



# What Types of Learning are Enhanced by a Cued Recall Test?

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## INTRODUCTION

- Information is remembered better after being tested as opposed to being re-studied—i.e., the **testing effect** (1, 2, 3).
- When learning cue-target pairs (A - B), long-term retention of the target (B) is facilitated more by attempting to recall it (A - ?) than by simply restudying it (A - B).
- It is unknown whether cued recall of the target (A - ?) improves long-term learning when the final test requires cued recall of the cues (? - B), or when the final test is of a different type than the intervening test (i. e., free recall instead of cued recall).

## METHOD

**Subjects:** Subjects participated in one 20-min learning session, followed by one 10-min test session the next day. Subjects participated from home through the Internet.

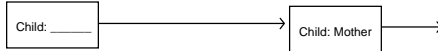
**Stimuli:** 40 English word pairs with similar forward and backward associative strength (child: mother)

**2 Learning Conditions:** Study vs. Test/Study

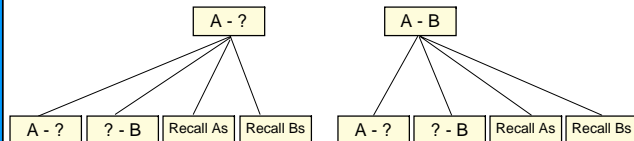
**Study** (subjects have the answer available for 6 sec)



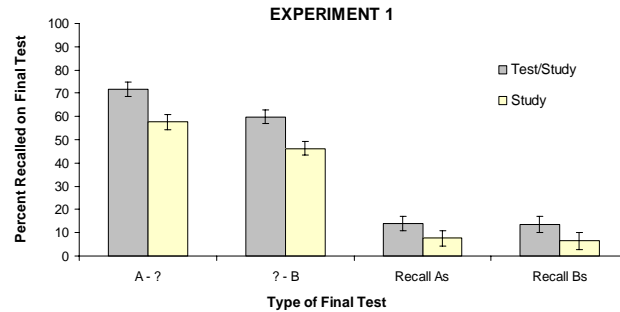
**Test/Study** (subjects have the answer available for only 2 sec)



**4 Final Test Conditions:** (1) cued recall of target (A - ?), (2) cued recall of cue (? - B), (3) free recall of target (Recall B's), (4) or free recall of cue (Recall A's).

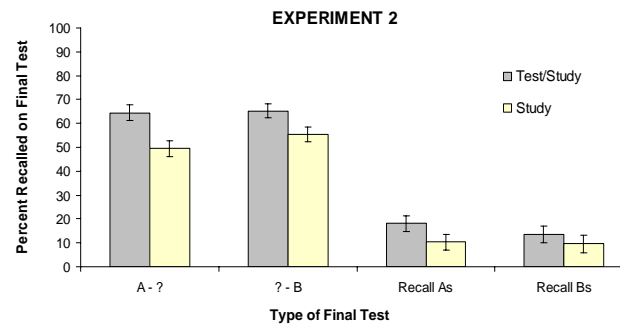


## FINAL TEST PERFORMANCE



**Figure 1.** Proportion of words correctly recalled on the final test as a function of test condition (Test/Study vs. Study) and type of final test. Subjects were given one of four different types of final tests: they were either given the cue and asked to remember the target (A - ?), given the target and asked to remember the cue (? - B), asked to free recall all of the targets (Recall Bs), or asked to free recall all of the cues (Recall As).

In Experiment 1, the order of Test/Study vs. Study trials was random (e.g., Study, Test/Study, Study, Study, Test/Study, Study, Test/Study, Test/Study...)



**Figure 2.** Proportion of words correctly recalled on the final test as a function of test condition (Test/Study vs. Study) and type of final test. Subjects were given one of four different types of final tests: they were either given the cue and asked to remember the target (A - ?), given the target and asked to remember the cue (? - B), asked to free recall all of the targets (Recall Bs), or asked to free recall all of the cues (Recall As).

In Experiment 2, the order of Test/Study vs. Study trials was blocked (e.g., Study, Study, Study, Study, Test/Study, Test/Study, Test/Study, Test/Study...)

## RESULTS

### (1) Tests benefited learning more than restudy opportunities

- Experiment 1 ( $F(1, 172) = 101.58, p < .001$ ).
- Experiment 2 ( $F(1, 78) = 30.80, p < .001$ ).

### (2) Cued recall final test was easier than free recall

- Experiment 1 ( $F(1, 172) = 244.76, p < .001$ ).
- Experiment 2 ( $F(1, 78) = 111.25, p < .001$ ).

### (3) Effects of tests did not interact with type of item (A vs. B)

- Experiment 1 ( $F < 1$ ).
- Experiment 2 ( $F < 1$ ).

## CONCLUSIONS

- A test (A - ?) enhanced retention more than a re-study opportunity (A - B), regardless of whether the final test was cued recall in the same direction (A - ?) or opposite direction (? - B), or free recall of just cues (Recall As) or targets (Recall Bs).
- The benefits of testing are not specific to the direction in which the material was originally tested, nor to the specific type of test employed.
- When learning foreign language vocabulary (Hund - Dog), self testing in one direction (Hund - ?) might be helpful for retention of the same direction (Hund - ?), as well as the opposite direction (? - Dog).

## REFERENCES

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- Carrier, M., & Pashler, H. (1992). The influence of retrieval on retention. *Memory & Cognition*, 20, 633-642.

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