

Erring once and again: Adaptive control in post-error slowing and other post-error performance adjustments

Ridderinkhof KR, Nieuwenhuis S*, Hajcak G**, Van den Wildenberg WPM***, Burle B***

Dept of Psychology, Univ of Amsterdam, Amsterdam, *Vrije Univ Amsterdam, Amsterdam, **Dept of

Psychology, Univ of Delaware, Delaware, USA, ***Dept of Cognitive Neuroscience, CNRS Marseille, France

Adequate performance in cognitive tasks requires that the results of cognitive processing be monitored for (external or internal) signs of error or conflict. Psychophysiological and neuro-imaging studies have identified a neural circuit in the frontal brain (involving primarily anterior cingulate cortex, ACC) that serves as an action monitoring system. This evaluative control system is thought to detect the activation of erroneous or conflicting responses, and to signal the need for increased top-down executive control processes to adjust performance strategies for subsequent events (so as to prevent future errors). We build on previously published findings that erroneous responses are preceded by transient deficiencies in this monitoring function, as expressed in the amplitude of the CRN, an ERP component associated with conflict monitoring in correct responses to conflict stimuli.

Here we hypothesize that transient lapses of conflict monitoring may occasionally result in mal-adapted, impaired performance. We tested this hypothesis by inspecting (in each single trial of an Eriksen flanker task) the amplitude of the CRN. Specifically, we examined whether executive control was decreased after trials showing a small as compared to large CRN. Indeed, accuracy was reduced and stronger distractor interference was observed after small-CRN trials than after large-CRN trials. Moreover, delta-plot analysis revealed that inhibition of the inappropriate response (as activated by distractors) was more efficient after large-CRN trials. Thus, these findings provide evidence for the theoretical supposition that inadequate action monitoring results in failures to instigate performance adjustments.

K. Richard Ridderinkhof, Department of Psychology, University of Amsterdam, Roetersstraat 15, 1018 WB Amsterdam, t 020 5256119, e-mail k.r.ridderinkhof@uva.nl

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