
Monitoring performance and action conflicts – effects of interpersonal relationship and social consequences

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Abstract

Action monitoring has been extensively studied in single-subject settings, suggesting specific responses to errors in anterior cingulate cortex (ACC), lateral frontal areas, and anterior insula (AI). Performance errors are also emotionally salient events and social context may influence their appraisal. In two experiments, we studied how one's own and observed errors are processed in interpersonal settings. Using EEG, we tested the influence of cooperation vs. competition between participants taking turns in performing and observing a go/no-go task. ERPs indicate differential processing of observed errors depending on social context. Additionally, feedback-related responses were more pronounced in the cooperating player, suggesting higher social relevance of negative feedback. To investigate, how the brain processes actions causing painful consequences for other persons, we designed an fMRI experiment, where participants played a visual decision task in turns with a friend placed outside the scanner. Errors always led to monetary losses to both players, but were sometimes additionally associated with painful stimulation applied to the friend. This allowed to investigate the neural underpinnings of self- vs. other-generated errors (factor: RESPONSIBILITY) which, in turn, might yield to vicarious experience of a painful vs. painless heat (factor: PAIN). Functional imaging results showed, consistently with previous studies, a main effect for PAIN in ACC and AI. Critically, AI was also associated with a significant PAIN*RESPONSIBILITY interaction, reflecting increased pain-related activations when errors were caused by oneself. By suggesting important interactions between empathic co-representation and error monitoring, these results illustrate the sensitivity of cognitive control mechanisms to social context factors.

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