Interference control on different levels of required effort and motivation in impulsivity

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Abstract

In our study event-related potentials (ERPs) were measured during a flanker task. The participants were undergraduate students classified as high and low impulsives based on the Barratt Impulsiveness Scale. As the Cognitive Energetic Model (CEM) proposes, the information processing is determined by the interaction of three main factors: executive control; energetic/state factors such as effort; and computational mechanisms of attention consisting of feature extraction, searching, encoding, and motor organization. The flanker trials had three levels of required effort manipulated by visual degradation of the stimuli. Performance-based monetary reward (+10 Forints), punishment (-10 Forints), abstract (correct, incorrect) or no-feedback information were given to the subjects after their responses.We measured the ERPs time-locked to the presentation of the flanker stimuli. Impulsive participants differed from controls in the feature extraction. While the P1 amplitude was less sensitive to the modulation of the effort level in the incongruent condition, the N1 decreased in the more degraded trials in the impulsive group. The binary evaluation of the motivational state was reflected in the N2b and N2c components as in the no-feedback condition they had larger amplitudes compared to all other conditions with feedback. The amplitude of P3 was largest in the neutral condition while it peaked later in the most degraded and in the incongruent conditions. Our results show that impulsivity affects the early information processing in interference control, i.e. the computational mechanisms of information processing in CEM, but not later stages, where only the effect of congruency and effort manipulations are reflected in ERPs.

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