

Test Before Study: Maximizing Adaptive Learning Gains using Prior Knowledge Assessment

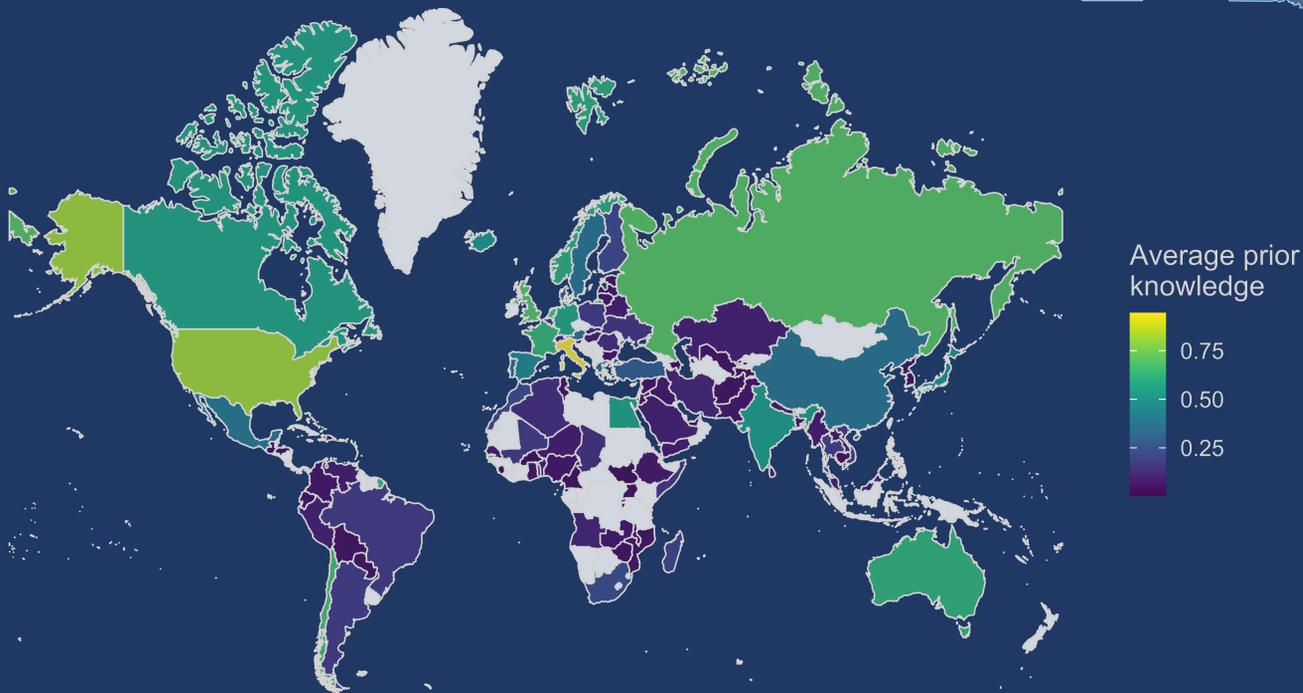
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1. BACKGROUND & AIMS

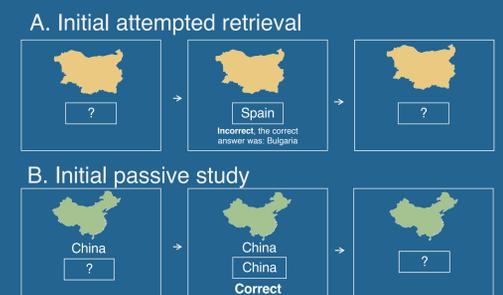
- **Attempted retrieval (AR) promotes learning** – even if the attempt is unsuccessful.
- Most studies examining AR benefits are artificial in nature.
- Here, we explore how AR can promote **real-world learning**, where (1) learners have varying degrees of prior knowledge and (2) items are repeated multiple times.

In a pilot study, we asked 287 participants to name countries from their outline. Prior knowledge of country names is shown below (grey countries were not tested):



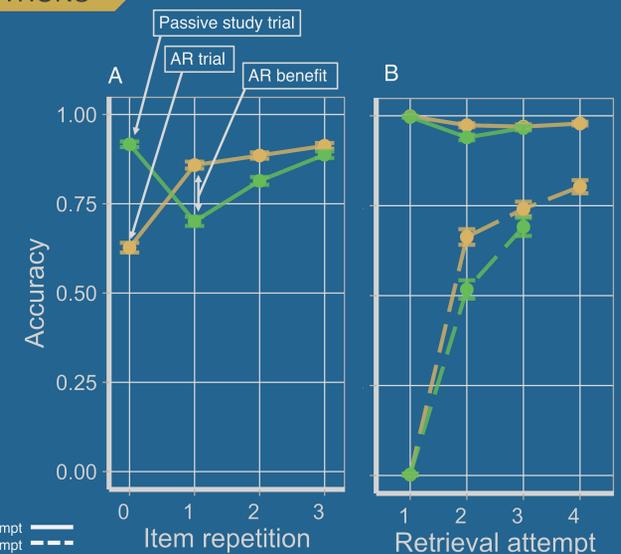
2. METHODS

- Participants (n =104, first-year Psychology students at the University of Groningen) were instructed to study country names from their outline.
- There were two within-subjects conditions.
- Participants cycled through all items four times, in random order.



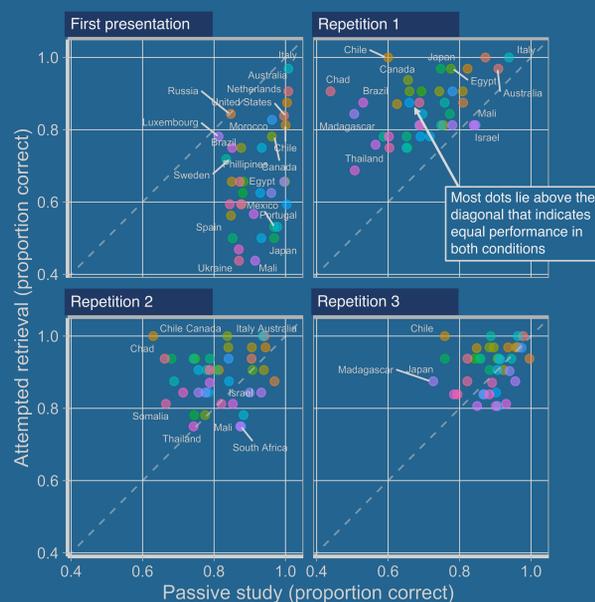
3. PERFORMANCE OVER REPETITIONS

- As expected, accuracy at first item presentation was higher in the passive study condition than in the AR condition.
- On the first and second repetition, **there was a strong AR benefit (A)**.
- Both after successful and after unsuccessful initial retrieval attempts, accuracy is boosted by AR (B).
- Initial AR takes more time than passive study, but results in faster responses at later repetitions.



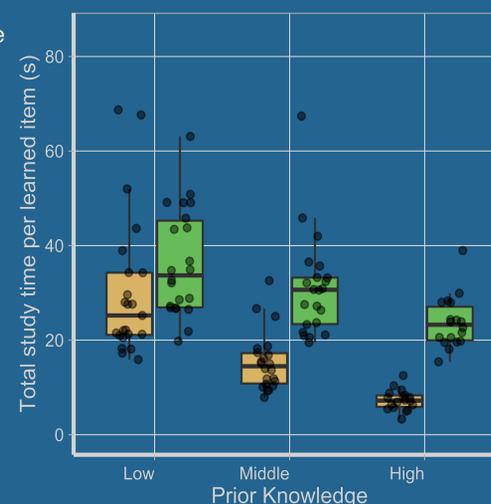
4. ITEM EFFECTS

Although there was much variation in item difficulty, the AR benefit at repetition 1 and 2 applied to most items.



5. TIME-EFFICIENT LEARNING

- Initial AR results in higher accuracy, but also takes more time: **is AR overall more efficient than passive study?**
- Items that are known at AR, are likely to be also known later (in 97% of all attempts). Therefore, they could be removed from the learning set.
- If initial AR trials are used to remove known items from the learning set, **overall learning efficiency would increase** (less time spent per learned item).
- The efficiency gain is most pronounced for learners with high prior knowledge, but all learners benefit.



6. CONCLUSIONS

- Initial **AR can promote learning**, relative to initial passive study, **in realistic learning contexts**.
- The AR benefit was found for both successful and unsuccessful attempts, and persisted over item repetitions.
- Although initial AR takes more time than passive study, attempting to recall before study can be an efficient study strategy.
- These results underline the potential value of testing before study, and can therefore be important for both **classroom practice** and for the development of **computerized learning applications**.

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