Feedback Related Negativity: Reward Prediction Error or Salience Prediction Error?

by

Sepideh Heydari BSc., from Shahid Beheshti University, 2011

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Abstract

Supervisory Committee
Dr. Clay B. Holroyd, Department of Psychology
Supervisor
Dr. E. Paul Zehr, Neuroscience, Division of Medical Sciences
Outside Member
Dr. James Tanaka, Department of Psychology
Additional Member

The reward positivity is a component of the human event-related brain potential (ERP) elicited by feedback stimuli in trial-and-error learning and guessing tasks. A prominent theory holds that the reward positivity reflects a reward prediction error that is differentially sensitive to the valence of the outcomes, namely, larger for unexpected positive events relative to unexpected negative events (Holroyd & Coles, 2002). Although the theory has found substantial empirical support, most of these studies have utilized either monetary or performance feedback to test the hypothesis. However, in apparent contradiction to the theory, a recent study found that unexpected physical punishments (a shock to the finger) also elicit the reward positivity (Talmi, Atkinson, & El-Deredy, 2013). Accordingly, these investigators argued that this ERP component reflects a salience prediction error rather than a reward prediction error. To investigate this finding further, I adapted the task paradigm by Talmi and colleagues to a more standard guessing task often used to investigate the reward positivity. Participants navigated a virtual T-maze and received feedback on each trial under two conditions. In a reward condition the feedback indicated that they would either receive a monetary reward or not for their performance on that trial. In a punishment condition the feedback indicated that they would receive a small shock or not at the end of the trial. I found that the feedback stimuli elicited a typical reward positivity in the reward condition and an apparently delayed reward positivity in the punishment condition. Importantly, this signal was more positive to the stimuli that predicted the omission of a possible punishment relative to stimuli that predicted a forthcoming punishment, which is inconsistent with the salience hypothesis.