



Test to Study: Attempted Retrieval Improves Learning and Facilitates Prior Knowledge-Based Personalisation

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Testing effects & attempted retrieval benefits

How do we learn facts in the most efficient way?

- Retrieval practice boosts learning (e.g., Roediger & Karpicke, 2006)
- Even if you do not know the answer, *attempting to retrieve the answer* boosts learning (Kornell, Hays & Bjork, 2009)

Can we use the attempted retrieval benefit in practice, when:

- items are repeated multiple times?
- continuous feedback is provided?
- learners have varying amounts of prior knowledge?

Is *initial attempted retrieval* prior to a multiple repetition retrieval practice session beneficial?



Prior Knowledge Norms for Naming Country Outlines: An Open Stimulus Set

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ABSTRACT

Paired-associate stimuli are an important tool in learning and memory research. In cognitive psychology, many studies use materials of which the learners are expected to have little to no prior knowledge. Despite their theoretical usefulness, conclusions from these studies are difficult to generalize to real-world learning contexts, where learners can be expected to have varying degrees of prior knowledge. Here, we present an ecologically valid stimulus set with 112 country outline-name pairs, and report response times and prior knowledge for these items in 285 largely Western European participants. Prior knowledge per item ranged from very high (94.4%) to zero (0.3%), thereby allowing researchers to select materials of which participants can be expected to have any given amount of prior knowledge. As such, this database provides a useful tool for research on real-world learning. The database can be accessed at: <https://osf.io/q25rd/>.

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Methods

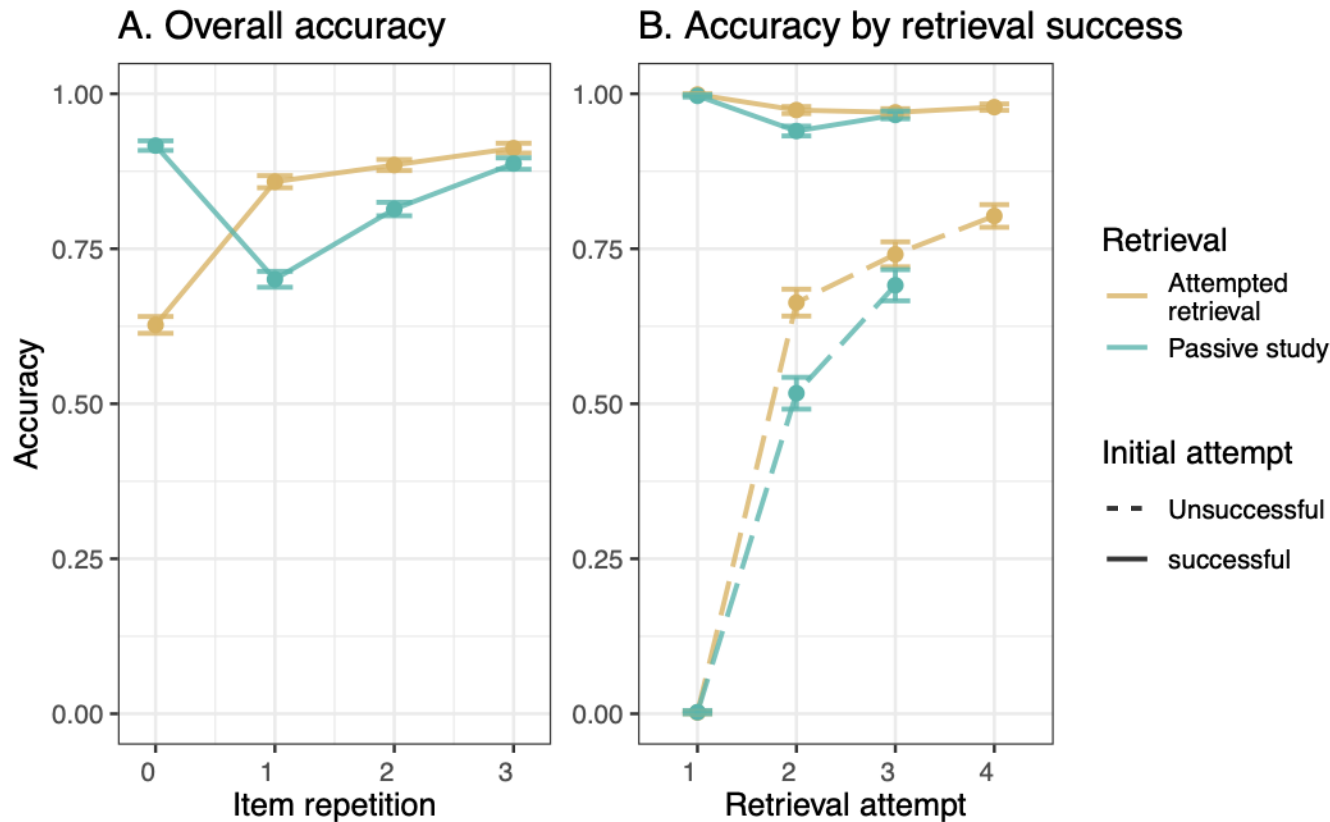
A. Retrieval



B. Study

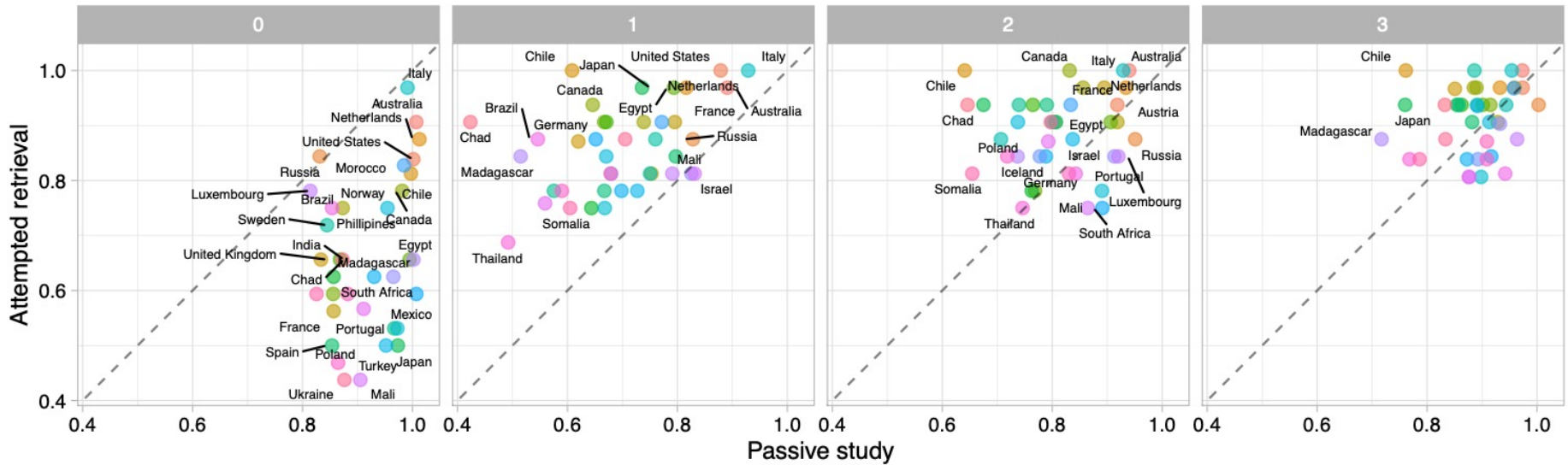


- Participants cycle through twenty items four times in random order



- There is an overall attempted retrieval benefit
- The initial attempted retrieval benefit gets smaller over repetitions
- There is a benefit both after successful and unsuccessful retrieval attempts

Item effects?



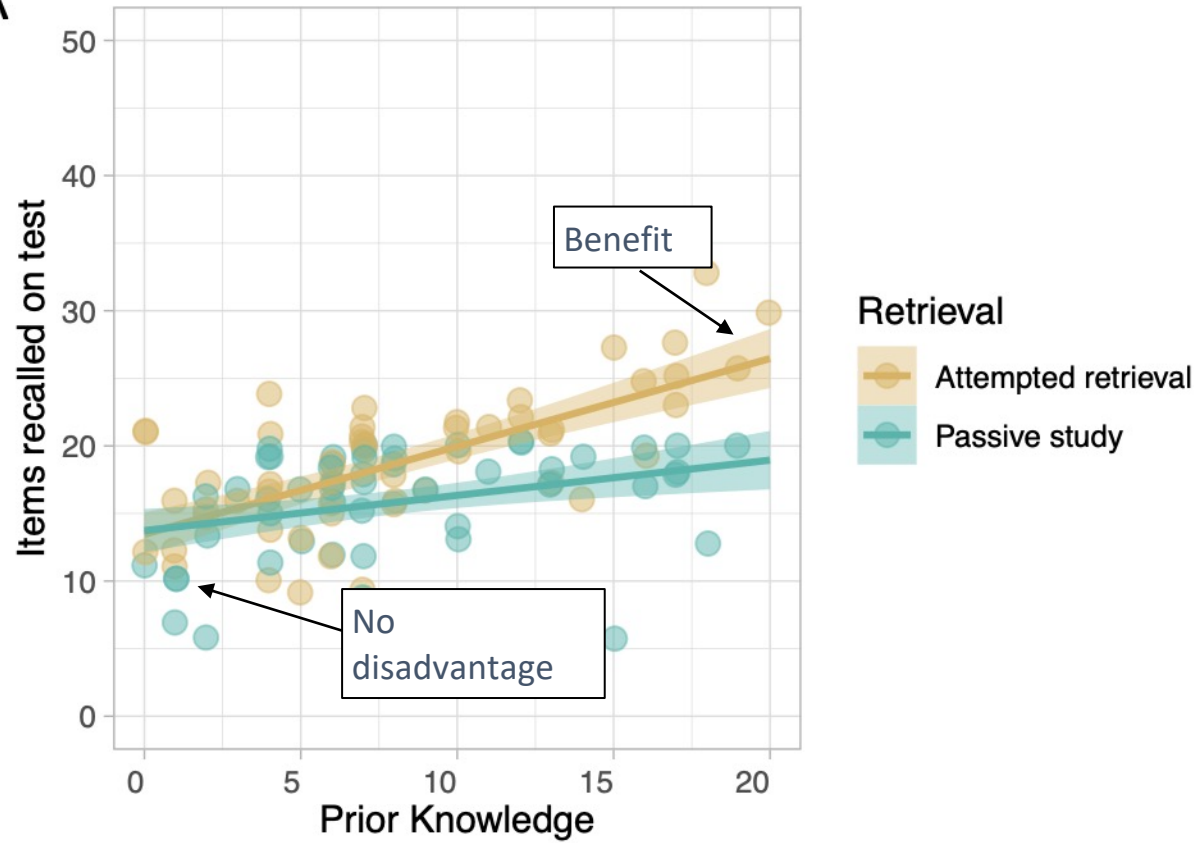
Interim conclusion

- Initial AR results in increased accuracy and faster response times
- Both successful and unsuccessful initial AR leads to benefits
- The ARB persist over repetitions, but gradually gets smaller
- After four repetitions, performance in both conditions is similar: no applicable benefit of initial attempted retrieval.

Experiment 2: prior knowledge based personalisation

- After successful initial attempted retrieval, accuracy on later repetitions was very high
- Can we use the initial AR trial to identify stable memory representations that do not need to be rehearsed?
- Introducing a new item for every known item
- Test on all items 1h after the learning session

A



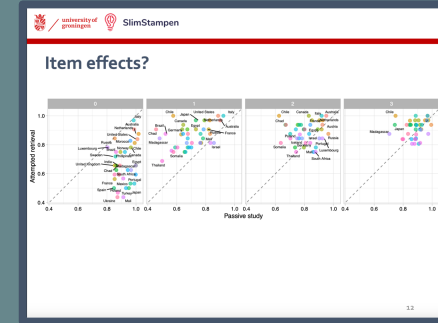
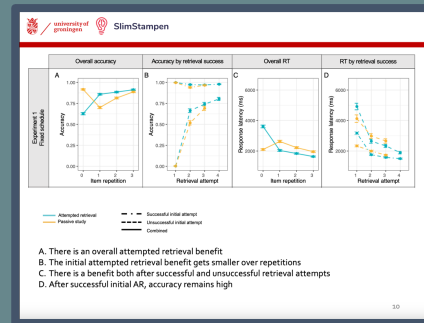
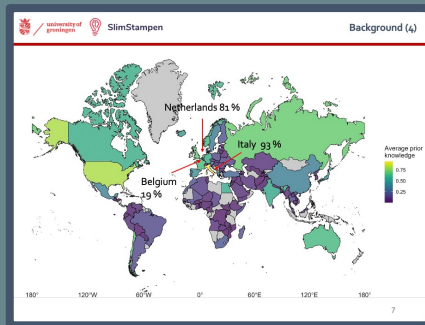
Conclusions

Initial AR, prior to retrieval practice results in better learning

- independent of the success of the initial retrieval attempt
- but only in the first couple of repetitions (after four retrieval practice trials, performance is similar)

Using attempted retrieval to personalise the learning schedule leads to overall learning benefits, especially if prior knowledge is moderate to high (but without a cost, if prior knowledge is low).

Thank you for your attention



Interim conclusion

- Initial AR results in **increased accuracy** and **faster response times**
 - Both successful and unsuccessful initial AR leads to benefits
 - The ARB persist over repetitions, but gradually gets smaller
 - After successful initial AR, performance remains high and stable
- Prior knowledge-based personalisation

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Conclusions

Initial AR, prior to retrieval practice results in better learning

- independent of the success of the initial retrieval attempt
- but only in the first couple of repetitions (after four retrieval practice trials, performance is similar)

Using initial attempted retrieval to personalise the learning schedule based on prior knowledge results in overall learning benefits, especially if prior knowledge is moderate to high.

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