The Impact of Practice-Phase Rewards on Later Memory

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Introduction

- Why do people retrieve memories?
- To successfully remember, we must both form new memories and retrieve stored memories
- Reward incentives can promote memory formation
- Findings suggest that our neural system supports motivated learning (Adcock et al., 2006)
- Expecting a future reward (e.g. money) for later remembering an experience promotes formation of a memory for that experience.
- In the absence of rewards, practicing retrieval is well known to improve later memory (Roediger et al., 2006; Lee et al., 2018).
- **Do rewards following retrieval promote memory success?**
- Prior behavioral work has found mixed results (Shigemune et al., 2017; Castanheira et al., 2022).

Hypothesis

- Extrinsic reward following retrieval will reinforce the information that is retrieved and modulate subsequent memory.

Summary

- No effect of reward during retrieval practice on subsequent memory.
- Highly vivid retrieval practice was associated with better recognition whereas low vividness during retrieval practice was associated with worse recognition.
- Findings consistent with "zone of destruction" (Newman & Norman, 2010) whereby partially remembering an experience weakens the representation of an experience.

References

Adcock, A. R., Thangavel, A., Whitfield-Gabrieli, S., Knutson, B., & Gabrieli, J. D. (2006). Rewardmotivated learning: Mesolimbic activation precedes memory formation. Neuron, 50, 507-517.
Castanheira, K. d. S., Lalla, A., Ocampo, K., Otto, A. R., & Sheldon, S. (2022). Reward at encoding but not retrieval modulates memory for detailed events. Cognition, 219(104957), 1-10.
Lee, H., Samide, R., Richter, F. R., & Kuhl, B. A. (2018). Decomposing parietal memory reactivation to predict consequences of remembering. Cerebral Cortex, 29, 1-14.
Newman, E. L., & Norman, K. A. (2010). Moderate excitation leads to weakening of perceptual representations. Cerebral cortex (New York, N.Y. : 1991), 20(11), 2760–2770.
Roediger, H. L., & Karpicke, J. D. (2006). Test-enhanced learning: taking memory tests improves longterm retention. Psychological Science, 17(3), 249-255.
Shigemune, Y., Tsukiura, T., Nouchi, R., Kambara, T., & Kawashima, R. (2017). Neural mechanisms underlying the reward-related enhancement of motivation when remembering episodic memories with high difficulty. Human Brain Mapping, 38, 3428-3443.

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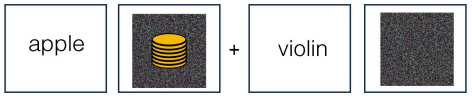
Experimental Paradigm

N=42

Phase 1: Study Phase

192 word-image pairs
2000 ms presentation
3500 ms interstimulus interval

Phase 2: Retrieval Practice



Vividness rating (1-4)
96 words presented
50% chance reward, not tied to response

Phase 3: Recognition Test

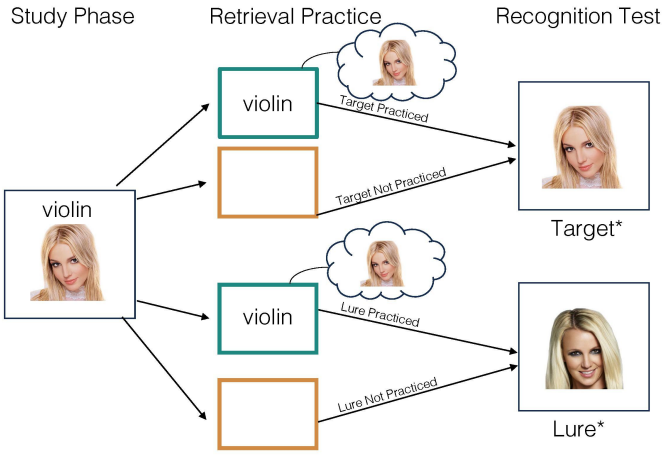
Novel Lure Target

288 trials
96 targets
96 lures
96 novel images

Confidence Judgment

1 Sure New | 2 Unsure New | 3 Unsure Old | 4 Sure Old

Practice and Test Phase Conditions

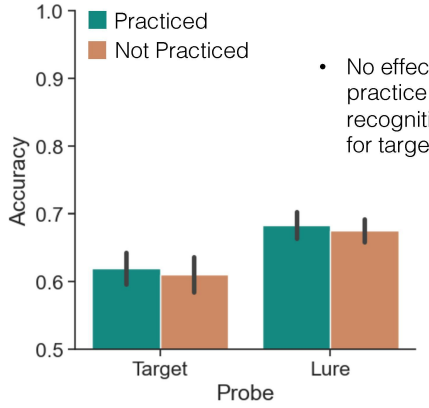


*Participants will not encounter both a target and lure of the same stimulus (e.g. Britney Spears)

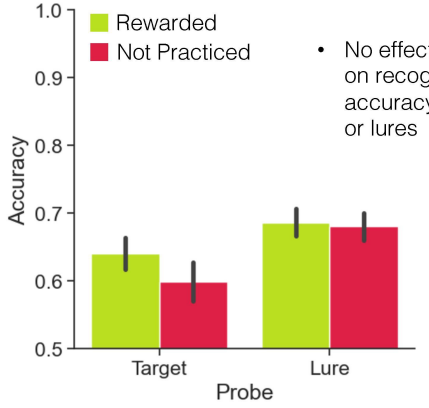
~p<0.10, **p<0.01, ***p<0.005

Error bars reflect standard error of the mean

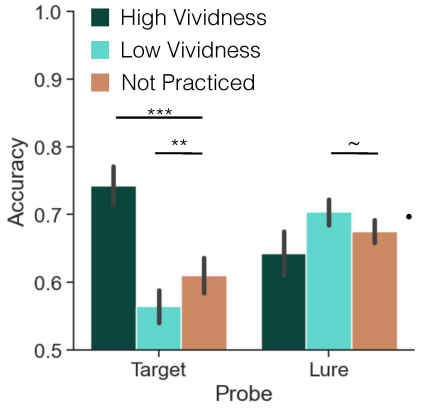
Results



- No effect of retrieval practice on recognition accuracy for targets or lures



- No effect of reward on recognition accuracy for targets or lures



- Greater recognition accuracy for high vivid compared to not practiced items
- Lower recognition accuracy for low vivid compared to not practiced items