Impulsivity and anterior alpha in predicting inter-temporal choices

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Abstract

The delay discounting paradigm is an established model of decision-making with implications for trait impulsivity. While the involved anatomical networks have already been identified, the EEG correlates of inter-temporal choices remain elusive.
50 participants made series of choices between two imaginary monetary rewards – a smaller sum available sooner and a larger one available later after a delay of 2, 4 or 10 weeks. In a "hot" condition the smaller reward was available immediately while in a "cold" condition both rewards were delayed by additional 2 weeks.

The difference between behavioral preferences defined as areas under discounting curves in the "hot" and "cold" conditions predicted trait impulsivity better that either preference alone. Subtracting the two conditions may thus isolate the specific response to immediacy from the general cognitive processes involved in all inter-temporal choices.

Similarly, EEG correlates of immediacy processing were isolated by subtracting response-locked spectral perturbations averaged in individually defined frequency bands collected in the "cold" condition from those recorded in the "hot" condition. Anterior alpha power was found to predict choices of delayed over immediate rewards corroborating recent conceptualizations of alpha power as a reflection of top-down inhibition, probably originating from the prefrontal cortex.
Interestingly, Big Five trait Conscientiousness was intermittently related to lower levels of anterior alpha prior to choices of delayed rewards and higher levels prior to choices of immediate rewards. This pattern might suggest that trait impulsivity relates to the efficiency as well as power of inhibitory mechanisms.

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