

# Testing Enhances Recollection: Process Dissociations and Metamemory Judgments

## Introduction

- Repeated studying often benefits retention in the short-term, relative to repeated testing. However, testing leads to better long-term retention than repeated studying, a phenomenon known as the testing effect (Roediger & Karpicke, 2006a, b).
- In two experiments, we examined the basis of the testing effect using a variant of the process-dissociation procedure to estimate Recollection and Familiarity retrieval processes (Jacoby, 1991). We also investigated subjects' predictions of their future recall after repeated study or repeated testing.
- Subjects studied a categorized word list and then either repeatedly studied it or took 1 or 3 free recall tests.
- They made an aggregate judgment of learning (JOL), predicting how many words they would recall on the final test.
- Retention was assessed either in the same session (5 or 10 min after learning) or after a week delay.
- For an inclusion test, subjects recalled as many words as they could from a category, guessing when necessary to make 20 responses (McCabe, Roediger, & Karpicke, 2006).
- For an exclusion test, subjects attempted to produce 20 new words from the category that they had not studied.

## Method

### Experiment 1 (N = 52)

- Materials: categorized word list; 4 categories with 20 items per category
- Study four times (SSSS) or study and take three free recall tests (STTT); visual presentation
- Aggregate JOL for each category (predict # out of 20)
- Retention Interval: 5 Min or 1 Week
- Final inclusion: Forced recall of 20 items
- Final exclusion: Produce 20 new items not studied earlier

### Experiment 2 (N = 48)

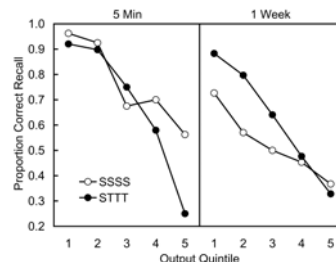
- Same materials as Experiment 1
- Study twice (SS) or study plus 1 free recall test (ST); auditory presentation
- Final tests 10 Min or 1 Week after learning

## Experiment 1

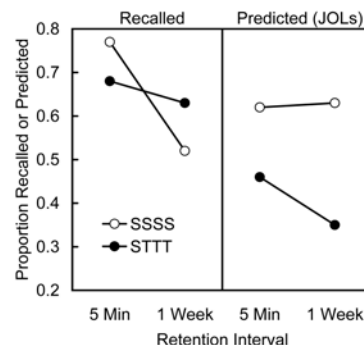
**Process Estimates.** After 5 min, repeated study led to better recall than repeated testing (77% vs. 68%). Exclusion errors were at floor in both conditions, preventing us from obtaining process estimates. After 1 week, repeated testing produced better recall than repeated studying, and testing selectively enhanced recollection.

	Inclusion	Exclusion	R	F
1 Week				
SSSS	.52	.20	.33	.27
STTT	.63	.14	.48	.26

**Output Order.** After 5 min, the advantage of repeated studying occurred late in recall. After 1 week, the advantage of repeated testing occurred early in recall.



**Metamemory Judgments.** Repeated studying produced overconfidence and led subjects to predict no forgetting over a week delay. Repeated testing produced underconfidence and led subjects to predict forgetting.

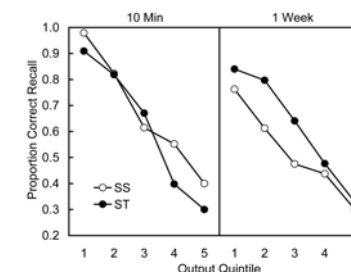


## Experiment 2

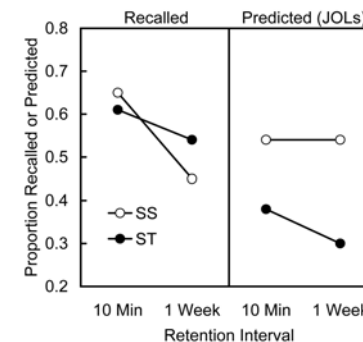
**Process Estimates.** The advantage of studying over testing at 10 min was driven by enhanced familiarity. The testing effect at a week delay was driven by recollection.

	Inclusion	Exclusion	R	F
10 Min				
SS	.65	.15	.50	.28
ST	.61	.11	.51	.19
1 Week				
SS	.45	.25	.20	.31
ST	.54	.18	.36	.28

**Output Order.** As in Experiment 1, the short-term advantage of repeated study occurred late in recall, whereas the long-term advantage of testing occurred early in recall.



**Metamemory Judgments.** The results replicated Experiment 1. Subjects who repeatedly studied predicted no forgetting over a week delay.



## Conclusions

- The short-term advantage of repeated studying is due to enhanced familiarity, while the long-term advantage of testing is due to enhanced recollection.
- Subjects based their JOLs on different cues after studying vs. testing, leading to different predictions of forgetting (cf. Koriat, Bjork, Sheffer, & Bar, 2004).

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## References

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