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# Retrieval Practice Based On Recognition Memory: Testing the Retrieval Effort Hypothesis

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## Background

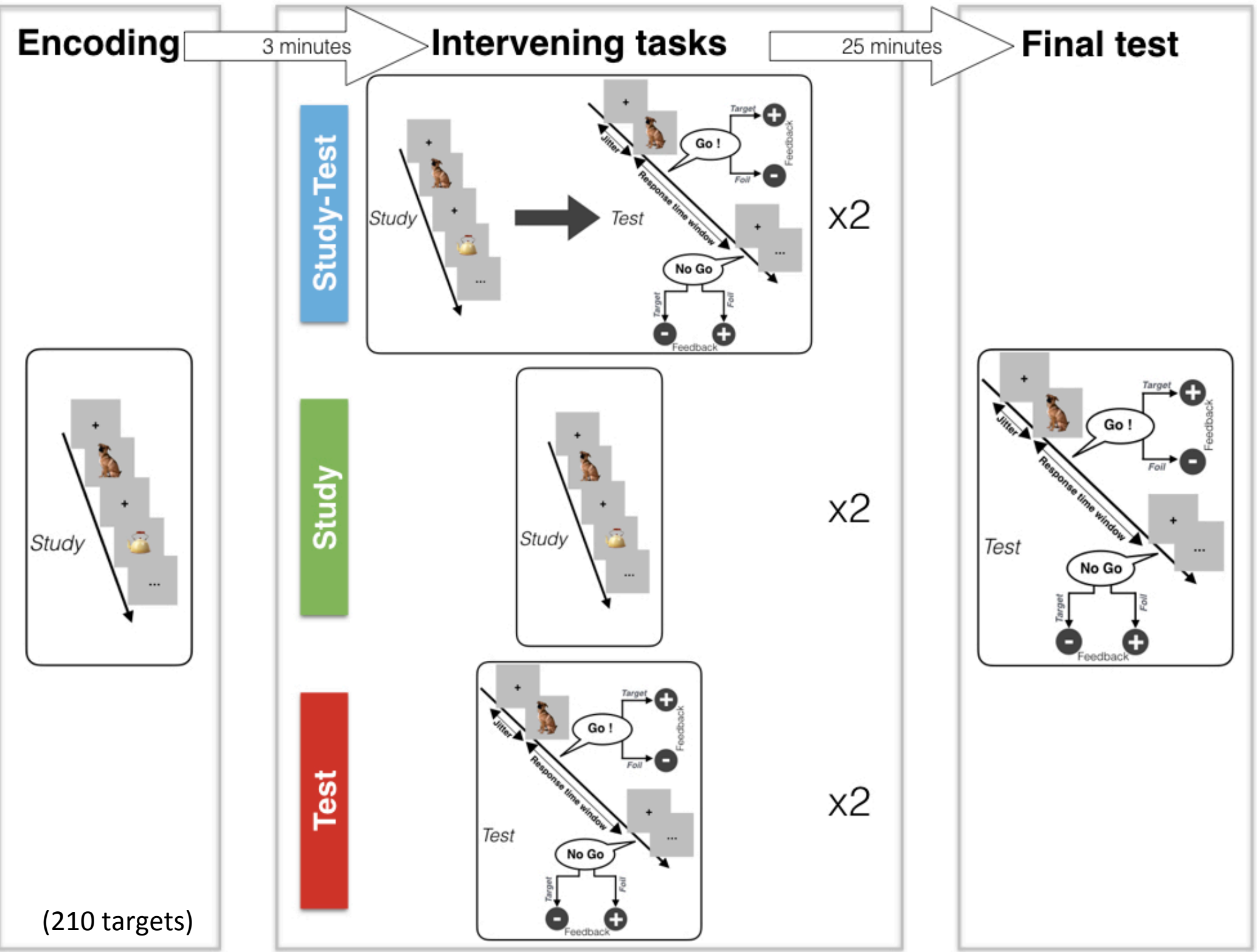
- The finding that taking memory tests improves long-term memory and overcomes repeated studying is called **retrieval practice effect** or **« testing effect »** (1,2). While it has been much replicated within recall paradigms, a mechanistic account is still lacking. One way to move forward is to test predictions derived from current accounts
- The **« Retrieval Effort Hypothesis »** states that controlled (effortful) retrieval (e.g. recall) supports more elaborative and integrative processing than passive restudying, thus increasing the available retrieval cues (3,4)
- Since **recognition memory** involves much less controlled retrieval than recall, repeated recognition **should not yield a retrieval practice effect, especially if familiarity alone supports recognition**

## Aim

Can recognition memory support a retrieval practice effect?

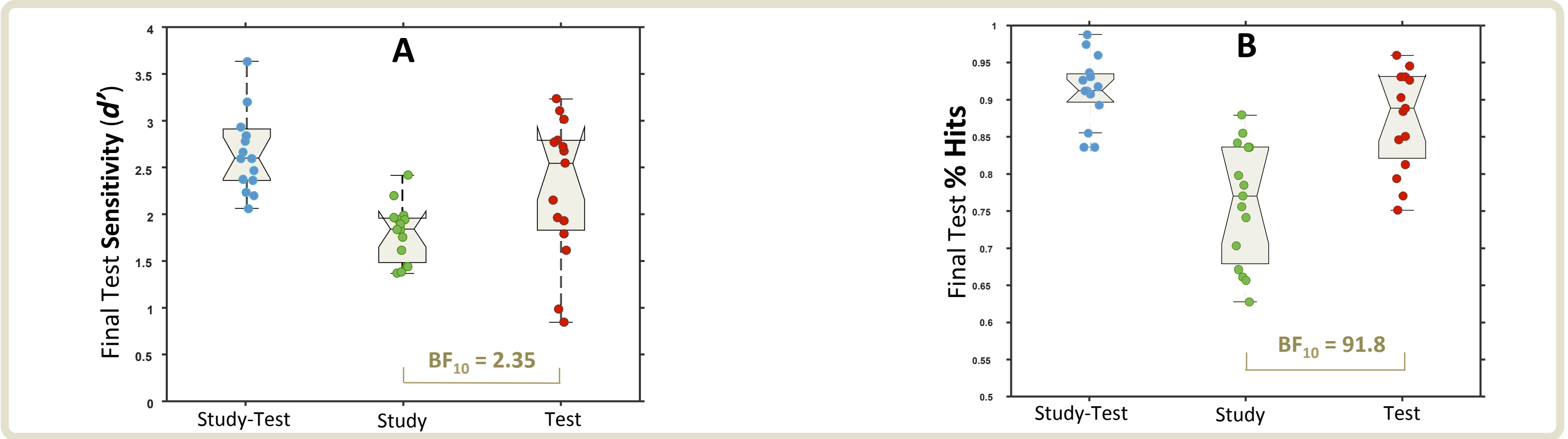
## 1. Experiment 1: recognition practice vs. restudying

- Between-subjects design, N = 76
- Recognition memory= typical Old/New task
- Matching for Age, Education, FSIQ, Verbal Memory
- Manipulation of the intervening tasks:**
  - 2 successive study-test trials= **« Study-Test »** group
  - 2 successive study trials= **« Study »** group
  - 2 successive test trials= **« Test »** group
- Main **outcome**: Performance at final test (25 min. delay)

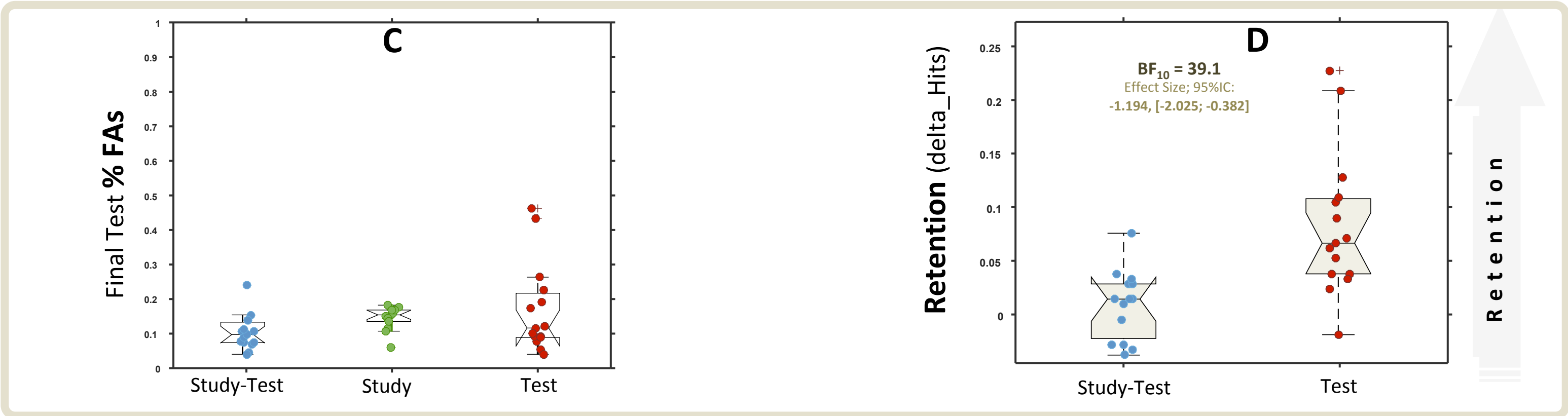


## 2. Results 1

- Before final test, study duration was on average 11 minutes in the « Study-Test » group, 7.4 minutes in the « Study » group and **only 6.3 minutes in the « Test » group**



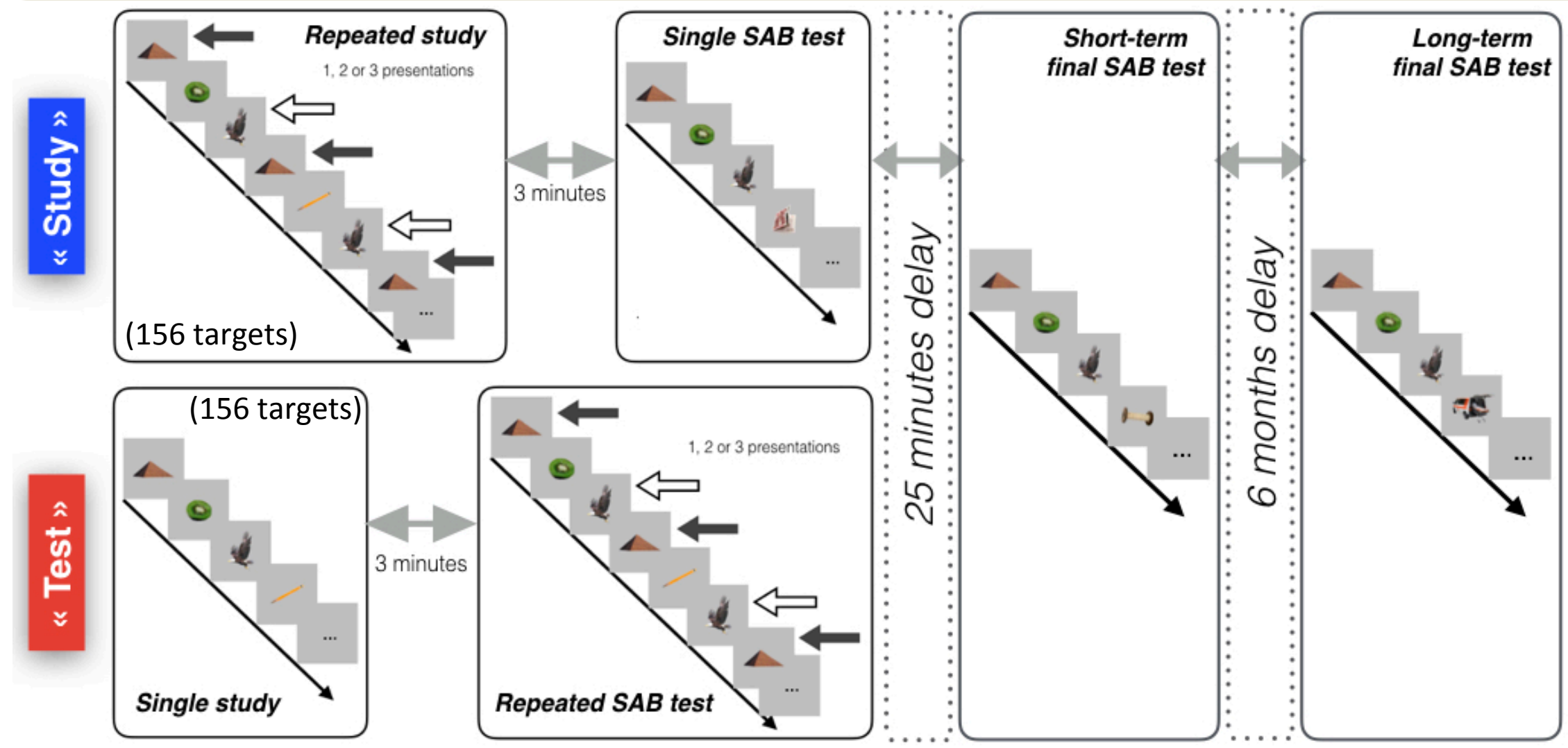
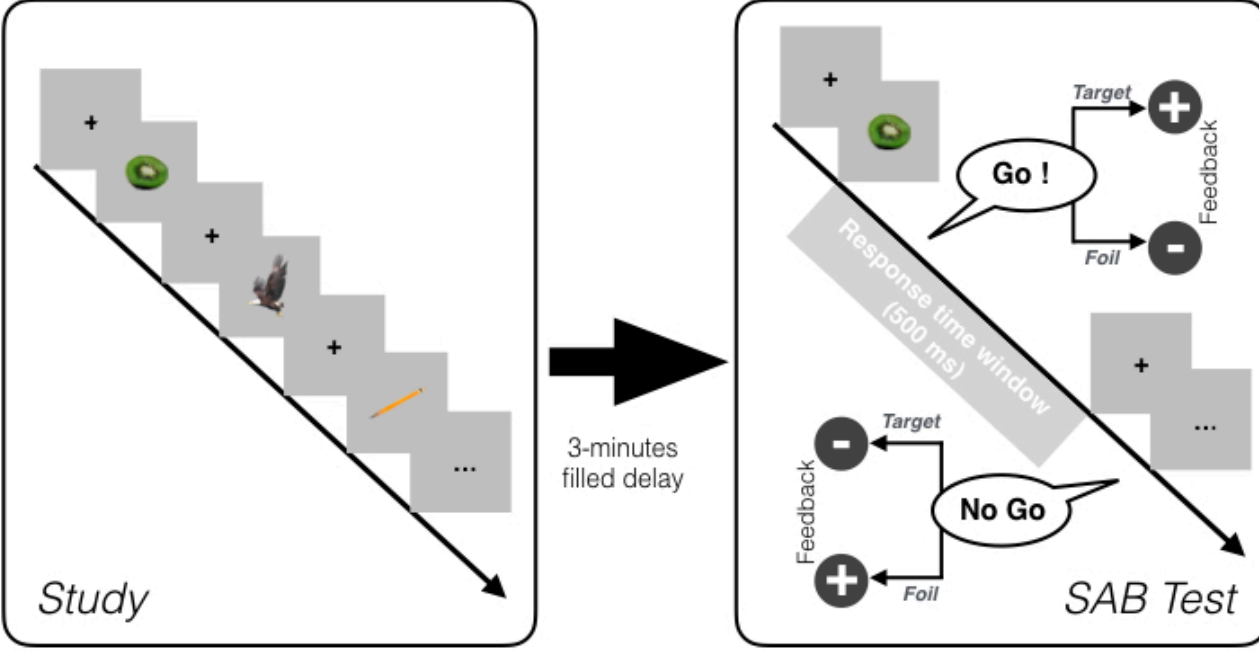
- Still, « Study-Test » & « Test » conditions yielded better long-term memory (A,B), without increase in False Alarms (C), and « Test » condition led to better 25 minutes – retention (D)



Experiment 1 provides **the first evidence for a retrieval practice effect based on recognition memory**. However, a contribution of controlled recollective processes cannot be ruled out, which is addressed in experiment 2

## 3. Experiment 2: familiarity practice vs. restudying

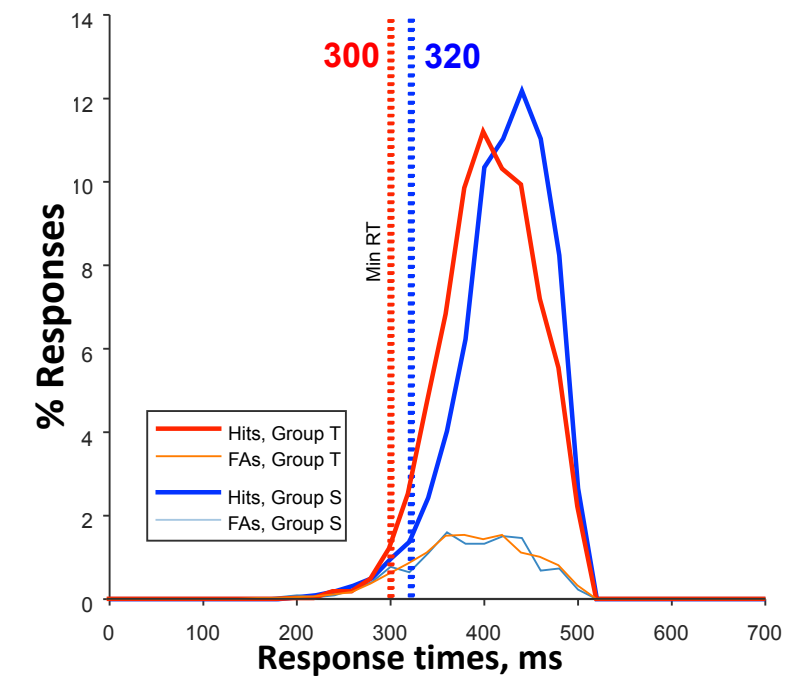
- Probing familiarity-based recognition memory:**  
The «Speed and Accuracy Boosting procedure» (SAB) is a speeded Old/New memory test providing a direct estimate of familiarity-based recognition memory (5).  
→ Use of the SAB procedure for all test phases



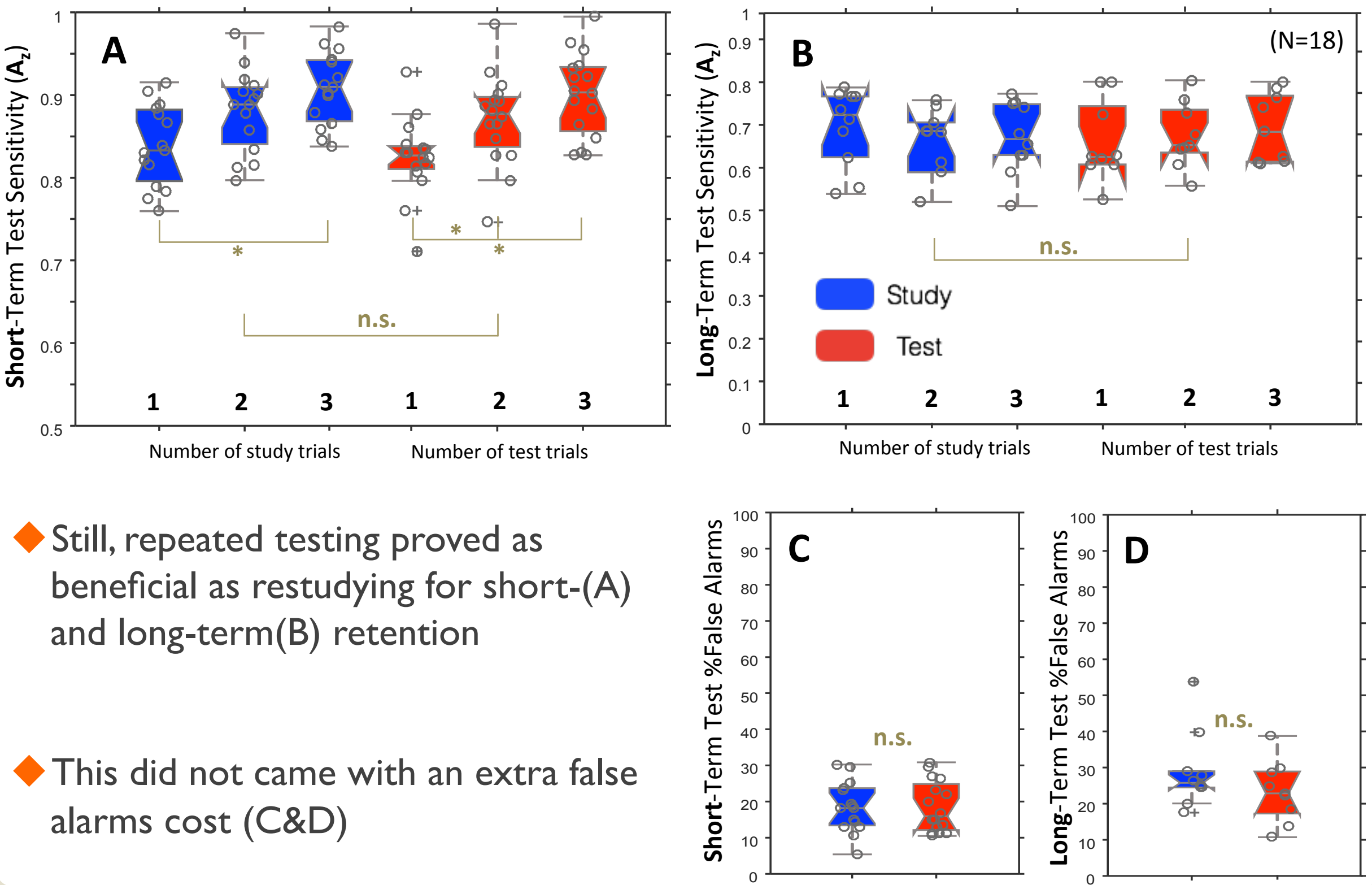
- Between-subjects design, N = 30
- Manipulation of the learning schedules:**
  - 1, 2 or 3 repetitions of **study** trials= **« Study »** group
  - 1, 2 or 3 repetitions of **test** trials= **« Test »** group
- Matching for Age, Education, FSIQ, Verbal Memory
- Main **outcomes**: Performance at short- and long-term final tests

## 4. Results 2

- Subjects in the « Study » group spent twice as much time studying AND had up to three times more opportunities to encode the stimuli



- Similar minimal reaction times (minRTs) were achieved in both groups, well below 400ms, strongly constraining responses to familiarity-based recognition memory(5)
- Repeated retrieval was therefore based on automatic & fast processing, rather than slow, effortful, recollection



Time spent studying does not drive learning efficiency. Instead, Experiment 2 provides unique **evidence that learning occurs through repeated familiarity-based retrieval, i.e. even when retrieval is automatic**

## Discussion

- Experiment 1 shows that the retrieval practice effect can be observed when retrieval is based on recognition memory rather than recall. Thus, **learning does occur during recognition testing**
- Importantly, both experiments show that the benefits of memory retrieval based on recognition memory are **immune to negative side effects** like extra false alarms
- When retrieval is constrained to fast and automatic processes (around 320 ms.), thus being mostly familiarity-based, the generation of elaborative retrieval cues and / or effortful (controlled) processing are quite unlikely. Even there, extensive restudying does not outreach retrieval practice. **Repeated automatic retrieval yields similar learning levels than extensive restudying**, up to a 6 months delay
- Familiarity-based recognition memory can support a retrieval practice effect, and resists to a 6 months delay similarly to restudying, thus challenging a core prediction of the « Retrieval Effort Hypothesis »**

## References

(1) Roediger, H. L., III, & Karpicke, J. D. (2006). The power of testing memory: Basic research and implications for educational practice. *Perspectives on Psychological Science*, 1, 181–210  
(2) Roediger, H. L. III & Butler, A; C. (2011) The critical role of retrieval practice on long-term retention. *Trends in Cognitive Sciences*, 15, 1, 20-27  
(3) Pyc & Rawson (2009) Testing the retrieval effort hypothesis: Does greater difficulty correctly recalling information lead to higher levels of memory? *Journal of Memory and Language*, 60, 437–447  
(4) Gardiner, J.M. et al. (1973) Retrieval difficulty and subsequent recall. *Memory & Cognition*, 1, 213–216  
(5) Besson, G., Ceccaldi, M., Didic, M., Barbeau, E.J. (2012) The Speed of Visual Recognition Memory. *Visual Cognition*, 20, 10, 1131-1152.