Neural context reinstatement mediates the effect of past choices on decisions for reward.

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Background

When evaluating choices, we actively sample memories of past decisions.

Decisions can be made by evaluating memories of individual choice episodes.

(Lengyel & Dayan 2008)

Incidental cues can bring to mind past decision episodes and bias subsequent decisions for reward.

(Bornstein, Khaw, Daw in prep)

Remembering an event also brings to mind its temporal and associative *context*.

(Howard & Kahana 2002)

Recalling a given context can cause the subsequent, involuntary recall of other memories sharing that context.

(Hupbach, Gomez, Nadel 2009)

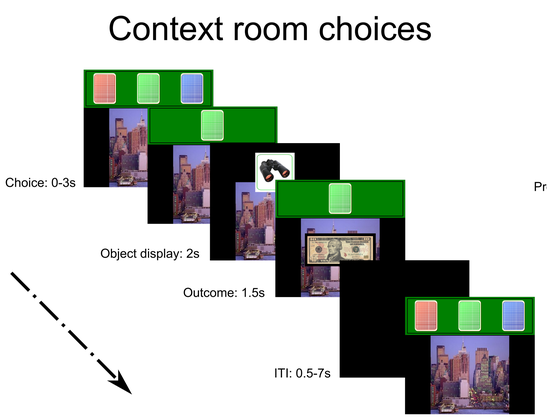
These involuntary recalls are indexed by neuroimaging measures of context reinstatement.

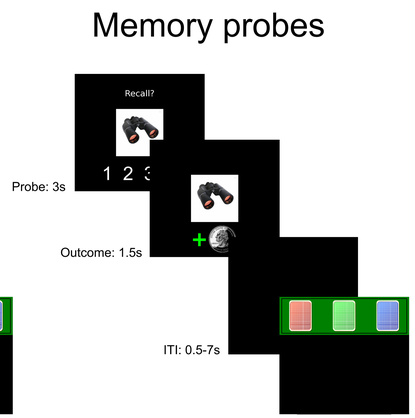
(Gershman, Schapiro, Hupbach, Norman 2013)

Questions: Does reminding decision-makers of past choices bias them to choose as they did in the reminded context? Is this bias modulated by the degree of context recall?

Strategy: Use MVPA to track reinstatement and its effect on the fit of a choice model to behavior.

Experiment design



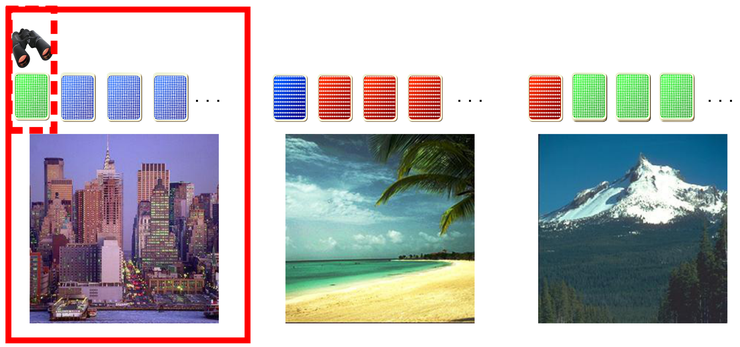


First phase: Choices made in one of six themed "casino rooms".

Second phase: Choices in a seventh, unthemed room are interrupted by incidental memory probes, reminders of past decisions.

Options on trials after reminders have three potential sources of value information:

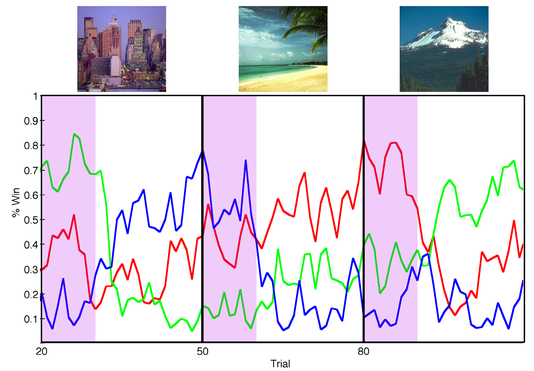
- **Recent reinforcement history.**
- **Reward received on the reminded trial.**
- **Average payout across the reminded context.**



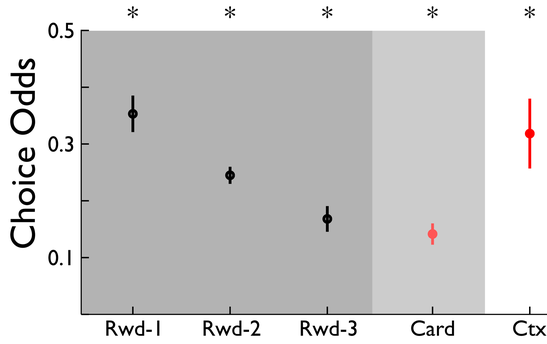
Payoffs

We designed payoffs to distinguish these three sources of information about values.

Payoffs on the individual reminded trials are distinct from the average payoff of each bandit over the entire reminded context.



Results



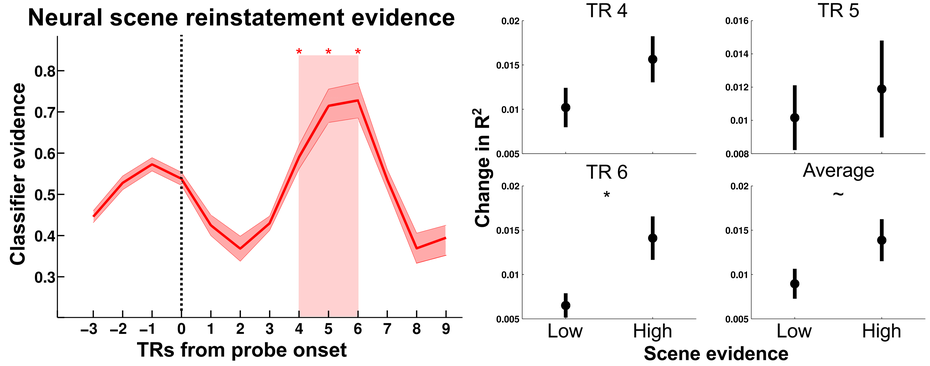
How does reward history affect choice odds?

Recent rewards, reminded trials, and reminded context *all* have significant effect on choices following a memory probe.

Now we can ask: Does context reward contribute *more* to explaining behavior on probe trials with higher contextual reinstatement?

For each of the TRs where scene evidence increased, we measured the impact of including context reward in choice model.

On trials with above-median scene evidence following a probe, context reward contributes more to explaining choices.



Summary

Incidental cues can bring to mind memories of individual past choices and their *contexts*.

These reinstatements have a measurable effect on subsequent choices.

The degree to which contextual information affects choice is indicated by neural markers of context reinstatement.

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