

# Offline Replay Supports Planning: fMRI Evidence from Reward Revaluation

**Submission ID** 3000154  
**Submission Type** Oral Presentation  
**Topic** Cognitive Science  
**Status** Submitted  
**Submitter** Ida Momennejad  
**Affiliation** Princeton Neuroscience Institute, Princeton University

## SUBMISSION DETAILS

**Presentation Type** Oral Presentation

**Presentation Abstract Summary** We offer fMRI evidence for the idea of planning as learning from replay. Learning to make advantageous decisions in sequentially structured tasks, like mazes, requires integrating information across multiple episodes. This is a challenge for learning approaches that work fully "online" and summarize ongoing experience. A proposed mechanism for such challenging integration is to replay and piece-together experiences "offline". A key question for this account is how the brain prioritizes whether or which experiences to replay. Based on research in machine learning, we hypothesize that the brain should preferentially replay experiences 'tagged' with prediction errors, signaling increased uncertainty that may have consequences for other states and decisions. To test this, we acquired fMRI data as participants performed a sequential decision task with retrospective revaluation and control trials. During revaluation, participants integrated initial experience about a task with later experience about a change in its goals. We used multi-voxel pattern analysis (MVPA) to measure replay during intermittent rest. We found that replay (a) predicts revaluation during test, and (b) correlates with earlier fronto-striatal sensitivity to prediction errors during learning (corresponding to prediction error tagging). These findings further our understanding of how the brain leverages offline mechanisms in planning and goal-directed behavior.

## Co-author Information

\* Presenting Author

First Name	Last Name	Affiliation	E-mail
Ida *	Momennejad *	Princeton Neuroscience Institute, Princeton University	idam@princeton.edu
Ross	Otto	McGill University	rotto@psych.mcgill.ca
Nathaniel	Daw	Princeton University	ndaw@princeton.edu

Kenneth	Norman	Princeton University	knorman@princeton.edu
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## Keywords

Keywords
reinforcement learning
Replay
fMRI
MVPA
episodic memory
decision making