Early processing stages in cognitive control

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Abstract

Flexible adjustments to a changing environment require the representation, maintenance and updating of contextual information – the task-set. Cognitive control needs to be adaptive in order to allow the awareness of new and relevant stimuli even if they occur outside the current focus of attention. Presenting a card sorting task to 17 healthy subjects, we aimed to investigate how the extraction of two distinct aspects of cue information (namely, "Does this cue convey any task-relevant information?" versus "what is the correct stimulus-response mapping?") are mirrored in the event-related potentials. We combined the experimental factors of endogenous preparation and exogenous adjustment (cue repetition, cue switch, task switch) with the factor of "Foreknowledge" (informative, non-informative cues). Interestingly, we found a modulation in the frontal cue-locked P2 component for task switch trials compared to repeat trials or non-informative trials. This suggests that the P2 can indicate whether anticipation is possible on the current information for task-set. In a former study we found the N1 and P2 but not the P3 amplitudes of schizophrenic patients differed from those of healthy subjects (n=16 in each group). Taken together, these results suggest that the early processing mirrored in the N1, as well as the evaluation of the stimulus and its salience reflected by the P2, play important roles in successful task-switching. Particularly the P2 seems to reflect early aspects of cognitive control. The inferior performance in schizophrenic patients compared to controls and the foreknowledge effects show how important early stimulus processing is for successful task-switching.

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