulation abilities. 48 healthy adults performed an experimental task during which they were required to voluntarily increase or decrease heart rate with or without visual feedback while electroencephalography and electrocardiography were recorded. Participants achieved appropriate changes in heart rate and were overall not influenced by the presence of visual feedback. Results indicate higher efferent activity from the brain to the heart when self-regulation occurs without external feedback, while higher afferent activity from the heart to the brain emerged when the feedback was present, especially in the reduced heart rate condition. These results suggest that greater cognitive demand seems to be required when the feedback is absent, as individuals rely more on self-generated cognitive strategies to modulate their cardiac arousal. In contrast, external feedback provides guidance and more accurate information on internal signals, potentially reducing cognitive load. These findings provide empirical support for the utility of BHI indices in revealing the psychophysiological mechanisms underlying self-regulation which is involved in emotional and cognitive processes.

FUNDING: University of Padua under the 2021 STARS Grants programme (Acronym and title of the project: Brain-beat - From the brain to the heart and back: an integrated psychophysiological approach to the brain-heart interplay).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 3.1 Observational Study: Cross-Sectional, 4.15 Biofeedback

LATE-BREAKING POSTER SESSION III-126 | MULTIMODAL CORRELATES OF MOTOR LEARNING IN LAPAROSCOPIC SURGERY TRAINING

Esra Zeynep Dudukcu, Zohreh Zakeri, Neil Mansfield, Caroline Sunderland, Ahmet Omurtag
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Laparoscopy training, a surgical modality, necessitates concurrently refining cognitive and motor abilities. Monitoring Brain-Derived Neurotrophic Factor (BDNF) levels offers insights into acquiring related neuroplastic skills. Moreover, EEG and fNIRS methodologies can assess cognitive and motor functions non-invasively. This study investigates the interplay among BDNF, EEG, and fNIRS responses concerning motor learning and cognitive skills. We utilized a 19-channel EEG setup and a prefrontal optode configuration for acquiring fNIRS data, involving 31 participants engaged in a complex motor task. Blood samples for BDNF levels were obtained after each task session. For EEG data analysis, we performed frequency power analysis (FPA) 6 frequency bands. Correlations between BDNF levels and FPA were computed for each task. Cerebral oxygenation, assessed through changes in the concentration of oxygenated haemoglobin (HbO), was analyzed across 6 channels. To elucidate the relationship between electrophysiological and hemodynamic responses, correlations were computed between FPA results and HbO values across each frequency band and 6 channels. The correlations observed between BDNF levels and electrophysiological responses yield crucial insights into attentional focus and sensory processing. Furthermore, they shed light on the mechanisms underlying cerebral blood flow modulation by neurophysiological phenomena. The frequency-specific EEG band powers were found to influence both BDNF levels and prefrontal oxygenation.
FUNDING: NTU School of Science and Technology has funded this poster presentation.
Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.22 Learning/conditioning, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION III-127 | CARDIAC VAGAL ACTIVITY AND PULSE-RESPIRATION QUOTIENT AS PREDICTORS OF EMOTION REGULATION CAPACITY AND SYMPTOM SEVERITY IN A COMORBID SAMPLE OF PTSD AND CHRONIC PAIN

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Chronic pain and PTSD often co-occur, leading to increased symptom severity, anxiety, depression, disability, and opioid use. Reduced cardiac vagal activity (CVA), measured via heart rate variability (HRV), and lower emotion regulation capacity are both observed within these patients, both of which are indicated to induce heightened anxiety when faced with pain or trauma stimuli. The Pulse-Respiratory Quotient (PRQ) captures complex regulatory states of the cardio-respiratory system. The PRQ, along with HRV, can provide information regarding the pathophysiological state of the individual and is posited to serve as diagnostic or predictive biomarkers for the development and progression of these conditions. However, it is necessary to elucidate the predictive relationship between PRQ, HRV and symptom severity in this population. This study investigates the baseline ECG, respiration, symptom severity and emotion regulation capacity of 60 participants diagnosed with chronic pain and PTSD, prior to commencing a six-week randomized control HRV Biofeedback intervention. The results clarify the correlations between lower vagally-mediated HRV and greater deviation of PRQ from normal resting rates with higher PTSD symptom severity, worse pain interference and reduced emotion regulation capacity. This study aids in developing new protocols for determining and predicting psychopathology in comorbid chronic pain and PTSD, laying the foundation for clinical applications to support early detection and treatment.
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 2.11 Questionnaires/Interviews, 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.9 Pain, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION III-128 | 3-D VR TRAINING MODULATES N2PC AND CDA ERP COMPONENTS IN VISUAL SELECTIVE ATTENTION AND WORKING MEMORY TASKS

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We measured the effects of virtual reality (VR) training on the N2 posterior contralateral (N2pc) and contralateral delay activity (CDA), event-related potential (ERP) components associated with visual selective attention and working memory. Thirty participants engaged in a 3-D VR environment developed for game-like training. The training (10 sessions) was designed to improve visual working memory by enhancing the ability to filter relevant from irrelevant visual stimuli. After five and 10 trainings, each participant in the VR group completed a change detection task (CDT) using a 2-D computer screen. Fifteen control group participants performed CDT only, without training between the CDT tests. In both groups, the CDT's stimulus set size was two or four target objects with zero or two distractors. The N2pc and CDA differences related to the CDT load were visually analyzed and formally tested with repeated measures of analysis of variance. The relation of the neurophysiological results with the behavioral results, including accuracy and reaction times, was also analyzed. Although formal statistical testing did not find a significant difference between the trained and control groups when analyzing least mean square estimates, a considerable effect indicating improved filtering was observed. A significant non-zero difference at the level of several tenths of μV was observed when comparing a CDA difference between trials with and without distractors after ten days of training versus an initial before-training difference. In the control group, no significant change was observed.

FUNDING: Supported by the Slovak Research and Development Agency (grant APVV- 16-0202), the Scientific Grant Agency of the Ministry of Education, Science, Research and Sport (VEGA2/0023/22) and by Pacific Development and Technology, LLC.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.18 Memory, 4.20 Attention, 4.22 Learning/conditioning

LATE-BREAKING POSTER SESSION III-129 | HIPPOCAMPAL VOLUME IS ASSOCIATED WITH ANXIETY BEFORE AND AFTER, BUT NOT DURING THE COVID-19 PANDEMIC

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The hippocampus is implicated in stress and emotional processes, with smaller volumes associated with increased risk for psychopathologies. However, it is unclear how hippocampal volume measured prior to a major societal stressor is related to emotional responses during the stressor and years following the event. We examined this in $n = 57$ ($m_{age} = 40.4$, $sd_{age} = 13.1$, 85% White, 67% female) participants who completed questionnaires and a structural MRI scan before the COVID-19 pandemic and a subset of participants who completed questionnaire follow-ups at the height of the pandemic (October 2020; $n = 43$; $m_{age} = 40.1$, $sd_{age} = 12.4$, 81% White, 63% female) and after pandemic stressors waned (May 2022; $n = 41$; $m_{age} = 41.7$, $sd_{age} = 13.3$, 88% White, 61% female). Larger pre-pandemic hippocampal volumes were significantly related to less pre-pandemic anxiety symptoms assessed with PROMIS-Anxiety CAT ($p = 0.018$) and with less post-pandemic anxiety symptoms (2022; $p = 0.019$), but were unrelated to anxiety symptoms assessed during the pandemic (2020; $p = 0.901$). Instead, anxiety symptoms during the pandemic were significantly associated with overall pandemic distress ($p < 0.001$). This suggests that hippocampal volume is associated with anxiety in periods of normal stress (pre-pandemic) and after periods of extreme stress (2022), but are unrelated to anxiety symptoms during periods of extreme stress (2020).

FUNDING: National Institute of Mental Health (2R01MH043454-28A1); Anna J. Finley was funded by Brain and Behavior Research Foundation Pfiel Foundation Young Investigator Award.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.2 Observational Study: Longitudinal, 4.7 Psychopathology, 4.10 Stress, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION III-130 | BEHAVIORAL, PHYSIOLOGICAL AND NEUROPSYCHOLOGICAL CORRELATES OF EMOTION REGULATION VIA ATTENTIONAL DEPLOYMENT

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There is a paucity of studies of attentional deployment, one of the best well-known emotion regulation strategies. We implemented an experimental task in which participants were asked to attend to negative valenced images from the IAPS under three conditions: focus on an arousing, unpleasant area, a neutral area, or free exploration. Fifty participants completed the task, rating the emotional intensity and valence elicited by the images. The participants' eye movements were monitored, and their attentional capacities were assessed through a computerized task (ANT). We recorded the electrocardiogram (ECG) from a subset of the participants. We found that participants regulated their emotions by deploying their visual attention to directed regions of the emotional images. Such deployment generated a decrease in the level of unpleasant emotions experienced. We also found that participants' attentional capacities did not explain attentional deployment ability. Preliminary analysis of ECG data shows that participants diminish their heart rate variability when exposed to unpleasant images, and this did not happen with neutral images. We conclude that capturing emotion regulation processes via attentional deployment in laboratory settings is feasible and that further research is needed to capture the psychophysiological correlates of the attentional deployment process.

FUNDING: Fondecyt 1230481.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.6 Eye Tracking (blink, movement, size), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.20 Attention, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION III-131 | AUDITORY STEADY-STATE RESPONSES IN DISORDERS OF CONSCIOUSNESS

Marek Binder[1], Sandra Frycz[1], Julia Papiernik[1], Inga Griskova-Bulanova[2]
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The reliable clinical diagnosis of patients with disorders of consciousness (DOC) after severe brain injury is a challenging issue and the rate of misdiagnosis remains high. EEG may help by directly probing brain responses. In this study, we used auditory steady-state response (ASSR) – EEG oscillatory responses evoked by periodic auditory stimulation. We assessed the strength of this response in a sample of DOC patients. We investigated three protocols of auditory stimulation. The DOC diagnosis was based on multiple assessment with Coma Recovery Scale-Revised. The first protocol involved constant frequency 40 Hz click-based stimulation, the second was chirp-modulated stimulation in the 25-55 Hz range using amplitude modulation of single tone. The third was chirp-modulated stimulation in the wider range of 30- 100 Hz, based on clicks. We measured the inter-trial phase clustering (ITPC) response in the time-frequency domain, from the frontocentral channels. Cluster-based, non-parametric analysis was used to identify inter-group differences. We found that in all three protocols the responses in low-gamma range (around 40 Hz) were attenuated in DOC patients that were diagnosed as unresponsive, while they could be systematically observed in the DOC patients with behavioral signs of awareness. The most stable effect was observed for the first protocol, i.e. constant frequency 40 Hz stimulation. Our findings indicate that brain response to periodic auditory stimulation at 40 Hz may be regarded as potential biomarker of awareness in patients with severe brain injury.

FUNDING: The work was supported by the Polish National Science Centre grant (2018/31/B/HS6/03920).

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.12 Sensation/perception/interoception, 4.16 Neurological disorders / Neuropathology

LATE-BREAKING POSTER SESSION III-132 | DIFFERENCES IN MICROBIOME DUE TO BIRTH MODE DOES NOT AFFECT CARDIAC INTEROCEPTIVE SIGNAL PROCESSING

Anxhela Sulaj, Laurie Henkes, Sirinda Tintinger, Mareike Boos, Lisa De Cillia, Tobias Prinz, Sam Bernard, Nina Buntic, André Schulz
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The microbiome may play an important role for an adequate or disrupted brain-body communication. For example, the microbiome communicates with the central nervous system (CNS) via visceral afferent nerves, thereby potentially enhancing activation and connectivity in the interoceptive brain network (IBN). Nevertheless, it remains unclear if the microbiome also affects the processing and perception of afferent signals from other organ

domains, such as the cardiovascular system. Children born through caesarean section (CS) typically show a reduced microbial diversity and richness as compared to vaginally delivered (VD) children. Hence, in the current study, 28 adult CS and 28 matched VD control individuals underwent two heartbeat perception tasks (heartbeat counting task/HCT and heartbeat discrimination task/HDT) and a continuous ECG and EEG assessment for the calculation of heartbeat-evoked potentials (HEPs), an indicator of cortical processing of cardiac signals. CS and VD individuals did not differ in heart rate, cardiac interoceptive accuracy (HCT and HDT), confidence ratings (HCT and HDT), or in HEPs as assessed during rest and while performing the HCT. Our findings suggest that microbiome-associated alterations in the IBN do not generalize to the processing of afferent signals from other organ systems, such as the cardiovascular system.

FUNDING: Research Foundation – Flanders (FWO) Luxembourg National Research Fund (FNR).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception

LATE-BREAKING POSTER SESSION III-133 | SPONTANEOUS ALPHA-BAND LATERALIZATION BOOSTS PERSISTENCE IN ICONIC MEMORY BY MODULATING CORTICAL EXCITABILITY

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Spontaneous occipital pre-stimulus oscillations in the alpha band have been shown to be associated with performance in visual tasks. Alpha power is thought to reflect neuronal excitability, with low alpha power indicating increased excitability and vice-versa. However, the research on the effects of this excitability have been focussed on detection/discrimination task. We investigated the link between excitability and visual memory, specifically iconic memory which has strong contributions from V1. Do spontaneous fluctuations in excitability have an effect on the persistence of visual information in IM in addition to effects on detection/discrimination? In order to answer this question and to distinguish this from typical visual tasks we utilized a partial-report paradigm (n=51). Six concentric stimuli were briefly flashed, and the to-be-reported target was indicated by a cue that appeared after a variable stimulus-cue onset asynchrony. High pre-stimulus alpha power was associated with better accuracy and stronger confidence, specifically at electrodes ipsilateral to the subsequently cued target item. Our results show that moment-to-moment fluctuations in cortical excitability of the two hemispheres affect visual processing beyond mere detection and discrimination. Specifically, relative suppression at the moment of stimulus onset of the hemisphere processing subsequently irrelevant items boost the persistence of relevant stimulus information in iconic memory.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.18 Memory, 4.20 Attention

LATE-BREAKING POSTER SESSION III-134 | POST-TRAUMATIC STRESS SYMPTOMS AND RESTING STATE FUNCTIONAL CONNECTIVITY OF THE DEFAULT MODE AND SALIENCE NETWORKS IN MILD TRAUMATIC BRAIN INJURY

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The default mode (DMN) and salience networks (SN) have structures within the brain responsible for contextual processing and emotion regulation (e.g., the amygdala). While seeds of these networks have been associated with mild traumatic brain injury (mTBI), both networks have been associated with risk for posttraumatic stress symptoms (PTSS). Little work has explored network relationships to mTBI or how these relationships are affected by increased risk seen for PTSS. In a sample of participants qualifying for mTBI (N=75, M_{age}=33), self-reported number of mTBI symptoms, PTSS (PCL-5), and resting state functional connectivity (RSFC) within the DMN and SN were assessed 2-weeks post-injury. We analyzed the correlation between these variables and total number of TBI symptoms. We separated the sample into 3 groups to explore if RSFC or PTSS varied across groups. mTBI symptoms were positively correlated with DMN connectivity (r=0.29, p=0.03) and PTSS (r=0.34, p=0.01). There was no difference in SN connectivity (F(2,54)=0.96, p=0.34) among mTBI groups. Finally, despite their correlation with mTBI symptoms, neither DMN (F(2,54)=2.14 p=0.13) nor PTSS (F(2,53)=2.62, p=0.08) significantly varied across groups. Activity in the DMN is positively correlated with number of mTBI symptoms and with any PTSS symptoms. Our findings align with prior literature. However, we did not see any group differences among our mTBI groups, which may be due to our categorization or small sample size. Future studies should continue

to explore neural associations with mTBI and prospective risk for PTSS.

FUNDING: NIH R01 MH106574 awarded to C. Larson.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.2 Observational Study: Longitudinal, 4.7 Psychopathology, 4.16 Neurological disorders / Neuropathology, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION III-135 | THE ROLE OF BRAIN-SPINAL CORD NETWORKS IN DEFENSIVE RESPONSES TO THREAT

Elena Andres[1], David Norris[1], José Marques[1], Linda de Voogd[2], Karin Roelofs[1,3]
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The spinal cord (SP) serves as a crucial pathway for all communication between body and brain. Descending circuits connect to the muscles through the ventral horn (vSP). Ascending circuits link the periphery to the brain, transmitting sensory information through the dorsal horn (dSP). Fine-tuning of sensory and motor functions via the SP becomes particularly important during threat responses, especially in attentive freezing (Roelofs, 2017). Freezing, characterized by immobility and bradycardia, is a state allowing individuals to assess the situation and plan potential actions. While associated with parasympathetic dominance, concurrent sympathetic arousal is linked to an increase of muscle tone and action preparation. Our goal is to gain a comprehensive understanding of brain-SP connectivity under threat, with a focus on threat-induced bradycardia. Using fMRI, we simultaneously measured brain and SP activity to replicate previous findings of brain-SP connectivity patterns during rest (Vahdat et al., 2020) and explore these patterns under acute threat. Additionally, we are investigating whether individual physiological responses, such as heart rate reduction during anticipatory freezing, are related to changes in brain-SP connectivity. The data collection for a subject sample of N=55 has been successfully concluded, and preliminary analyses indicate distinctive patterns for dorsal versus ventral SP – brain connectivity.

Our current study lays the groundwork for future research exploring sensory processing and motor preparation under threat in a comprehensive manner.

FUNDING: ERC grant for Prof. Karin Roelofs, project DARE2APPROACH.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 3.1 Observational Study: Cross-Sectional, 4.22 Learning/conditioning, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION III-137 | HEART RATE VARIABILITY, PSYCHOPATHOLOGY AND SELF-REGULATION IN ADOLESCENTS LIVING IN POVERTY IN NEPAL, COLOMBIA, AND SOUTH AFRICA

Mohammadamin Sinichi[1], Mai Anh HANGOC[2], Martin Gevonden[1], Lydia Krabbendam[1], Crick Lund[3], Mark Jordans[3], Emily Garman[4], Brandon Kohrt[5], Georgia Eleftheriou[5], Nagendra Luitel[6], Katherine Sorsdahl[4], Sandra Jaramillo[7], Maria Dedios Sanguineti[7]
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Most literature on the relationship between heart rate variability (HRV) and psychological constructs focuses on Western, Educated, Industrialized, Rich, and Democratic countries. Less attention has been given to understanding this dynamic in adolescents from Low- and Middle-Income Countries. In a cross-sectional study, we measured HRV, psychopathology, and self-regulation in 810 adolescents (aged 13-15) living in poverty in Nepal, Colombia, and South Africa. We calculated RMSSD from a 5-minute resting-state recording using chest strap ECG or ear clip PPG as an index of HRV (the mean RMSSD for Nepal, Columbia, and South Africa is 30.45, 39.33, 40.16 respectively). We used the 28-item MMAPP tool (Carvajal-Velez et al., 2023) to evaluate anxiety and depressive symptoms. Self-regulation was evaluated using an Emotional Go/No-Go task and a Delayed Discounting task. We also assessed self-reported emotional regulation difficulties using the 15-item Difficulties in Emotion Regulation Scale Short Form (DERS-SF). We used multi-level modeling to account for the clustering effect of different countries, controlling for BMI, gender, and age. We hypothesized that HRV would negatively correlate with depression and anxiety symptoms, false alarms, emotion dysregulation, and the choice of immediate reward. However, no significant association was found between HRV and any outcome measures. We discuss the implications of out-of-lab measurements, the development of the autonomic nervous system in this age

group, the potential impact of poverty, and the value of exploring this type of research.
FUNDING: This work was supported by the Wellcome Trust [221940/Z/20/Z].
Topics: 1.2 Human Studies: General Population - Children/ Adolescents, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/Interviews, 2.14 Computerized Tasks (e.g. neuropsychology), 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION III-138 | THE DIFFERENCES IN SMALL ARTERY ELASTICITY FROM ALOHOL USE DISORDER STATUS AMONG YOUNG AFRICAN AMERICAN ADULTS

Alexis Morris, Larry Keen
Virginia State University, Petersburg, VA, USA

The purpose of the current study was to explore the differences in small artery elasticity in those living with alcohol use disorder (AUD) compared to those living without AUD. The sample included 70 African American undergraduate students (Women = 75%) with a mean age of approximately 19.76 (SD = 1.65) years. After giving consent, participants' small artery elasticity was assessed using the HDI Pulsewave CR-2000 Cardiovascular Profiling Instrument. Once the cardiovascular profile was determined, a semi-structured interview was administered that included the Mini International Neuropsychiatric Interview (MINI). A participant's AUD status was determined by the participant answering "yes" to two out of the eleven AUD symptoms endorsed by the DSM-5 criteria in the MINI. Employing an Independent Sample T-test analysis suggested a significant difference between the small arterial elasticity, ($t(70) = 2.32$, $p = 0.012$) and AUD status. An ANCOVA was conducted to assess for a sex and age as covariates which showed no influence on the relationship between small artery elasticity and AUD status. These preliminary findings suggest that individuals living with AUD will have less arterial elasticity than those living without AUD. These findings may inform tailored health education intervention strategies to reduce alcohol consumption by identifying cardiovascular sequelae.
FUNDING: The National Institute On Drug Abuse of the National Institutes of Health, under Award Number R15DA052886, supported the research reported in this presentation.
Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/ Interviews, 3.1 Observational Study: Cross-Sectional, 4.5 Population-specific health, 4.10 Stress, 4.26 Other

LATE-BREAKING POSTER SESSION III-139 | BEFORE AND AFTER CANNABIS USE IN BLACK YOUNG ADULTS LIVING WITH CANNABIS USE DISORDER: AN EMA PILOT STUDY

Larry Keen, Alexis Morris
Virginia State University, Petersburg, VA, USA

Purpose: The purpose of the current study was to determine the difference between heart rate variability levels before and after self reported cannabis use within a sample of young adult African Americans living with cannabis use disorder. Methods: The sample included 27 self-identifying African American undergraduate students (Women = 85%), with a mean age of approximately 19.81 (SD = 1.52) years. After giving consent, the participants were administered a semi-structured interview that included the Mini International Neuropsychiatric Interview. The MINI was used to determine cannabis use disorder status. If a participant met the criteria for CUD, they were advanced to Phase II, where they were instructed to wear a Garmin smartwatch for three consecutive days. The Garmin smartwatch collected interbeat intervals via photoplethysmographic measurement. Participants were also instructed to complete a survey each time they use cannabis, a survey which asked 1) the start and stop times for each cannabis use session, 2) route of cannabis administration, and 3) how much cannabis they used. Results: Employing a paired sample t-tests, results suggest a significant difference in HRV levels before and after self-reported cannabis use. Specifically, both time and frequency domain HRV metrics are significantly lower than levels prior to using cannabis. Further, we see a significant increase in average heart rate from before to after cannabis use. Conclusions: Cannabis use is associated with a parasympathetic decrease and increase in sympathetic activity among individuals living with CUD.
FUNDING: Cannabis Nexus Initiative: Cannabis and Heart Rate Variability Study in HBCU Students (1R15DA052886-01A1).
Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.11 Questionnaires/ Interviews, 2.12 Ecological Momentary Assessment (EMA), 3.2 Observational Study: Longitudinal, 4.5 Population-specific health, 4.26 Other

LATE-BREAKING POSTER SESSION III-140 | EVALUATING INDIVIDUAL DIFFERENCES IN INHIBITORY CONTROL USING DRIFT DIFFUSION MODELING COMPARED TO TRADITIONAL BEHAVIORAL PERFORMANCE METRICS

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Inhibitory control is a neurocognitive process that has referents in both the behavioral performance and neural domains. Computational models of task performance in conflict reaction time (RT) tasks suggest that drift rate - *the relevant amount of information that is absorbed per time unit* - and response boundary - *the amount of information accumulation required for action* - represent distinct aspects of the decision process (Voss et al., 2004). In the current study, we evaluated these drift diffusion model parameters in a young community/student sample ($N = 150$) who completed a standard flanker task. We utilized the Diffusion Model for Conflict Tasks (DMC; Ulrich et al. 2015) to evaluate how drift rate and response boundary estimates (relative to standard RT and accuracy metrics) correspond to previously reported structural model estimates of inhibitory control (Venables et al., 2018) modeled in self-reports, behavioral performance, and P3 brain potential response measurement domains in addition to other external criteria (e.g., substance use). Consistent with our hypotheses, results showed significant differences across a range of external correlates between computational parameters (drift rate and response boundaries). These measures demonstrated an expected pattern of associations with other measures of inhibitory control assessed via distinctive measurement modalities and with external clinical criteria related to externalizing. These results provide further insight into distinctive aspects of decision making processes that relate to inhibitory control.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.20 Attention, 4.21 Decision making, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION III-141 | INHIBITORY CONTROL PERFORMANCE AS REVEALED BY DELTA PLOT PARAMETERS: ASSOCIATIONS WITH SELF-REPORTS, BRAIN POTENTIAL RESPONSE, AND OTHER TASK PERFORMANCE MEASURES OF DISINHIBITION

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Deficits in inhibitory control have been implicated across many forms of psychopathology. While extant work has demonstrated a coherent multi-modal account of inhibitory control from self-report, behavioral performance, and P3 brain response variables (Venables et al., 2018), the correlations between behavioral performance with self-reports and brain response were modest in size. The current study sought to examine if a novel quantification of behavioral performance in the Eriksen flanker task, termed delta plotting (Ridderinkhof et al., 2004) would better converge with inhibitory control indicators across measurement modalities. N=149 college and community participants completed a flanker task during EEG recording. The association between delta plots (the changing condition difference on correct trials when ordered from fastest to slowest reaction time), and indicators of inhibitory control in different modalities were examined using multilevel modeling. Results revealed a significant delta plotting effect – the condition difference (incongruent-congruent) on correct trials grew linearly as reaction time slowed, and this tapered at later reaction times (i.e., a quadratic effect). Individual differences in both the linear and quadratic delta plot effects were significantly associated with amplitude of the P3 in two tasks, but not in others. Results for other measurement modalities will also be presented. Our findings provide initial evidence for the construct validity of delta plot parameters based on the pattern of associations with other inhibitory control measures.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.13 Behavioral Tasks (e.g. stress exposure), 2.14 Computerized Tasks (e.g. neuropsychology), 3.3 Lab Based Experiment, 4.20 Attention, 4.21 Decision making, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION III-142 | SOCIOECONOMIC STATUS AND ERROR POSITIVITY IN CHILDREN AND ADOLESCENTS

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Error monitoring elicits unique event related potentials. The error related negativity (ERN) reflects unconscious error processing, and the error positivity (Pe) reflects adapting behavior post error. Socioeconomic status (SES) may impact a child's ERN; however, less is known about its impact on Pe. This study examined the relationship between SES factors and Pe amplitude in children. Participants were typically developing 5 to 13-year-olds (50% male, N=67). SES was represented using parental education. Pe amplitude was obtained for all incorrect trials during a speeded flanker task. An adaptive Woody filter controlled for trial-to-trial variability. The resulting Pe had an early and late positive component, the latter thought to better reflect the cognitive processes post error. A regression analysis evaluated the relationship of late Pe to SES controlling for ERN amplitude, the variability of the waveform shifts post Woody Filter, and then child's age. The overall model was significant, $F(4,62)=8.04$, $p<.001$. The first two controls accounted for 7.7% ($p=.08$) and age accounted for 21.2% ($p<.001$) of the variance in Pe. Parental education was a significant positive predictor of Pe ($B = .65$, $p<.05$) accounting for an additional 5.3% of the variance ($p=.03$). These findings suggest higher SES (i.e., parental education) leads to an increased Pe amplitude beyond maturation. Thus, association between Pe and academic achievement may be important for understanding the mechanistic pathways underlying socioeconomic disparities in cognitive development and academic achievement.

Topics: 1.2 Human Studies: General Population - Children/Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.1 Observational Study: Cross-Sectional, 4.2 Development, 4.24 Social factors, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION III-143 | PHYSIOLOGICAL MARKERS AND COGNITIVE REAPPRAISAL: INSIGHTS INTO EMOTIONAL REGULATION STRATEGIES

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It is known that emotions and emotional regulation might influence heart rate variability (HRV). Challenges in managing emotions could be linked to low levels of top-down processes like mentalizing and emotion regulation. In addition, previous studies indicate a positive correlation between galvanic skin response (GSR) and emotional activity. This study aimed to identify which emotion regulation strategies decrease physiological tension. Responses to altercations and neutral social interactions presented by point-light agents were investigated. 151 young adults were asked to reappraise or watch negative stimuli while ECG and GSR were recorded. Participants also completed the Cognitive Emotion Regulation (CER-Q) and FCZ-KT questionnaires. Results indicated that declarative emotional reactivity was associated with heart deceleration (HD) and GSR decreases. Higher physiological reaction to negative stimuli (measured by HD) positively correlated with maladaptive strategies (self-blame and catastrophizing). Lower physiological response was linked to positive refocusing, which involves thinking about pleasant experiences. Interestingly, HD increase during cognitive reappraisal was associated with refocusing on planning, suggesting links between HD and cognitive load. However, GSR was not associated with any specific emotion regulation strategy. The results suggest that heart deceleration may be a sensitive marker for effective emotion regulation, highlighting the importance of adaptive strategies for managing physiological responses to stress.

FUNDING: The grant of National Science Center Poland: 2019/35/B/HS6/00517.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.7 Skin responses, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION III-144 | DIFFERENTIAL PATTERNS OF PERFORMANCE AND FUNCTIONAL CONNECTIVITY RELATED TO ANXIOUS APPREHENSION AND MENSTRUAL PHASE

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The menstrual cycle and its effects on cognitive and physiological function are understudied. Although some studies find an impact of menstrual phase on tasks thought to be sexually dimorphic (spatial ability) and on some tasks of executive function, results are inconsistent, and methodological problems render findings difficult to interpret. However, menstrual phase has been related to

brain activity and connectivity during resting state and task-related fMRI. Since anxiety can fluctuate with hormonal shifts and influence task performance, the goal of the current investigation is to identify how anxiety dimensions influence task performance and connectivity as a function of menstrual phase on a working memory (WM) task. Using data from the Human Connectome Project, regularly menstruating subjects were divided into luteal (n=80) or follicular (n=157) menstrual phases and compared on task performance, anxiety scores, and task functional connectivity. Behavioral analyses identified different menstrual phase patterns in the WM task, with higher anxious apprehension related to longer reaction time in the luteal phase and lower accuracy in the follicular phase. Task fMRI also revealed differences in the menstrual groups' connectivity patterns during the WM task when anxious apprehension was taken into account. Greater functional connectivity was found in the follicular group for task-relevant ROI pairings with the IFG, a region implicated in anxious apprehension. These findings point to a role for anxious apprehension in task performance variability during menstrual phases.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.3 Sex differences, 4.23 Emotion/affect, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION III-145 | I'M EXHAUSTED, BUT FORTUNATELY, I'M NOT ANXIOUS AS WELL: ANXIETY, PERFECTIONISM, AND FUNCTIONAL CONNECTIVITY DURING SLEEP DEPRIVATION

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Cognitive changes are a result of sleep deprivation (SD), yet the interaction of SD with personality traits remains insufficiently explored. Perfectionism is often linked with high performance and anxiety but is multifaceted. Self-oriented perfectionism (SOP), socially prescribed perfectionism (SPP), and anxiety (BAI) under alert and SD conditions were examined using electrophysiological measures (EEG) during a gambling task. Small World Propensity (SWP) measures were calculated across three frequency bands: Alpha (9-13 Hz), Beta (14-30 Hz), and low Gamma (31-50 Hz). 15 participants (11 f, mean age 21) completed a task designed to simulate coin flips, resulting in several consecutive wins and losses. EEG data was collected, and SWP was computed by analyzing path lengths and clustering coefficients following the 2nd, 3rd, and 4th consecutive wins and losses under both alert and SD conditions. Differences in functional connectivity (SWP) between these conditions were assessed using 2-way ANOVAs. Moderate anxiety was a significant predictor of increased clustering in the SD (but not alert) condition across consecutive wins and losses in the low gamma band frequency, particularly for individuals high in SOP. Similar findings were found in participants with severe anxiety in the alert (but not SD) condition within the low gamma band. These findings suggest that people with moderate anxiety and higher levels of SOP may be more resilient to SD and that SWP measurements are a valuable method to investigate functional connectivity across diverse cognitive states.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 3.3 Lab Based Experiment, 4.8 Sleep, 4.11 Personality, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION III-146 | EMOTIONAL EVENTS INDUCE SUSTAINED CHANGES IN SPONTANEOUS APERIODIC EEG

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Arousal is pivotal to emotional experiences and significantly impacts many cognitive functions. Accordingly, understanding how emotional events modulate neural activity at rest is crucial for unraveling the mechanisms underlying emotion regulation and affective disorders. Here, we investigated the spectral changes in resting-state EEG following high-arousal emotional elicitation by analyzing two independent datasets. In the first dataset, 36 healthy participants viewed neutral and emotionally arousing video clips, followed by resting periods with closed eyes. In the second dataset, 32 participants viewed neutral and emotional pictures, and the resting state was recorded before and after emotional induction. EEG data was analyzed using spectral parametrization methods to differentiate between oscillatory and aperiodic activity. We found significant changes in aperiodic EEG parameters following emotionally arousing stimuli. Specifically, emotional arousal was associated with smaller aperiodic exponents, indicating a shallower spectral slope. These changes, distributed over posterior and central scalp sites, reflected increased high-frequency activity. Our findings

show for the first time that emotion-induced arousal leads to lasting changes in aperiodic EEG activity, indicative of increased neural excitation at rest. These results provide valuable insights into the neural correlates of emotional experience and highlight the importance of considering aperiodic activity in affective studies.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 3.3 Lab Based Experiment, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION III-147 | CARDIAC VAGAL TONE IS NOT RELATED TO PERFORMANCE ON VALIDATED TESTS OF INDIVIDUAL DIFFERENCES IN ATTENTIONAL CONTROL

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Attentional control is a construct integral to several prominent neurobiological theories of vagal function. A challenge with empirically assessing this relationship, however, is that several classic tests of attentional control (Stroop, Simon, and Flanker) have shown low test-retest reliability and low convergent validity with measures of related cognitive functions. Recently, these tests were modified to effectively index individual differences in attentional control. These modified tests have shown great internal consistency, high test-retest reliability, and have been strongly correlated with measures of related constructs (e.g., working memory capacity, fluid intelligence). To test a central tenet of theories of vagal function, one hundred thirty-three undergraduates had 5min of vagal tone collected before completing modified versions of the Stroop, Simon, and Flanker tasks. After controlling for known confounding variables, regression analyses indicate that vagal tone is unrelated to primary performance metrics on any of the three tasks. Consistent with the growing body of empirical findings demonstrating weak or inconsistent relationships between vagal tone and measures of executive function, we encourage further theory refinement to more effectively elucidate the limited integration of cardiac and attentional control.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 3.3 Lab Based Experiment, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION III-148 | ANXIETY DIMENSIONS ARE DIFFERENTIALLY RELATED TO THE TEMPORAL COURSE OF RESPONSE INHIBITION

Maya Marder[1], Kelly Polnaszek[2], Ian Kahrilas[2], Genevieve Roth[2], Sarah Sass[3], Gregory Miller[4], Wendy Heller[1], Rebecca Silton[2]
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Distinct dimensions of anxiety symptoms (i.e., anxious arousal and anxious apprehension) are related to functional differences in brain regions that implement inhibitory control processes. This study evaluated whether dimensions of anxiety symptoms differentially influenced the implementation of the temporal course of neural activity during response inhibition, or the ability to withhold prepotent responses. A subset of undergraduate participants ($n = 97$; 55% women) were selected from a larger study sample based on established threshold cutoffs on questionnaire measures of depression and anxiety. Participants completed a Color-Word Stroop Task while EEG data were collected. ERPs were calculated for N200 (220-320ms), N450 (360-472ms), and the conflict SP (600-900ms). Results showed that anxious apprehension was related to larger N200 amplitude and longer N200 latency on congruent and incongruent trials and longer N450 latency on incongruent trials ($ps < .05$). Anxious arousal was related to larger conflict SP amplitude on congruent and incongruent trials ($ps < .05$). Anxious apprehension modulated response inhibition earlier in the processing stream, which may indicate difficulties efficiently monitoring stimuli due to ruminative processes such as worry. Anxious arousal affected response inhibition later in the processing stream, which may indicate a failure to efficiently sustain effective top-down control. Investigating dimensional anxiety symptoms advances a translational goal to inform effective treatment strategies for individuals with anxiety symptoms.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/ Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION III-149 | COMMON FACTORS IN CHRONIC PAIN AND PTSD: TARGETING AUTONOMIC FLEXIBILITY AND EMOTION REGULATION THROUGH HEART RATE VARIABILITY BIOFEEDBACK

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Deficits in emotion regulation and reduced cardiac vagal activity, represented via Heart Rate Variability (HRV), are both evidenced in individuals with chronic pain and PTSD. Theoretic models suggest that reduced cardiac vagal activity leads to psychophysiological inflexibility, reducing the capacity for regulated emotional responding. This predisposes an individual to respond to potential threats with anxiety. Consequently, autonomic dysregulation and deficits in emotion regulation may interact with and perpetuate the cycle of fear and avoidance present in both chronic pain and PTSD. While several empirically supported therapies are available for each condition, the application of these therapies does not result in concomitant improvement in co-occurring PTSD or chronic pain. Focusing on these transdiagnostic factors, which may account for aspects of the comorbidity of symptoms between chronic pain and PTSD, presents valuable treatment targets to interrupt the perpetuating cycle of both. While breathing-based HRV biofeedback has shown promise in improving symptoms separately, its effectiveness for individuals with both conditions remains uncertain. This study utilises a six-week randomized wait-list control breathing-based HRV biofeedback intervention involving 70 participants diagnosed with chronic pain and PTSD. Pre-to-post echocardiogram (ECG) and psychometric measures indicate that HRV biofeedback increases emotion regulation capacity, measured by the Deficits in Emotion Regulation Scale (DERS), as well as an increase in vagally-mediated HRV (RMSSD).

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 2.4 Respiratory, 2.11 Questionnaires/Interviews, 3.4 Clinical Trial (RCT etc.), 4.7 Psychopathology, 4.15 Biofeedback, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION III-150 | NEURAL CORRELATES OF HEART RATE DECELERATION DURING AVERSIVE GENERALIZATION CONDITIONING: A PARAMETRIC MODULATION ANALYSIS

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The cardiac response to aversive stimuli unfolds as a dynamic cascade that is modulated by motivational and attentional facets of human defense. The early heart rate (HR) deceleration component of this response is thought to reflect attentional orienting, a process of information gathering. In the context of aversive conditioning, greater HR deceleration has been found in response to the threat cue (CS+) relative to a safety cue (CS–). It thus serves as an index of discriminative fear learning. The present study extended this finding to examine how HR deceleration is modulated by aversive generalization learning. Simultaneous ECG-fMRI was recorded to allow for an exploratory analysis of the BOLD correlates of single-trial HR deceleration. The study (n = 28) separately presented 4 Gabor patches varying linearly in orientation. One of the Gabor patches co-terminated with an electric shock applied to the ankle (US), while the others were never presented with the US. A linear trend analysis found that the early HR deceleration component generalized across stimuli as a function of CS+ similarity. Additionally, it was found that BOLD signals in bilateral occipital and parietal regions (cuneus, precuneus) were significantly correlated with HR deceleration. This suggests that HR deceleration during aversive generalization may reflect increased attentional orienting to conditioned visual stimuli as a function of motivational relevance.

FUNDING: This study was funded by a grant from the National Institute of Mental Health (R01MH125615).

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 3.3 Lab Based Experiment, 4.12 Sensation/perception/interoception, 4.22 Learning/conditioning, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION III-151 | NEUROCARDIAC REACTIVITY TO COGNITIVE LOAD AMONG ALCOHOL AND CANNABIS USERS

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Cannabis and alcohol are widely used substances that may dysregulate the autonomic nervous system (ANS). While chronic binge drinking (5+ drinks for males, 4+ drinks for females) has been linked to blunted ANS functioning, few studies have evaluated how chronic cannabis use affects the ANS. Cognitive load is a component of psychological stress that elicits acute changes in the high frequency band of heart rate variability (HF-HRV), a cardiovascular measure that is linked to parasympathetic functioning. This ongoing study seeks to characterize the effects of cannabis and alcohol use on HF-HRV reactivity to a cognitive load task. Cardiovascular data from 22 health young adults (age 18-29) were evaluated at baseline and during a mental arithmetic task. Self-reported past 30-day alcohol and cannabis use data were collected. Cannabis quantity was calculated from estimated tetrahydrocannabinol (THC) and amount of cannabis smoked on a typical day. A cannabis frequency x quantity variable (C-QFI) and binge drinking frequency were used in a multiple linear regression, using SAS 9.4, to evaluate HF-HRV reactivity. C-QFI predicted HF-HRV changes (R^2=0.35, F(3,21)=5.1, p=0.02) with alcohol in the model. Higher C-QFI predicted larger changes in HF-HRV (B=0.0008, t(21)=2.24, p=0.037) and binge frequency predicted smaller changes (B=-.132, t(21)=-2.43, p=0.025). The results suggest that alcohol use may blunt parasympathetic reactivity, while cannabis use exaggerates it. Further evaluation of these neurocardiac changes will be conducted on a larger sample at the time of poster presentation

FUNDING: This study is funded by NIH/AAA K02AA025123.

Topics: 1.1 Human Studies: General Population - Adults, 2.3 Cardio (HR, HRV, LVET, PEP), 3.3 Lab Based Experiment, 4.10 Stress, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION III-152 | FURTHER REFINEMENT OF INHIBITORY CONTROL PERFORMANCE: APPLYING DELTA PLOT AND DRIFT DIFFUSION ESTIMATES TO A MULTI-MODAL STRUCTURAL MODEL OF INHIBITORY CONTROL

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Inhibitory control refers to the ability to suppress or modify behavioral responses and impulses based on task demands or environmental cues. It is theorized to represent a latent trait with significant clinical implications, including substance use and other externalizing problems. Venables et al. (2018) reported on a multi-modal structural model of inhibitory control capacity assessed in distinctive measurement modalities: self-reports, task performance measures, and variants of the P3 brain potential response. One limitation of this work was reliance on standard approaches to quantifying lab-task performance (e.g., error rates or *M/SD* reaction times), which obscure variability in task performance seen by examining the distribution of the conflict task manipulation (compatible vs incompatible) as a function of reaction time. In the current study, we expanded the nomological network of this inhibitory control model by further refining task performance indices. Specifically, we computed delta plot and drift diffusion model parameter estimates across multiple tasks including standard flankers and Stroop paradigms. In bivariate analyses, we found a generally expected pattern of associations between delta plot and drift diffusion model estimates with model parameter estimates and clinical criteria reported by Venables et al. (2018). Updated structural model analyses will be reported based on incorporating further refinement of quantifying inhibitory control as revealed by standard simple choice lab-task measures.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.11 Questionnaires/Interviews, 2.13 Behavioral Tasks (e.g. stress exposure), 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION III-153 | EMOTION REGULATION AND THE HEART-BRAIN INTERACTION IN CHILDREN AS AN ASSESSMENT OF ADAPTABILITY TO CONTINGENCY DEMANDS

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Difficulties in emotion regulation (ER) are considered a transdiagnostic risk factor and have been linked to dysfunctional adaptation, mental health difficulties, problem behaviour and overall adjustment difficulties. Assessing ER skills at an early developmental stage, i.e., childhood, will help us identify early markers of risk factors for developing later psychopathology. Understanding the heart-brain interaction will explain brain responses to emotional stimuli related to ER skills, which is supported by ANS activity. In this project, a community sample of children (n= 72, age range 8-12), participated in multimodal assessments in which they completed a Posner task, modified to include an emotion eliciting condition. A resting state assessment was also included. EEG data (event-related potentials), behavioural data (reaction time & errors) and resting state heart rate variability (HRV), as an index of ER and ANS activity, were assessed. Preliminary results show that resting HRV predicts P300 mean amplitude time-locked to target presentation. Additional ERPs will be included in the further analyses. Within-subject differences show a decrease in reaction times during the frustration-condition as well as an increase in P300 amplitude. These findings demonstrate an interaction between parasympathetic activity and brain event-related responses to target stimuli during an attentional task under emotional load, highlighting the physiological basis of adaptability associated with effective emotion regulation.

Topics: 1.2 Human Studies: General Population - Children / Adolescents, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 2.3 Cardio (HR, HRV, LVET, PEP), 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.7 Psychopathology, 4.20 Attention, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION III-154 | EVIDENCE FOR FRONTAL NEGATIVE ERP COMPONENTS IN SEMANTIC PROCESSING

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In recent years there has been increasing interest in how reported frontal N300 effects in visual picture priming paradigms (Barrett & Rugg, 1990; Hamm, Johnson, & Kirk, 2002; Kumar, Federmeier, & Beck 2021) contrast with the well-studied posterior N400 effects. There have also been scattered reports of frontal semantic N300 effects in visual reading tasks (e.g., Chen, Ye, Liang, Cao, Lei, & Li, 2014; Frishkoff, 2007). Two visual lexical decision studies (Franklin, Dien, Neely, Waterson, & Huber, 2007; O'Hare, Dien, Waterson, and Savage, 2008) reported co-registered EEG and fMRI data suggesting that an N300fz reflects some aspect of controlled priming and that it emanates from the posterior cingulate cortex. In this preliminary report, (based on 34 out of a planned sample size of 40), EEG data were recorded from 69-channels while participants performed a lexical decision task. The experiment varied block-wise the prime-target relations (associative, category coordinates, and semantic similarity) and automatic vs. controlled conditions. Two-step PCA analysis (Dien, 2012; Dien & Frishkoff, 2005; Spencer, Dien, & Donchin, 1999) suggests that at least two frontal negativities are present, an N300fz that most responded to automatic associative priming and an N500cz that most responded to categorical priming under both automatic and controlled conditions. These findings shed light on existing reported ERP effects and their underlying cognitive processes.

Topics: 1.1 Human Studies: General Population - Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.3 Lab Based Experiment, 4.13 Speech/language, 4.25 Cognitive control/executive functions

LATE BREAKING POSTER SESSION III-155 | EXOSKELETON RESPONSE DURING INFANT PHYSIOLOGICAL KNEE KINEMATICS

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Spina bifida is a type of neural tube defect that affects the nervous system and can lead to problems such as total leg paralysis. Treatment requires physical therapy and rehabilitation. Robotic exoskeletons have been used for rehabilitation to train muscle movement and assist in injury recovery; however, most studies focus on the adult populations and not on the infant population. The proposed

framework aims to couple a novel musculoskeletal infant model with a robotic exoskeleton using vacuum-powered artificial muscles to provide rehabilitation to infants affected by spina bifida. The study that drove the input values for the robotic exoskeleton used motion capture technology to collect data from the spontaneous kicking movement of a 2.4-month-old infant lying supine. OpenSim was used to develop the musculoskeletal model and Inverse kinematics was used to estimate hip joint angles. The robotic exoskeleton used a Vacuum-Powered Artificial Muscle (VPAM) the structure comprised of cells that were clipped in a collapsed state and unclipped when desired to simulate infant's age. The artificial muscle works with vacuum pressure. When air is removed the muscle contracts and when air is added, the muscle relaxes. Bench testing was performed using a 6-month-old infant mannequin. The previously developed exoskeleton worked really well with controlled ranges of motion and frequencies which are typical of rehabilitation protocols for infants suffering with spina bifida. This study has the potential to advance the infant rehabilitation field.

Topics: 1.2 Human Studies: General Population - Children/Adolescents, 2.13 Behavioral Tasks (e.g. stress exposure), 3.3 Lab Based Experiment, 4.2 Development, 4.22 Learning/conditioning, 4.25 Cognitive control/executive functions

LATE-BREAKING POSTER SESSION III-156 | COMPARATIVE EFFECTS OF TWO NEUROMODULATION TECHNIQUES ON DEPRESSIVE SYMPTOMS IN A COHORT OF PATIENTS WITH RESISTANT PSYCHIATRIC DISORDERS

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Nearly half of the patients with depression respond suboptimally to first-line treatments, such as antidepressants or psychotherapy, and up to 80% experience a relapse within a decade. Therefore, there is an urgent need to find new treatments. Neurostimulation techniques, such as transcutaneous auricular vagus nerve stimulation (tVNS) and repetitive transcranial magnetic stimulation (rTMS), by targeting in a top-down (rTMS) and bottom-up (tVNS) manner the frontal vagal network, which involves several keys structures in depression, seem to be promising. To compare the two techniques, fourteen patients with depressive symptoms (seven with eating disorders and seven with mood disorders) were enrolled at the Mental Health Department of the Policlinico Hospital, Milan. Eight patients underwent tVNS treatment and six rTMS treatment. Hamilton Depression Rating Scale (HAM-D) and Beck Depression Inventory (BDI-II) were used to evaluate depressive symptoms. Two-way ANOVA for repeated measures was used for comparison. After one month of treatment, patients within the tVNS group reported a significant reduction in the HAM-D ($p=.002$) and BDI-II ($p=.004$) scoring, while no significant results, despite a trend toward a decrease, were found in the rTMS group. Both techniques demonstrated promising effects in treating depressive symptoms, with reductions reported by both clinicians and patients, especially in the tVNS treatment group. Further studies are needed to investigate the physiological systems underlying this improvement.

Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.18 Brain stimulation, 3.4 Clinical Trial (RCT etc.), 4.7 Psychopathology, 4.23 Emotion/affect

LATE-BREAKING POSTER SESSION III-157 | ASSOCIATION OF NEURAL CORRELATES OF INHIBITORY CONTROL WITH ALCOHOL-RELATED PROBLEMS BEYOND THE DEGREE OF ALCOHOL USE. A CONCEPTUAL REPLICATION STUDY

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Problems in inhibitory control have been linked to the development and maintenance of substance use disorders, however results are inconsistent. We found reduced neural activity related to inhibitory control to be associated with substance-related problems when controlling for the degree of use (Hildebrandt et al. 2023). This highlights the importance of considering confounding effects, such as the degree of use. In a pre-registered study, we tested whether this effect is also present for alcohol-related problems beyond the degree of alcohol use. Using fMRI, inhibition effects were measured during a visual stop-signal task (SST) within a clinical sample of $N = 132$ individuals with varying degrees of alcohol use and alcohol-related problems. Among other regions of interest, we expected that reduced inhibitory control activity in the right inferior frontal gyrus (rIFG) would be associated with more alcohol-related problems, when controlled for the degree of alcohol use. Our results conceptually replicated the findings of our

earlier study and showed a negative association between activity in the rIFG and alcohol-related problems beyond the degree of alcohol use. However, current effects were not found within the pre-registered ROI in the rIFG, but slightly adjacent to it. The results of this study contribute to the understanding why only some individuals that drink alcohol develop an alcohol use disorder.

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Topics: 1.4 Human Studies: Clinical Samples- Adults, 2.1 Neuroimaging (EEG, fMRI, fNIRS etc.), 3.1 Observational Study: Cross-Sectional, 4.7 Psychopathology, 4.25 Cognitive control/executive functions

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