



ASSESSMENT OF MOTIVATION'S ROLE IN ERROR RESPONSE

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Introduction

Error monitoring and subsequent correction is an important aspect of life. Ideally, when a person makes an error, they learn from the mistake and reduce future error commission. We can measure error monitoring in the brain with electroencephalography (EEG). The error-related negativity (ERN) is a component of the event-related potential that occurs when someone makes an error. Previous studies have demonstrated that motivation influences the ERN component amplitude (Hajcak, 2005).

Over the past two semesters, we have explored this link between motivation and the ERN amplitude through a secondary analysis of a dataset previously collected in our lab (LoTempio et al., in prep). While a handful of researchers have demonstrated an indirect relationship between motivation and the ERN, few have tested this directly. There is a gap in the literature focusing on the role that subjective motivation may play in a person's response to errors. Our project directly explores the link between self-reported motivation and the ERN amplitude.

Background

An individual's ERN detects and regulates neural networks based on environmental cues (Gehring et al., 2011). When an individual makes an error, the ERN component is thought to act as a behavioral adaptation mechanism. This mechanism learns through reinforcement learning, where the ERN component compares the outcome to the intent of an action and trains the Anterior Cingulate Cortex (ACC) to respond appropriately in future scenarios (Holroyd & Coles, 2002). While we understand the role of the ERN in error processing and environmental learning, little research has directly tested if subjective motivation affects the ERN amplitude and subsequent behavioral change.

Perceived value of a task influences the ERN component amplitude. The amplitude of the ERN is sensitive to the value of the error made. For example, perceived value of an error affects the ERN amplitude, such that increasing the value of an error made increases the ERN component amplitude (Hajcak, 2005). In sum, the perceived value of a task can either increase or decrease the cognitive response to errors made.

The ERN component amplitude can be influenced by motivational factors. For example, motivation to perform well on a given task increases the ERN amplitude when an error occurs (Hajcak, 2005). The ERN component amplitude increases when a participant is influenced by manipulated or external motivation, such as telling the participant their performance is being evaluated or compared to another (Potts, 2011). While previous studies have observed increases in ERN amplitude when motivation is manipulated, there is a lack of research into how individual, subjective motivation affects the ERN component. We predict that subjective motivation will either amplify or dampen the ERN amplitude depending on subjective motivation levels.

Method

Participants

We recruited participants through the University of Utah's SONA participant pool. We included a total of 30 individuals (16 female, 14 male, $M = 23.4$ years) in our analysis. After data scrubbing, 26 participants were included in our final analyses. Participants were between the ages of 18-64 and received course credit for their participation.

Materials

We set each participant up with a BrainVision EEG cap to record their brain activity while completing the experiment. Between each experiment block, participants completed a self-report motivation questionnaire where participants rated their motivation on a Likert-type scale from 1 (*strongly disagree*) to 5 (*strongly agree*).

Procedure

Participants came into the lab for two 3-hour sessions spaced one week apart. At each visit participants completed three Flanker task blocks to elicit the ERN. At the end of each flanker task block, participants filled out the self-report motivation scale for a total of three motivation scales per lab visit, with six in total.

Results

We did not find any significant effect of self-reported motivation on the ERN amplitude. While no significance effect was found, it's possible that participants were not motivated to perform well on the task due to lack of an external or manipulated incentive. Overall, motivation to do well on a given task is a subjective experience and more studies must be done to understand the distinction between internal and external motivation to better understand their influence on the ERN amplitude.

References

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