

DFG research grant (FI 1624/5-1) 2020-2023, "Increased perception-action coupling through embodied cognition: How the human body improves the simultaneous performance of two tasks in basic and applied task contexts"

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This project aims at filling the gap between basic cognitive research on multiple task performance on the one hand and current developments of applied dual-tasking demands in technical environments on the other. Recent research in cognitive psychology has substantiated the assumption of a strong connection between action components directly affecting perception and attentional control. Such action-perception interactions are increasingly prevalent in high-demanding complex cognitive tasks, which require the simultaneous processing and coordination of multiple stimuli and responses. Especially in real-life and applied contexts, task control is often implemented via handheld devices or touch screens and thus, the visual-manual interaction focus is shifted into a shared visuo-spatial attentional region. This project builds on recent findings in our labs that stimulus-hand nearness indeed improves dual tasking performance. This near-hand benefit was expressed in improved shielding of the prioritized task against interference by additional task processing (i.e., reduced between-task interference) when hands were located close to the stimuli compared to when they were located far from the stimuli. This is a highly important step in this new research area, as it offers possibilities for optimizing dual tasking in conditions of stimulus-hand nearness. At the same time, however, the cognitive mechanisms underlying these findings of improved dual tasking are to date highly underspecified. We reason that traditional theoretical assumptions about mechanisms underlying the action-perception interactions cannot be easily transferred to situations of multiple task performance. Instead, we propose that in dual-task conditions, in which each task-specific stimulus is operated with the respective task-specific response hand, the nearness of the hand to the stimulus will facilitate perception-action coupling in each task and will thus, facilitate the conceptual separation of two tasks. As a consequence, we propose that presenting stimuli close to the hands will help to reduce unwanted information-transmission between tasks (between-task interference). The present project aims at testing and confirming this assumption in three work-packages that include the investigation of the type of interference that can be reduced, the identification of the underlying mechanisms, the modality-specificity and the transfer of the near-hand-benefit effect to applied and real-life dual-task scenarios using hand-held devices, tool-based and hand-movement responses. The present approach of addressing action-perception interactions in dual tasking will therefore not only provide important theoretical scientific information on how stimulus-hand proximity affects dual-task performance costs, but promises also important knowledge for transfer into applied cognitive sciences and technical developments.