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More on James and the Physical Basis of Emotion

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Abstract

We first present a reconstruction of James's theory of emotion (JATE) and then argue for four theses: (a) Despite constructivist elements, James's views are overall in line with basic emotions theory. (b) JATE does not exclude an influence of emotion on intentional action even in its original formulation; nevertheless, this influence is quite limited. It seems possible, however, to repair this problem of the theory. (c) Cannon's theory of emotion is a centralized version of JATE that inherits from the latter theory a potentially fatal flaw, the insufficient physiological differentiation of emotions. (d) The core claim of JATE, that emotions are bodily feelings, is very likely false.

Keywords

bodily feedback theory, Cannon's theory of emotion, constructivism, embodiment, emotion and motivation, emotional experience, evolutionary theory of emotion, facial feedback, James's theory of emotion

James's theory of emotion (JATE) has undoubtedly been highly influential. Since its inception in 1884, the theory has incited passionate debate, has inspired a large body of empirical research (see, e.g., Laird, 2007), and has influenced theorizing about emotions in psychology and philosophy up to the present. What is more, partly in the wake of the recent "embodiment boom" (see Stephan, Walter, & Wilutzky, 2013), there have been several attempts to newly defend JATE, or to revive it in a modified form (e.g., Damasio, 1994; Laird & Bresler, 1992; Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005; Prinz, 2004; Ratcliffe, 2005). For these reasons, JATE is not only an interesting study object for philosophers of science, historians, and sociologists, but continues to hold some interest as a model of emotion.

A 130-year-old theory that has significantly influenced, and continues to influence, psychology, philosophy, and other disciplines offers many opportunities for discussion. Begin with exegetical questions: What exactly does JATE claim, and what is the best reconstruction of the theory—the one most consistent with the primary texts in which it was presented, as well as the broader background constituted by James's other writings (e.g., Reisenzein, Meyer, & Schützwohl, 1995)? Did James possibly

propose not just one, but several emotion theories (e.g., Averill, 1992)? Closely related are questions concerning the reception of JATE: How has the theory been interpreted by the scientific community, what is the standard interpretation, and which alternative interpretations have been offered (e.g., Ellsworth, 1994)? How has JATE been criticized, and to what degree have the different criticisms been incorporated into the subsequent scientific discourse within psychology and philosophy? Next, how has JATE influenced subsequent theories of emotion and what kinds of research has it inspired? On the other side of JATE's history, what are the intellectual ancestors of JATE (see Titchener, 1914), and what might James's larger aims have been when proposing it (Dror, 2014)? Finally, from the perspective of emotion science, the most important questions are: Is JATE correct, or, to put it more generously, to what extent is it correct—which truths does it contain? Considered from the perspective of Lakatos's (1978) philosophy of science: Has JATE generated a progressive research program, as some claim (e.g., Laird, 2007), or has it led to a dead end of emotion research, as others have suggested (e.g., Averill, 1992)? And has the theory and the scientific discourse that it generated produced insights, ideas, and arguments that remain valuable even if—as many

have argued (e.g., Averill, 1992; Cannon, 1927; Reisenzein, 1996a; Stumpf, 1899) – the theory itself is false?

The other four contributors to this special section of *Emotion Review* touch many of these questions, although to different degrees. Ellsworth (2014) and Deigh (2014) are, at first sight at least, mainly concerned with exegesis: what James really said, and how he has possibly been misinterpreted. Ellsworth (2014) argues that James—different from how he has been typically interpreted—was in fact strongly opposed to the evolutionary theory of discrete basic emotions. Deigh (2014) argues that modern reinterpretations of JATE (e.g., Damasio, 1994; Prinz, 2004) that reclaim for emotions-as-bodily-feelings the representational and motivational roles that emotions play in classical philosophical theories, are actually at cross-purposes with James’s ulterior motive for his theory, which was precisely to *dislodge* these classical theories of emotion. Dror (2014) is also concerned with historical reconstruction, although his focus is not on JATE itself, but on its neurophysiological successor theory, the Cannon–Bard theory of emotion (Cannon, 1927), which was at least in part intended as an alternative to JATE and better in line with the facts. However, in developing their theses, Ellsworth, Deigh, and Dror bring up topics that are of interest not only to historians and philosophers of science. Thus, Ellsworth (2014), in the process of supporting her claim that James rejected basic emotions theory, simultaneously develops potential arguments against basic emotions theory itself. Deigh’s (2014) analysis raises the important, but rarely discussed, question of whether a JATE-type theory is indeed necessarily incompatible with the assumption that emotions play a causal role for action: Laird and Lacasse (2014), who also discuss this question, disagree. And Dror’s historical analysis raises, at least implicitly, further neglected questions: Namely, exactly in what respect is Cannon’s theory different from JATE, and to which degree may it actually have preserved core assumptions of James’s theory? Finally, Laird and Lacasse (2014), taking a critique of Cannon’s critique of JATE as their starting point, reopen the question of whether James’s theory may after all be true, and boldly answer this question in the affirmative.

Taking up the issues raised by the contributors to this special section, we will argue for four theses: (a) Despite constructivist elements, James’s views are overall in line with basic emotions theory. (b) JATE does not exclude an influence of emotion on intentional action even in its original formulation; nevertheless, this influence is quite limited. It seems possible, however, to repair this problem of the theory. (c) Cannon’s theory of emotion is a centralized version of JATE that inherits from the latter theory a potentially fatal flaw, the insufficient physiological differentiation of emotions. (d) The core claim of JATE, that emotions are bodily feelings, is very likely false.

A Reconstruction of JATE

To provide some background for our theses, we begin by trying to answer the main questions we raised about JATE. The most basic of these is: What does the theory claim? JATE comprises assumptions about the nature of emotional experiences, their causal generation, the historical (evolutionary and learning)

origins of the emotion mechanisms, the neurophysiological correlates of emotion, and (implicitly) also the effects of emotion (Meyer, Reisenzein, & Schützwohl, 2001).

The Nature of Emotional Experience

James actually proposed *two* versions of JATE: JATE1 is the original theory described in James (1884, 1890/1950, 1892); JATE2 is a clarification and partly a modification of JATE1 proposed by James (1894) in response to criticisms of JATE1. The core assumption of both versions of JATE concerns the nature of emotional experience. As argued by Reisenzein and Döring (2009), James’s main explanatory aim was to account for the peculiar phenomenal character of emotion, the fact that it “is like,” or “feels like,” a particular way to have an emotion—as James put it, that affective experiences have “emotional warmth” (1890/1950, p. 451). More precisely: Introspection suggests that the phenomenal quality of emotions differs from that of nonemotional states, that it is more or less different for different emotions, and that each emotional quality can occur in different intensities. Considered purely as phenomenal experiences, emotions thus present themselves as a unique group of related experiential qualities that occur in different intensities. This description fits the classical definition of sensations (e.g., of color, tone, or taste; Külpe, 1893; Wundt, 1896). Given the similarities between emotions and sensations, it is natural to try to explain the phenomenal properties of emotions by assuming that they are mental states analogous to sensations (e.g., centrally generated feelings of pleasure and displeasure; Meinong, 1894; Wundt, 1896) or even that they *are* a class of sensations.

The latter assumption is the one adopted by James. He claims that emotional experiences are type-identical with “bodily feelings,” namely, sensations or perceptions of bodily changes. That is, for each emotion type E_i from $\{E_1, E_2, \dots, E_n\}$, there is a type of bodily feeling or sensation S_j from $\{S_1, S_2, \dots, S_m\}$ such that $E_i = S_j$. (As discussed later, the converse does not hold: Not all bodily sensations are emotions.) It follows that each instance $E_i(a, t)$ of E_i —the experiencing of emotion E_i by person a at time t —is identical to an instance $S_j(a, t)$ of S_j . The emotions that JATE seeks to explain comprise *prima facie* all mental states presystematically classified as emotions; but at minimum, the theory seeks to account for what James called the “coarser” emotions, those which in his view are evidently accompanied by bodily changes. Paradigmatic examples are “anger, fear, love, hate, joy, grief, shame, pride, and their varieties” (James, 1892, p. 374). As to the remaining, “subtler” emotions, those “moral, aesthetic, and intellectual feelings” (James, 1890/1950, p. 468) for which bodily changes are less clearly evident, James tries to make plausible (a) that they too are in fact accompanied by bodily changes and hence presumably can be accounted for by JATE, or (b) are in fact not emotions at all, but intellectual judgments (in particular judgments of value). The sensation patterns S_j are to be understood as prototypes (see Smith & Medin, 1981), whose instances $S_j(a, t)$ —concrete experiences of sensations of type S_j —vary within limits around the statistical average represented by the prototype. (The intensity of emotions can

be taken into account by construing the E_i and S_j as numerical functions; see Reisenzein, 2000). The bodily feelings S_j are regarded by James as holistic experiences (as “emotional diffuse wave[s]”; James, 1894, p. 522) that integrate feedback from numerous bodily changes, although the subject is to some degree able to discern the elements (e.g., heartbeat) from which an emotional feeling is composed. Each S_j is based on a pattern of peripheral bodily changes $\langle P1_j, P2_j, \dots, Pr_j \rangle$ where $P1 \dots Pr$ are types or dimensions of bodily changes (e.g., heart rate, sweat gland activity, zygomaticus contraction versus relaxation). Analogous to the S_j , the patterns of physiological changes $\langle P1_j, P2_j, \dots, Pr_j \rangle$ are statistical prototypes whose instances can vary, within limits, both inter- and intraindividually.

The core assumption of the theory, that emotions are bodily feelings, was upheld by James (1894) against his critics in JATE2. However, in JATE2, James, in response to pertinent objections, restricted emotion-relevant bodily changes to visceral changes: only these are now regarded as necessary and sufficient for emotions (see Meyer et al., 2001; and Reisenzein et al., 1995, for textual evidence).

The Process of Emotion Generation

In JATE1, James seemed to claim that emotions are elicited in a reflex-like fashion by the perception (or imagination) of suitable objects. In response to counterexamples suggesting that emotions are typically elicited by a process of appraisal (e.g., Irons, 1894; Worcester, 1893), James clarified that emotions are not elicited by isolated objects but by the “total situation,” ultimately by that one of its elements that “strikes us ... as most vitally important” (1894, p. 518), such as in the case of an encounter with a bear, the idea that the bear may kill us. This can be, and has been (e.g., Arnold, 1960; Ellsworth, 1994), interpreted as implying agreement with the appraisal theory of emotion generation, although James suggests that the appraisal process can be understood in purely associationist terms. Importantly, however, James (1894) continued to believe that (some) emotions can also be directly elicited by certain perceptions, that is, without mediating appraisals (see Reisenzein et al., 1995). For example, fear can be directly elicited by the sight of a dark moving form in the woods (James, 1890/1950, p. 457). In addition, James continued to defend the existence of nonpsychological routes to emotion, such as via drug-induced bodily changes (Reisenzein et al., 1995).

Evolutionary and Learning Origins of the Emotion Mechanisms

According to James, the link between perceptions or appraisals of objects on the one hand, and “emotional” bodily changes on the other hand, is ultimately based on evolutionary stimulus–response connections. However, these inherited connections can be elaborated as well as changed by learning and experience. James (1884, 1890/1950) specifically had in mind associative learning—more or less what later became known as classical conditioning (see also McDougall, 1908/1960).

Concretely, humans start out with a limited set of inborn emotion mechanisms comprising at minimum those corresponding to the “coarser” emotions. These basic emotion mechanisms are elaborated on the input side (the evoking perceptions) by associative learning, and can be similarly modified on the output side (the bodily response programs), as a consequence of which the bodily changes produced by them begin to diverge from the inherited prototypes. Nevertheless, they retain enough similarity to the prototypes to be still regarded as variants of the latter (see also McDougall, 1908/1960).

Neural Structures and Processes that Implement Emotions

In addition to describing the process of emotion generation in psychological terms, James (1884, 1890/1950) sketched how this process might be neurophysiologically implemented. The resulting, neurophysiological version of JATE assumes that the neural programs for emotional bodily changes reside in areas of the motor cortex, whereas the perception (and appraisal) of eliciting objects as well as the perception of bodily changes take place in the sensory cortex. The elicitation of the bodily changes is explained in terms of inborn and learned reflexes and their perception is assumed to occur via unspecified sense-organs in the body. The aim of this neurophysiological model was to demonstrate that JATE was consistent with the neuroscience of 1890, which recognized the distinction between sensory and motor brain centers, the reflex circuit, and little else. James regarded it as a virtue of his theory that it required no more than that—that no “separate and special centres” for emotion in the brain have to be assumed and “no new principles ... beyond the ordinary reflex circuits” have to be postulated (James, 1890/1950, pp. 473–474).

Effects of Emotion

Implicitly, JATE contains the assumption that emotional experiences are largely epiphenomena. In particular, JATE implies that emotions are not motives of action (as assumed in common-sense); for example, that one does not flee from danger *because one feels afraid*. However, as pointed out by McDougall (1923) and discussed below, emotions can still have an influence on action in a JATE-type theory. Furthermore, several commentators have pointed out that in other writings (e.g., in Chapter 10 of the *Principles of Psychology* [1890/1950] and in James, 1896, 1902) James did ascribe to emotions important roles in decision making and action (e.g., Barbalet, 1999; Ratcliffe, 2005; Slaby, 2008). Whether this latter view of James still is (or can be made) consistent with JATE is considered later.

We believe that the proposed reconstruction of James’s theory makes the most sense of his primary writings on his bodily feedback theory (James, 1884, 1890/1950, 1892, 1894); but we do not claim that it makes sense of all of his writings on emotion. The reason is that James is not fully consistent in his writings on emotion (nor elsewhere; Averill, 1992; Myers, 1986).

More important for the subsequent course of history than what James actually said was how he was interpreted. We believe that the standard interpretation of James has been a mixture of JATE1 and JATE2. The focus of this standard interpretation has been the central claim of the theory, but with bodily feedback restricted to visceral feedback as in JATE2, possibly because Cannon's (1927) much-read critique of JATE focused on it. The process of emotion elicitation was typically interpreted as a reflex-like process, and basic emotions theory was adopted as a (usually implicit) background assumption that helped to make plausible the theory's core claim. Hence, although the standard interpretation of JATE missed the cognitive view of emotion generation suggested in JATE2 (Ellsworth, 1994), it was in other respects an essentially correct reading of the revised version of James's theory (Reisenzein et al., 1995).

Is James a Basic Emotions Theorist?

We proposed that James is a basic emotions theorist in the same general sense as McDougall (1908/1960) and later Izard (1971) and Ekman (1972) are. Ellsworth (2014) disagrees with this interpretation, arguing that, to the contrary, James rejected "the categorical, taxonomic approach to studying emotions, and indeed ... the whole idea of basic emotions" (p. 21).

Although basic emotions theory was for the first time presented in elaborated form by McDougall (1908/1960; see Reisenzein, 2006), it was already clearly visible in JATE. In fact, McDougall (1908/1960, p. 43, footnote 1) says that James came very near to stating the basic principle of his theory (that each of the primary instincts generates an emotional quality specific to it). Evidence for this interpretation in the primary sources (James, 1884, 1890/1950, 1892, 1894) is not lacking. Most generally, James's approach to emotions is clearly evolutionary (see also Myers, 1986; Richards, 1987), being particularly influenced by Darwin's (1872/1965) treatise on emotions. More specifically, James closely aligns emotions with instincts (James, 1890/1950, Chapters 9–10, 1892, Chapter 24; see also Deigh, 2014), which are, at their core, domain-specific inherited dispositions to act. He argues that JATE is first and foremost applicable to the "coarser emotions," those associated with characteristic instinctual bodily changes, and he lists as paradigmatic examples "anger, fear, love, hate, joy, grief, shame, pride, and their varieties" (James, 1892, p. 374). This list contains four of Ekman's (1972) six biologically basic emotions (anger, fear, joy, and grief) and each of the others can be found on the list of basic emotions proposed by some other basic emotions theorists. Apparently influenced by Darwin (1872/1965), James is uncertain that natural selection is the only force in evolution (though he becomes more sure about this on the last pages of the *Principles* 1890/1950) and doubts the adaptive value of many bodily reactions associated with emotions; but he does assume that at least some of these bodily reactions are adaptive and that others are by-products of adaptive reactions.

While acknowledging that James sometimes does sound like a basic emotions theorist, Ellsworth (2014) argues that certain of his *other* views are incompatible with basic emotions theory. She

mentions specifically: (a) James's emphasis on the multitude of possible combinations of bodily changes and the limitless number of possible emotions; (b) his emphasis on the interindividual variability of emotional bodily changes; and (c) his disdain for descriptive and taxonomic analyses of emotions. But are James's views on these matters really incompatible with basic emotions theory?

James on the Limitless Number of Emotion Qualities

It is true that James (1890/1950) suggested that

the various permutations and combinations of which these organic activities are susceptible make it abstractly possible that no shade of emotion, however slight, should be without a bodily reverberation as unique, when taken in its totality, as is the mental mood itself. (p. 450)

and that "there is no limit to the number of possible different emotions which may exist" (1890/1950, p. 454). However, the context suggests to us that these statements mainly served to convince skeptical readers that the bodily changes in emotion are differentiated enough to match the many different emotion qualities; and even then, James only claims the "abstract possibility" of an unlimited number of different emotions, rather than asserting it as a fact.

In fact, even if the number of dimensions of bodily changes (heart rate, blood pressure, sweat gland activity, etc.) is very large, as James assumes, this does not imply that all combinations of the values on these dimensions do in fact occur. Many combinations are physiologically impossible, and of those that remain, probably only a small subset are adaptive, or by-products of adaptive reactions. Accordingly, the set of actually occurring patterns of bodily reactions is very likely only a small subset of the logically possible ones; and even of these, not all are emotional (see below). Furthermore, even an unlimited number of emotions is logically compatible with the existence of a limited set of basic emotion categories such as "anger," "fear," etcetera, since the domain of emotions could be hierarchically structured (e.g., Johnson-Laird & Oatley, 1989). James himself seems to endorse a hierarchical taxonomy of emotions when he describes the coarser emotions as comprising "anger, fear, love, hate, joy, grief, shame, pride, *and their varieties* [emphasis added]" (James, 1892, p. 374).

James on Interindividual Differences

It is true that James suggested that "the emotions of different individuals may vary indefinitely ... as to their constitution" (James, 1890/1950, p. 454). However, "indefinite" is not "infinite" (Gardiner, 1896), and a few pages earlier, James had in fact written that the general descriptions of the bodily responses characteristic of the "coarser" emotions (anger, fear, etc.) that he had cited (e.g., Darwin, 1872/1965) apply, at least, to "the average man" (James, 1890/1950, p. 448). Furthermore, in his reply to Irons (1894), James reemphasized that "the bodily variations are within limits" (James, 1894, p. 520). James did so for good

reason; for as he acknowledged to Irons, the assumption of limitless interindividual variability in the bodily responses associated with a given emotion is incompatible with the claim that emotions are bodily feelings. This, at least, is the case if one assumes, with James, that (sufficiently) different bodily changes give rise to different bodily feelings. For in this case, the instances of a given emotion type E_i would correspond to instances of different sensation-types S_j, S_k, \dots , in different individuals; this is incompatible with JATE's type-identity claim that $E_i = S_j$.

James on Description versus Causal Explanation in Emotion Research

Finally, Ellsworth (2014) refers to James's dislike for traditional philosophical and psychological analyses of emotions, which was apparently based on his belief that these analyses were merely descriptive, classificatory, and taxonomic instead of causal-explanatory. Although this is not per se incompatible with believing that discrete basic emotions exist, a potential conflict to this belief could be seen in James's further claim to which Ellsworth also refers, that all classifications of emotions are "equally real and true" (James, 1890/1950, p. 485): If basic emotions theory is correct, then there is one best—because natural—classification of the emotions, which results from dividing the set of emotions into (a) the basic emotions and (b) the nonbasic emotions, which are subforms or mixtures of the basic emotions (e.g., Johnson-Laird & Oatley, 1989; McDougall, 1908/1960). However, one could read James as proposing that, now that the natural, evolutionary classification of emotions has been found, all *other* classifications of emotions previously proposed in the literature (e.g., "inspired by animate or inanimate things, formal or material, sensuous or ideal, direct or reflective"; James, 1890/1950, p. 485) can be seen to be, by comparison, of secondary relevance only.

The deeper question implicitly raised by Ellsworth (2014) is whether JATE's core claim could be true even if basic emotions theory were false. The evolutionary component of JATE, basic emotions theory, explains the existence of emotion-specific bodily changes (James, 1890/1950) and beyond that, embeds JATE into a broader evolutionary theory of humans' prereflective, practical dealings with the world (Slaby, 2008). This component of JATE can be dropped without epistemic loss only if it can be replaced by an alternative assumption with similar explanatory power. Averill's (1980) theory of emotion syndromes as socially constructed roles might be such an alternative; but the tenability of this proposal would require more discussion than is possible here.

Is James's Theory of Emotion Incompatible with Emotions-as-Motives?

The traditional theory of emotions in philosophy, as articulated by Descartes and Hume (see Deigh, 2014) assumes—in line with common-sense psychology—that emotions arise from perceptions

or appraisals of events and, in turn, cause more or less emotion-specific actions, expressions, and physiological changes. For example, we see a bear approach, appraise this event as dangerous, and feel afraid; and our fear then motivates our running away from the bear. James's reversal of this causal sequence implies that the traditional emotion theory is wrong; emotions are not the causes of emotional behaviors, but their effects. Whereas the implication of JATE that emotional experiences do not cause *physiological changes* and *facial expressions* (but that both are directly caused by the perception or appraisal of events) may still seem to be acceptable; its implication that neither do emotions motivate *intentional actions* seems deeply counterintuitive (e.g., Oatley, 1992): Isn't it just *plainly evident* that one flees the bear *because* one feels afraid of it, helps the beggar *because* one feels pity for him, insults the opponent *because* one is angry at him, and so on (e.g., McDougall, 1923; Reisenzein, 1996b; Weiner, 1995)? If one accepts this intuition, it seems that one has a powerful argument against JATE: (a) JATE implies that emotions do not motivate actions; (b) emotions obviously do motivate actions; (c) therefore, JATE is false. But is this "argument from action" against James's theory really valid?

How Emotions Can Influence Action in JATE

There are two ways one can try to answer the argument from action: One can either, with James, try to make plausible that the intuition on which it rests (its first premise) is false; or one can try to show that contrary to appearances, JATE—or at least a suitably modified version of it—does allow emotions to be motives for action. The first possibility will not be pursued here given the intuitive and systematic empirical evidence that emotions do motivate action (see e.g., Baumeister, Vohs, DeWall, & Zhang, 2007; Reisenzein, 1996b; Weiner, 1995) and the fact that James himself seems to have assumed so in other writings. As to the second possibility, McDougall (1923) has pointed out that JATE actually *does* allow emotions to exert a degree of control over action. According to McDougall (1923), an emotional feeling (which for him, too, is at least in part based on bodily feedback) tells consciousness that a particular instinct—a basic emotion mechanism that generates among others an action impulse—has been aroused; and by providing this information, the emotion enables "higher" centers of action control to regulate the instinctive action:

The emotional qualities have ... a cognitive function; they signify to us primarily not the nature of things, but rather the nature of our impulsive reactions to things; they are the cognitive basis of self-knowledge and self-control. (McDougall, 1923, p. 326)

The emotional qualities serve ... to indicate, to the subject himself, the nature of his excitement and the kind of action to which he is compelled ... they enable us to recognize our own state and to regulate, direct and in some degree control the impulses by which we are moved. (McDougall, 1923, p. 326)

Essentially the same proposal is made by Laird and Lacasse (2014). These proposals assume a two-tiered action control system: An automatic system that generates "instinctive" action

impulses, and a more deliberate system that permits to “regulate, direct, and control” these impulses.

Why JATE Still Needs to Be Modified

However, the control of emotions over actions allowed by the two-tiered action control system is very limited, for two reasons. First, if emotions require feedback from bodily changes *including actions*, as in JATE1, emotions can only signal actions that have already been initiated; but at this point, it may be too late to regulate them. This system of action control is therefore only suited for actions that have a certain minimum duration (e.g., running), so that there is still time to stop them or steer them into a different direction. To prevent emotional actions from even occurring, one needs to be aware of the corresponding action impulses *before* they are expressed, as McDougall (1923) in fact assumed. Second, and more importantly, this action control system cannot account for the cases that originally motivated the “argument from action”: I run because I am afraid, help because I feel pity, insult because I am angry. In these cases, emotions generate, or at least cogenerate together with other mental states, the original intention to act in a particular way, rather than merely providing information that an “instinctive” action is taking place or will take place, thereby allowing to regulate it.

To explain these cases, two modifications of JATE1 are necessary. First, one must abandon the assumption that emotions depend on feedback from intentional actions. This is in fact done in JATE2, where the bodily changes responsible for emotions are restricted to visceral reactions. Second, one must explicitly assume that already the initial intention to act (e.g., to flee from the bear) is generated or at least cogenerated by the emotion.

Even for this revised version of JATE, problems do remain. In particular, how do emotions as bodily feelings, which do not contain information about the concrete eliciting objects (see Deigh, 2014; Reisenzein & Döring, 2009), manage to generate an intention to act towards or against these objects? Information about the concrete nature of a threat or challenge (e.g., I might be eaten by the attacking bear) seems to be indispensable for this purpose. To solve this problem, one can either assume that the necessary additional information is provided by the emotion-evoking appraisal; or that the emotion is after all not *only* a bodily feeling, but also contains a representation of the eliciting object. Because the second option amounts to the abandonment of JATE’s core claim, Jamesians should prefer the first. Hence, we conclude that a modification of JATE that preserves the theory’s core claim but allows emotions to motivate actions is in principle possible. However, if one adopts this modification of JATE, one has nearly come back to the classical theory of emotion that, according to Deigh (2014), James tried to replace.

Is Cannon a Covert Jamesian?

Walter B. Cannon is famous in emotion psychology and affective neuroscience for two achievements: for having effectively

criticized JATE, and for having proposed, together with Philip Bard, an alternative emotion theory that—presumably—is very different from James’s (see Dror, 2014).

The Cannon–Bard “thalamic” theory of emotion is certainly different from JATE in being a “centralist” in contrast to James’s “peripheralist” theory, that is, it locates the proximate origins of the neural signals experienced as emotions in the brain rather than the body (see Dror, 2014). However, two points seem to have been overlooked in the debate between the peripheralists and centralists in emotion theory: (a) Cannon’s theory of emotion is in other respects not as different from James’s as one might at first think; on the contrary, it is a “centralized” version of James’s theory; (b) as a consequence, part of Cannon’s (1927) critique of JATE also works against his own emotion theory.

Cannon’s Theory Is a Centralized Version of James’s

According to Cannon (1927, 1931), emotional feelings are based on “upward” (cortex-directed) signals generated in emotion centers residing in the “thalamic region” (which includes the thalamus, hypothalamus, and adjacent areas). However, the thalamic nuclei that generate the signals experienced as feelings are the very same nuclei that generate the emotion-related bodily reactions: “The individual patterns of emotional reaction, organized in the thalamus ... discharge not only to the periphery but also to the cortex and there ... add ‘feeling’ to sensation” (Cannon, 1931, p. 285). Given this assumption, it would not be unreasonable to conclude that the *feelings* generated by the “upward” thalamic signals are also similar to those caused by feedback from the periphery; but even if one insists that they differ from feedback-based feelings in experiential quality, at least their *degree of differentiation* should be similar (see Cannon, 1931, p. 288). The differences between James and Cannon therefore are reduced to (a) their assumptions about the anatomical location of the “bodily reaction programs” (James: the motor cortex; Cannon: the thalamic region); (b) the question whether the cortex senses the signals generated by the bodily reaction programs directly (Cannon), versus indirectly via becoming aware of the feedback from the bodily changes that they cause (James); and as a consequence, (c) whether or not bodily feedback is necessary for emotion (James: yes; Cannon: no).

However, it can be argued that, important as these remaining differences between James and Cannon are to the neurophysiologist, they do not matter greatly psychologically: Considered from the psychological perspective, Cannon’s theory is just a centralized version of James’s—an alternative proposal about how the processes described in James’s psychological emotion theory might be neurophysiologically implemented. In fact, in the first article on JATE, James (1884) had himself ventured the hypothesis that the bodily changes might be sensed even “*before* they are produced, by our being conscious of the outgoing nerve-currents” (James, 1884, p. 193, footnote 1; this is similar to Damasio’s [1994], “as-if body loop”); and although he believed that the evidence spoke against this hypothesis, he

apparently regarded this “physiological question” (1884, p. 193) as being only of secondary importance. Therefore, James could actually have welcomed the Cannon–Bard theory as a variant of his own centralist version of JATE that took care of (most of [see the next paragraph]) Cannon’s (1927) objections to JATE. Conversely, Cannon (1931) could have agreed that his theory is but an alternative neurophysiological implementation proposal for JATE:

Cannon took no exception to James’s definition of emotion as a *qualie* added to simple perception. The difference lay in the supposed source. (Cannon, 1931, p. 285).

The thalamic neural patterns *precede* the postural and organic changes, they are exactly as various as these changes, they can exist without these changes, and according to the theory, by their different conformations they offer a basis for the specificity of the different emotions. (Cannon, 1931, p. 288)

Problems for Cannon and James

Because Cannon’s theory is a centralized version of James’s, at least one of Cannon’s (1927) arguments against JATE (see Laird & Lacasse, 2014, for a review) can be turned against his own theory. This is the argument that the visceral reactions in emotion are largely emotion-unspecific: Presumably, this is the case because the efferent signals from the thalamic nuclei to the bodily end-organs are not emotion-specific to begin with. However, since the “upward” signals to the cortex experienced as emotions are generated by the same thalamic nuclei and encode essentially the same information, the emotional experience created by these signals should be similarly undifferentiated. Hence, not just James’s theory has problems explaining the differentiation of emotional experience; so has Cannon’s. Cannon’s theory—like James’s (1884) own centralized version of his theory, and like Damasio’s (1994) “as-if body loop” theory—may be able to explain emotion in the absence of peripheral feedback (e.g., in spinal-cord-injured people) and may take account of the objection that visceral feedback is too slow for emotions (Cannon, 1927). It may also be able to explain that adrenaline injections do not cause emotion under normal circumstances (Marañón, 1924; see also Cannon, 1927). However, it still cannot account for the differentiation of emotional experience.

Was James Right?

We come, finally, to the central question for emotion researchers: Was James right with this theory, or at least its central claim, that emotions are feelings of bodily changes? Laird and Lacasse (2014) unambiguously answer this question with “yes”: “James’s basic notion, that emotional feelings are consequences of expressions and autonomic responses, has been supported over and over” (p. 31). They feel entitled to this conclusion by the results of a large number of empirical studies, many of them conducted by Laird’s research group (see also

Laird, 2007). Such strong endorsements of James’s theory are rare among contemporary emotion psychologists. The more typical interpretation of the available data is that feedback from bodily changes, be it from physiological reactions, facial expressions, postures, or other reactions, is not necessary for emotional experience, but can influence emotion, at least under certain conditions (e.g., Manstead, 1988; McIntosh, 1996; Parkinson, 1995; Reisenzein, 1996b).

Two main objections have been advanced against the central claim of JATE, that emotions are bodily feelings, by psychologists and philosophers. The first objection is that even granting that this theory of the nature of emotion can explain the experiential quality of emotions, it fails to account for other salient properties of emotion, in particular their intentionality or object-directedness (e.g., Solomon, 1976) and their motivational force (e.g., Deigh, 2014). The second objection is that JATE even fails to account for the very phenomenon which it was primarily meant to explain: The peculiar phenomenal quality (“emotional warmth”) of emotions. We have already discussed one facet of the first criticism—JATE’s problems with accounting for the motivational role of emotions—in a previous section (for more information on JATE’s problems with intentionality, see Reisenzein & Döring, 2009). Here, we focus on the second criticism. The arguments that have been advanced to support this second objection to JATE can be summarized in terms of two basic problems of James’s attempt to explain the phenomenal quality of emotions, a theoretical and an empirical one (Reisenzein & Döring, 2009).

The *theoretical problem* of JATE’s account of emotional phenomenality is created by the fact that, at the very least, *not all* bodily changes give rise to an emotion. Physiological reactions such as hiccupping or trembling from cold, or those caused by running, ingesting caffeine, and adrenaline injections (Marañón, 1924) are not accompanied by, and hence do not cause, emotions in healthy subjects under normal circumstances. The facial expression created by pursing the lips, blowing the cheeks, and closing one eye (Tourangeau & Ellsworth, 1979), and most other of the many anatomically possible facial contortions are presumably not associated with emotion either. To take account of these cases, JATE needs to assume that emotions are but a *subset* of bodily feelings (as James, 1894, explicitly states). But this immediately raises the question (Irons, 1894; Stumpf, 1899) of *why* this is so, what *specific feature* of bodily changes endows certain of them, but not their fellow brethren, with the power to generate “emotional warmth.” Neither James nor the neo-Jamesian theorists have been able to give a convincing answer to this question. The reason is not hard to find: A close comparison of “emotional” and “nonemotional” bodily changes—and likewise, of the bodily feelings to which they give rise—reveals no conspicuous difference between them; on the contrary, they seem to be composed of similar or identical elements (Irons, 1894). Claiming that emotions are a subset of bodily sensations is thus like claiming that emotions are color sensations with the exception of the yellows and greens. Hence, JATE has to cope with a serious, possibly unbridgeable *explanatory gap*. To the skeptic, the natural conclusion to draw from the existence of nonemotional

bodily sensations is that *all* bodily feelings are *intrinsically* nonemotional (Irons, 1894); they become emotional only by virtue of co-occurring with emotions. But if so, the attempt to explain the special experiential quality of emotions, their “affective warmth,” by referring to bodily sensations, is a non-starter. JATE has missed its central aim, to give an explanation of the phenomenal quality of emotions.¹

The *empirical problem* of James’s account of emotional phenomenality is that the tight covariation and close temporal synchrony between emotional experiences and patterns of bodily changes implied by JATE simply does not seem to exist. $E_i = S_j$ implies that for all persons a and all time points t : $E_i(a, t)$ if, and only if, $S_j(a, t)$; and since the S_j are based on patterns of corresponding bodily changes $\langle P1_j, P2_j, \dots, Pr_j \rangle$, it implies furthermore that $E_i(a, t)$ exactly if $P1_j(a, t')$ & \dots & $Pr_j(a, t')$, where t' is shortly before t . In addition, JATE implies that changes in the *intensity* of an emotional experience are preceded by corresponding changes in the intensity of the underlying bodily reactions. JATE thus places very strict empirical constraints on the bodily changes in emotion—much stricter constraints, we suspect, than many Jamesians have been aware of. To see just how strict they are, imagine a child attacked by a wasp, who experiences rapid increases and decreases of fear as the wasp hovers back and forth. JATE implies that the child shows a fear-typical pattern of bodily changes (e.g., heart rate increase, blood pressure increase, peripheral vasoconstriction, sweating), whose composition remains constant during the fear episode while the intensities of its components change in synchrony with the temporal change in the child’s feeling of fear; furthermore, these intensity changes always precede the corresponding changes in experience.

The objections raised against JATE by Cannon (1927), and similar objections raised before (see Gardiner, 1896) and after him, are essentially different arguments against this implication of JATE of a tight covariation and temporal synchrony of emotions and bodily changes. We cannot review the empirical evidence in detail here. Much of it is cited by Laird and Lacasse (2014), and still more by Laird (2007), although they often draw different conclusions from particular studies and sets of studies than we do. However, we want to highlight some of the most important findings and explain why we disagree with several interpretations of the data offered by Laird and Lacasse (2014).

Covariation of Bodily Changes and Emotional Experiences

Studies on the covariation of emotional experiences and bodily changes suggest that this covariation (or coherence) is typically modest. With regard to *facial expressions*, the relevant evidence has been summarized by Reisenzein, Studtmann, and Horstmann (2013) for laboratory studies and by Fernández-Dols and Crivelli (2013) for field studies. According to these reviews, high coherence between emotional experience and facial expression (intraindividual $r \approx .70$) has been found for amusement (not a classical basic emotion) and smiling. For surprise and disgust, the available evidence suggests that these emotions

are accompanied by their “traditional” facial expressions, and even just components of these expressions, only in a minority of cases. Evidence for sadness, anger, and fear is limited, but what evidence there is also suggests that emotion–expression coherence is typically low. If these studies are representative for everyday life situations, then *facial feedback* cannot be the source of most emotional experiences in everyday life—simply because the required facial expressions do not occur.

The coherence of *physiological changes* with emotional experiences appears to be even lower than that of facial expressions (e.g., Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005; Mauss & Robinson, 2009; see also Niepel, 2001, for surprise). Laird and Lacasse (2014) do not mention these coherence studies, but refer instead to studies of emotion-specific physiological patterning to support their case (Kreibig, 2010). However, even if one accepts at face value Kreibig’s (2010) conclusion that characteristic physiological response patterns exist for a number of emotions, these are *average response patterns*; hence what these studies document are covariations between emotions and physiological reactions at the group level, not the typically much lower individual-level covariations (e.g., Mauss et al., 2005), which are decisive for judging the degree of coherence (Reisenzein et al., 2013). Kreibig’s (2010) review, furthermore, if taken at face value, reveals another serious problem for JATE. This is the apparent existence of *subtypes* of physiological patterns for some emotions. For example, different physiological response patterns seem to be associated with contamination-related disgust and mutilation-related disgust. Still, people presumably feel the same emotion—disgust—in both situations. How can this be if JATE is correct?

Temporal Synchrony of Bodily Changes and Emotions

The reported coherence studies did not examine in detail the temporal relations between emotions and bodily changes. However, what evidence there is on this question (see, e.g., LeDoux, 1998; Schmidt-Atzert, 1993) suggests that the latencies of most physiological reactions (e.g., sweat gland activity, blood pressure changes) are indeed, as Cannon (1927) had argued, too slow to explain subjective experience. Inspired by our wasp example and a pertinent comment by Stumpf (1899), we submit, furthermore, that the *inertia* of most physiological reactions is too great (i.e., they are too sluggish) to explain rapid fluctuations in subjective experience, although this issue does not seem to have been empirically investigated.

Mixed Emotions

Numerous studies suggest that emotions very often do not occur in isolation, but together with other emotions (e.g., Schimmack, 2001). To account for these cases, JATE needs to assume that the corresponding emotion-specific patterns of bodily change likewise co-occur. However, because the bodily changes associated with different emotions recruit partly the same reaction systems, this is only possible to a limited degree: Response

patterns involving directionally opposed bodily changes (e.g., an increase vs. a decrease in blood pressure) cannot co-occur; and the summation of the neural signals controlling the bodily response patterns of different co-occurring emotions will destroy the pattern characteristic for any one emotion (for empirical evidence, see Kreibig, Samson, & Gross, 2013). This problem was not given serious attention by James, nor has it been since by the neo-Jamesians, but it should be.

Reduction of Bodily Feedback

Low covariation between an emotion E and a bodily reaction P (e.g., a particular facial expression) is frequently due to cases where E is present but P is absent (e.g., Reisenzein, Bördgen, Holtbernd, & Matz, 2006): $E(a, t)$ & not- $P(a, t)$. These cases show that P is not necessary for E . We can thus conclude from the coherence studies cited before that facial expressions are not necessary for emotional experience. A parallel conclusion is suggested by the studies of the coherence of emotions and physiological changes.

The conclusion that bodily feedback is not necessary for emotions is further supported by studies of the effects of experimental, quasi-experimental, and naturally occurring reductions of bodily feedback on emotional experience. Facial expressions have been experimentally blocked completely using curare (e.g., Campbell, Sanderson, & Laverty, 1964; see also Fridlund, 1994) and selectively by BOTOX injections (e.g., Davis, Senghas, Brandt, & Ochsner, 2010); they are quasi-experimentally reduced in patients suffering from facial paralysis (e.g., Keillor, Barrett, Crucian, Kortenkamp, & Heilman, 2002; see Leventhal, 1984, for a review of earlier clinical case studies); and they are naturally blocked during rapid eye movement (REM) sleep (e.g., Fridlund, 1994). The available evidence suggests that in all of these cases, emotional experience remains essentially intact (see also, Reisenzein, 1996a).²

Physiological (mainly cardiovascular) arousal has been reduced experimentally using beta-adrenergic blocking agents. As Laird and Lacasse (2014) note, beta-blockers typically fail to reduce emotions in healthy participants (e.g., Erdmann & van Lindern, 1980), but they have been found to reduce anxiety in some groups of patients. However, a closer look at these clinical studies suggests that the patients who profit from beta-blockers are cases where physiological symptoms are a cause of anxiety in the first place, such as people suffering from panic attacks (see Tyrer, 1988) or performers suffering from stage fright (Kenny, 2005; Nubé, 1991). In these patients, the beta-blocker, by reducing cardiovascular symptoms (palpitations, trembling), presumably removes the elicitor of the fear. This is not a Jamesian effect. In addition, another close look at the clinical studies reveals that the effects of beta-blockers were often restricted to so-called “somatic anxiety symptoms” (cf. Kenny, 2005), which, it turns out, are just perceived physiological symptoms by another name. Nobody questions whether beta-blockers can reduce physiological symptoms. The question is whether they reduce emotions.

Physiological arousal is reduced quasi-experimentally in spinal-cord-injured people. In some studies of the emotional experience of these people, reductions in emotionality have been found; however, as with all quasi-experimental studies, one must be aware of possible confounding factors (Reisenzein, 1983). The strongest designs have used laboratory inductions of emotion and have compared spinal-cord-injured subjects with reasonably matched controls. In most of these studies, no significant group differences in emotional experience were found (e.g., Cobos, Sánchez, García, Vera, & Vila, 2002; Deady, North, Allan, Law Smith, & O’Carroll, 2010; Heidbreder, Ziegler, Schafferhans, Heidland, & Grüninger, 1984).

Induction of Bodily Changes

The main evidence on which Laird and Lacasse (2014) base their claim that James’s theory is well supported stems from studies in which bodily changes have been experimentally induced. Of these, facial feedback studies provide the strongest and most consistent evidence for an influence of bodily feedback on emotional experience (Laird, 2007). However, most of these studies, and nearly all in which inconspicuous expression manipulation methods were used (such as holding a pen between one’s teeth to produce a smile), have focused on happiness-smiling and to a smaller extent on sadness-frowning (McIntosh, 1996). Attempts to obtain facial feedback effects for other “basic emotions” (Ekman, 1992) using unobtrusive methods seem to have been conducted only for surprise and these studies did not find a feedback effect despite high statistical power (Reisenzein & Studtmann, 2007).

Inductions of physiological changes by adrenaline injections (e.g., Cantril & Hunt, 1932; Marañón, 1924; see Breggin, 1964, for a review) typically did not result in emotions in most participants. Laird and Lacasse (2014) argue that the fact that at least a few participants reacted with emotions in these studies would be “a bit surprising if something like James’s theory was not correct” (p. 30). Closer examination of these and other adrenaline injection studies (Breggin, 1964; Reisenzein, 1983) reveals, however, that the most frequently experienced emotion was anxiety, which was more likely to occur if the situation contained anxiety-arousing cues or the participants were dispositionally anxious. This suggests that the mediating mechanism was appraisal: The occurrence of strong arousal symptoms as a reaction to the adrenaline injection was interpreted as a threat, causing anxiety. This is not a Jamesian feedback effect.

An additional problem for JATE is the modest size of the effects obtained in the bodily feedback studies. A meta-analysis of facial feedback studies by Matsumoto (1987) revealed an average effect size of 11% explained variance. The effects of induced physiological changes on emotion, if found at all, are similarly modest (Reisenzein, 1983). In a discussion of the effect size issue, Laird (2007) suggests that in everyday-life emotion-evoking situations, feedback from different bodily changes might accumulate; however, given the low coherence of different bodily reactions, complete bodily reaction patterns will in fact occur only rarely.

Finally, there is the still unresolved question of how the bodily feedback effects obtained in the induction studies come about. JATE suggests that the induced bodily changes are integrated (together with those that occur naturally) into a holistic feeling that *is* the emotion; but this describes only one of several possible mediating mechanisms (see, e.g., Laird, 2007; McIntosh, 1996; Niedenthal et al., 2005; Reisenzein, 1996a). Let us mention three (not necessarily mutually exclusive) alternatives. First, certain facial or physiological changes could activate a centrally located emotion-generating mechanism (e.g., a pleasure–displeasure module; Reisenzein & Studtmann, 2007). Second, bodily feedback may not affect emotional feelings, but the self-attribution of emotion, that is, the process of judging the quality and intensity of the emotions that one experiences (Reisenzein, 1996a; see also the discussion in Laird, 2007). Without denying that self-ascriptions of emotions have a degree of first-person authority, they are certainly not infallible (as James, 1890/1950, Vol. 1, p. 191, emphasized); accurately judging the quality and even more so the intensity of emotions is a demanding task (Junge & Reisenzein, 2013). To solve this task, subjects may sometimes take recourse to the information provided by emotion-associated cues such as felt bodily symptoms, even though these symptoms are not a part of the emotion. Third, related to this second hypothesis, the bodily changes associated with emotions could influence self-reports by priming the respective emotion concepts, thereby making them more accessible to the judgment process. The activation of emotion concepts by bodily feedback is in fact predicted by theories of “embodied cognition” (e.g., Niedenthal et al., 2005), according to which the mental representations of most concepts are not amodal and abstract, but include sensory and motor representations. Together, Hypotheses 2 and 3 can not only explain bodily feedback effects on self-ascriptions of emotion, but can also make sense of other documented effects of bodily feedback. For example, induced facial expressions of different emotions influence not only the self-ratings of the corresponding emotions but have secondary effects on the ratings of semantically related emotions (Duclos et al., 1989). Induced corrugator contractions affect not only judgments of sadness (Larsen, Kasimatis, & Frey, 1992), but also nonemotional judgments of effort (e.g., Stepper & Strack, 1993). Furthermore, fairly direct evidence for an effect of bodily feedback on concept activation has been found for some kinds of nonemotional bodily changes (see Wilutzky, Walter, & Stephan, 2011, for a review). For example, Schubert (2004) obtained evidence that making a fist activated the concept of power and Mussweiler (2006) that moving in a portly manner activated the stereotype of overweight people. Finally, if one allows for interindividual differences in the tightness of the perceived association between emotions and particular bodily changes and/or interindividual differences in the process of emotion self-ascription (see Leventhal, 1984), Hypotheses 2 and 3 can also make sense of the reported interindividual differences in feedback effects to which we now turn.

Interindividual Differences

Laird and Lacasse (2014) mention yet another empirical problem for JATE: the existence of stable and trans-situationally

consistent interindividual differences in the reactivity to bodily (especially facial) feedback manipulations. That is, the feedback manipulations seem to affect only a subgroup of “body-sensitive” participants (for more information, see Laird, 2007). There are three ways in which one can deal with this finding: (a) conclude that bodily sensations are not necessary for emotions; (b) assume that half of the population have malfunctioning emotion mechanisms or lack them altogether or (c) assume that there are two kinds of emotion mechanisms in the human species—Jamesian and non-Jamesian. Because the first option means to abandon JATE and the second is implausible (given that people insensitive to bodily cues also claim to experience emotions and—as far as we know—show similar bodily and brain reactions to emotional stimuli), Laird and Lacasse (2014) opt for the third alternative: They argue that the emotions of half of the population are based on bodily feedback, whereas the emotions of the other half are based on “situational cues.” This suggestion is analogous to proposing that half of the population have an inverted color spectrum (see e.g., Hardin, 1988); in fact it is even more radical because, whereas people with an inverted color spectrum would at least still experience *colors* when we do, the basis of emotional experience in Jamesian and non-Jamesian emoters is completely different (bodily versus situational cues). If we have to decide between this option and abandoning JATE, then surely JATE must go.

And this, indeed, is the overall conclusion that we draw from the evidence and from our theoretical considerations.

Notes

- 1 In this respect, Cannon’s centralized version of JATE is again at an advantage: One could assume that the “upward” signals generated by the bodily reaction programs in the thalamic nuclei create unique emotional feelings (feelings endowed with “emotional warmth”) that differ qualitatively from the sensations caused by peripheral feedback.
- 2 The finding of less depression and anxiety in a BOTOX-treated group than in a control group in the clinical study by Lewis and Bowler (2009) cited by Laird and Lacasse (2014) should be treated with caution because of possible pretreatment differences to the control group and self-selection problems mentioned by the study’s authors. In addition, the smoother forehead resulting from the BOTOX treatment could have improved the patient’s mood by increasing self-perceived attractiveness.

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