

Comprehensive Analysis of Event-Related Potentials of Response Inhibition: The Role of Urgency and Compulsivity

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Abstract

Behavioral and neural correlates of response inhibition are assumed to manifest in self-reported impulsivity and compulsivity, but findings are inconsistent. Existing studies often examined only isolated components of the complex underlying neural process and used sumscores of impulsivity and compulsivity. Yet, there is evidence suggesting that alterations in response inhibition may be linked to specific subfacets of the multidimensional constructs. Therefore, our aim was twofold: to investigate behavioral and neural correlates of response inhibition in a comprehensive way, and to examine whether these effects are associated with urgency, compulsivity, or the interaction of both. We examined 233 participants who performed a stop-signal task while electroencephalography (EEG) was recorded. The analysis involved single-trial regression and latency analyses, exploring the relationships with self-reported urgency and compulsivity. Stop-signal reaction time (SSRT) was not related to urgency or compulsivity. SSRT and urgency scores were negatively associated with an attenuated successful inhibition-P3 effect. Crucially, whereas long SSRT was associated with a reduced attention-P1 effect and a later onset and peak of the P3, we observed the opposite pattern for higher urgency with higher P1 related activity and an earlier onset and peak of the successful inhibition-P3. Associations with compulsivity were not observed. The absence of a direct association between urgency and SSRT can possibly be clarified by considering early attentional processes reflected in P1 and latency effects during response inhibition. Urgency appears to be related to increased recruitment of early attention and a faster action cancellation process that may compensate the reduced P3 related activity.

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