

## Author's Accepted Manuscript

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PII: S1053-8119(16)30764-9

DOI: <http://dx.doi.org/10.1016/j.neuroimage.2016.12.041>

Reference: YNIMG13662

To appear in: *NeuroImage*

Received date: 21 June 2016

Revised date: 16 November 2016

Accepted date: 15 December 2016

Cite this article as: Ethan M. McCormick and Eva H. Telzer, Failure to Retreat Blunted sensitivity to negative feedback supports risky behavior in adolescents *NeuroImage*, <http://dx.doi.org/10.1016/j.neuroimage.2016.12.041>

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Failure to Retreat: Blunted sensitivity to negative feedback supports risky behavior in adolescents

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## Abstract

Decision-making processes rarely occur in isolation. Rather, representations are updated constantly based on feedback to past decisions and actions. However, previous research has focused on the reaction to feedback receipt itself, instead of examining how feedback information is integrated into future decisions. In the current study, we examined differential neural sensitivity during risk decisions following positive versus negative feedback in a risk-taking context, and how this differential sensitivity is linked to adolescent risk behavior. Fifty-eight adolescents (ages 13-17 years) completed the Balloon Analogue Risk Task (BART) during an fMRI session and reported on their levels of risk-taking behavior. Results show that reduced medial PFC (mPFC) response following negative versus positive feedback is associated with fewer reductions in task-based risky decisions following negative feedback, as well as increased self-reported risk-taking behavior. These results suggest that reduced neural integration of negative feedback into during future decisions supports risky behavior, perhaps by discounting negative relative to positive feedback information when making subsequent risky decisions.

## Introduction

**1.1** Decision-making processes almost never occur in isolation; rather individuals' representations are constantly being updated based on internal and external information. Feedback, either positive or negative, can be used to update decision-making in real time, affecting subsequent behavior in complex ways (Gold & Shadlen, 2007). Successful monitoring of decision-making performance involves both the ability to extract relevant information from feedback stimuli and then adjust behavioral strategies in appropriate ways. However, these abilities are not uniform across development. Rather, different phases of development show differential susceptibility to the wide array of feedback available in the environment. Adolescence is a time when sensitivity to positive and negative feedback undergoes significant changes, which have important implications for adolescents' real-world risk behavior (Somerville et al., 2010).

Theoretical and empirical work has explored how sensitivity to positive and negative feedback changes during the adolescent phase of development. Some models of adolescence

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