

Abstract

An Event-Related Potential Study of Error Monitoring to Affective and
Non-Affective Stimuli in Adolescents and Emerging Adults

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Adolescents frequently make choices with less than optimal outcomes in emotional situations. There is a growing body of neurobiological evidence that suggests this may be due to more rapid development of subcortical areas that mediate emotional responses compared to cortical control areas. We used event-related potentials (ERPs) to examine response monitoring and/or error detection in an affective and non-affective flanker task, in adolescents (Study 1) and emerging adults (Study 2). In Study 1, we hypothesized immaturities in the anterior cingulate cortex (ACC) would result in adolescents being less able than adults to ignore distracters in the affective flanker task. To better understand the neural correlates of self-regulation in Study 1, we compared amplitude differences in the response-locked error-related negativity (ERN) on an emotional face flanker and a traditional letter flanker task, in adults (25–35 years) and adolescents (15–17 years). Because the ERN was thought to have neural generators in the ACC, we hypothesized errors made by adolescents would elicit disproportionately less negative ERNs in the affective condition compared to the non-affective condition. Similarly, we predicted adolescents would make more errors than adults for affective targets but not for non-affective targets. The amplitude of two other ERP components—the stimulus-generated N2, and the

response-locked correct-related negativity (CRN), were also measured. These components provided further indicators of neural maturation, as they are also thought to be generated in the ACC. To investigate the predictive value of the ERPs for behavior, ERP measures (ERN, CRN, and N2) were correlated with measures of self-regulation (error rates and interference effect), and cognitive flexibility (post-error slowing and Gratton effect) on the ERP task.

In Study 2 we examined the utility of the ERP components in predicting risk-taking (Sensation Seeking Scale and modified Youth Behavioral Survey) in a sample of emerging adults (18–24 years). Emerging adulthood is thought to be an extended developmental period between adolescence and adulthood, during which cortical control areas are still developing, and risk-taking is prevalent. Research in this population could better inform us about the developmental trajectory of the ACC. We predicted ERP correlates of response monitoring in the affective task would correlate with sensation seeking and health risk-taking.

Overall, it was hypothesized these data would demonstrate that adolescents are less able to self-regulate in affective situations than adults. Similarly, we predicted emerging adults who engage in greater risk-taking would show less negative ERNs in the affective condition than those who report less risky behaviors. By investigating the predictive value of ERPs as biomarkers of ACC maturation and/or predictors of risk-taking, we anticipated these data would offer further support to current developmental neurobiological models of decision-making in adolescents and emerging adults.