The Scaled Target Learning Model: A Novel Computational Model of the Balloon Analogue Risk Task

Ran Zhou
The Ohio State University, Columbus, Ohio, United States

Jay Myung
The Ohio State University, Columbus, Ohio, United States

Mark Pitt
Ohio State University, Columbus, Ohio, United States

Abstract

The Balloon Analogue Risk Task (BART) is a sequential decision making paradigm that assesses risk-taking behavior. Several computational models have been proposed for the BART that accurately characterize risk-taking propensity. An aspect of task performance that has proven challenging to model is the learning that develops from experiencing wins and losses across trials, which has the potential to provide further insight into risky decision making. The Scaled Target Learning (STL) model was developed for this purpose. STL describes learning as adjustments to the pumping strategy in reaction to previous outcomes, and the size of adjustments reflects an individuals sensitivity to wins and losses. STL is shown to be sensitive to the learning elicited by experimental manipulations. In addition, the model matches or bests the performance of three competing models in traditional model comparison tests (e.g., parameter recovery performance, predictive accuracy, sensitivity to risk-taking propensity). Findings are discussed in the context of the learning process involved in the task. By characterizing the extent to which people are willing to adapt their strategies based on past experience, STL provides a more complete depiction of the psychological processes underlying sequential risk-taking behavior.