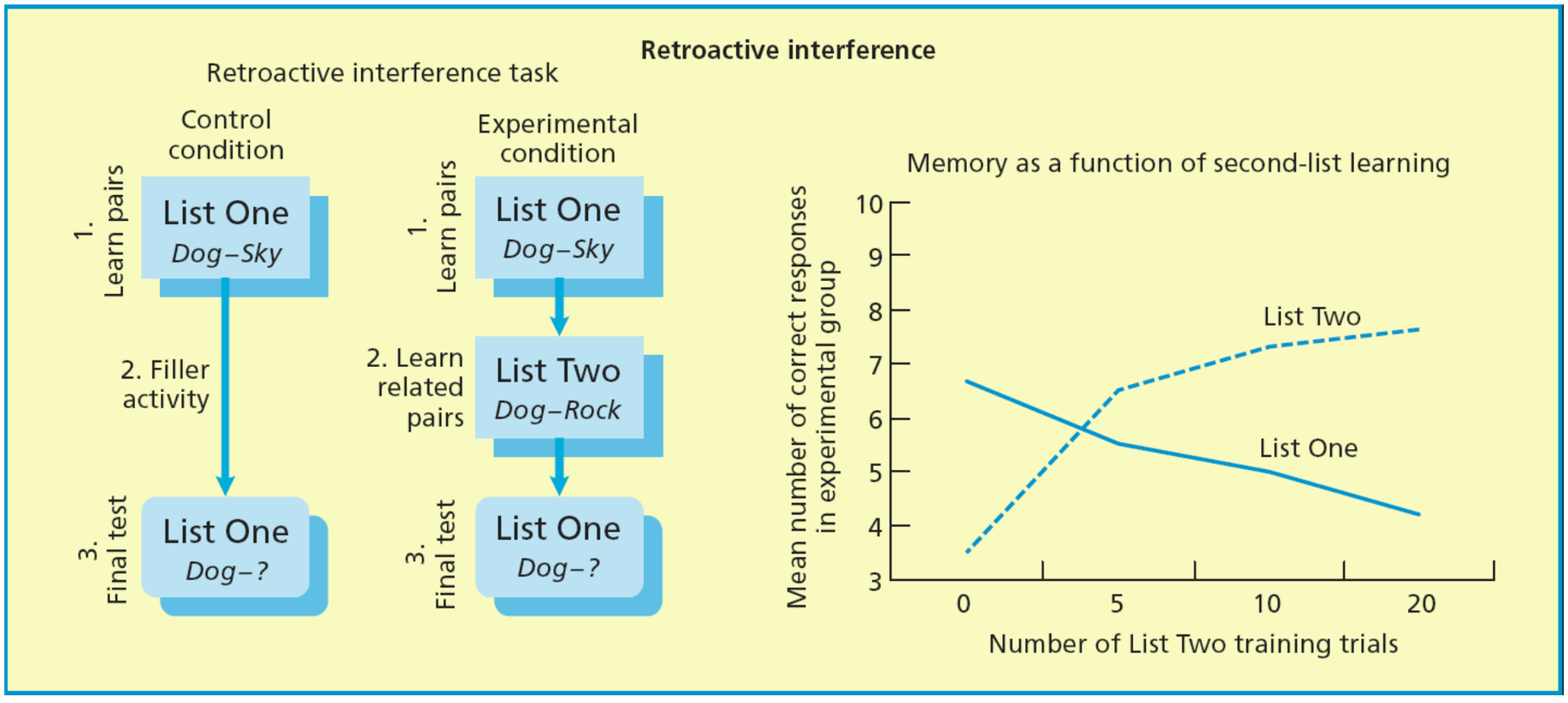
Recap

- Proactive interference

Retroactive interference

- Newer memories get in the way of older memories
- Memory for Thursday and Friday's breakfasts get in the way of memory for Wednesday's breakfast

Retroactive interference



Data from Barnes and Underwood (1959)

Retroactive interference

- Why does learning new stuff degrade memory for old stuff?

- New memories might overwrite or damage old memories (i.e. damage during **encoding**)

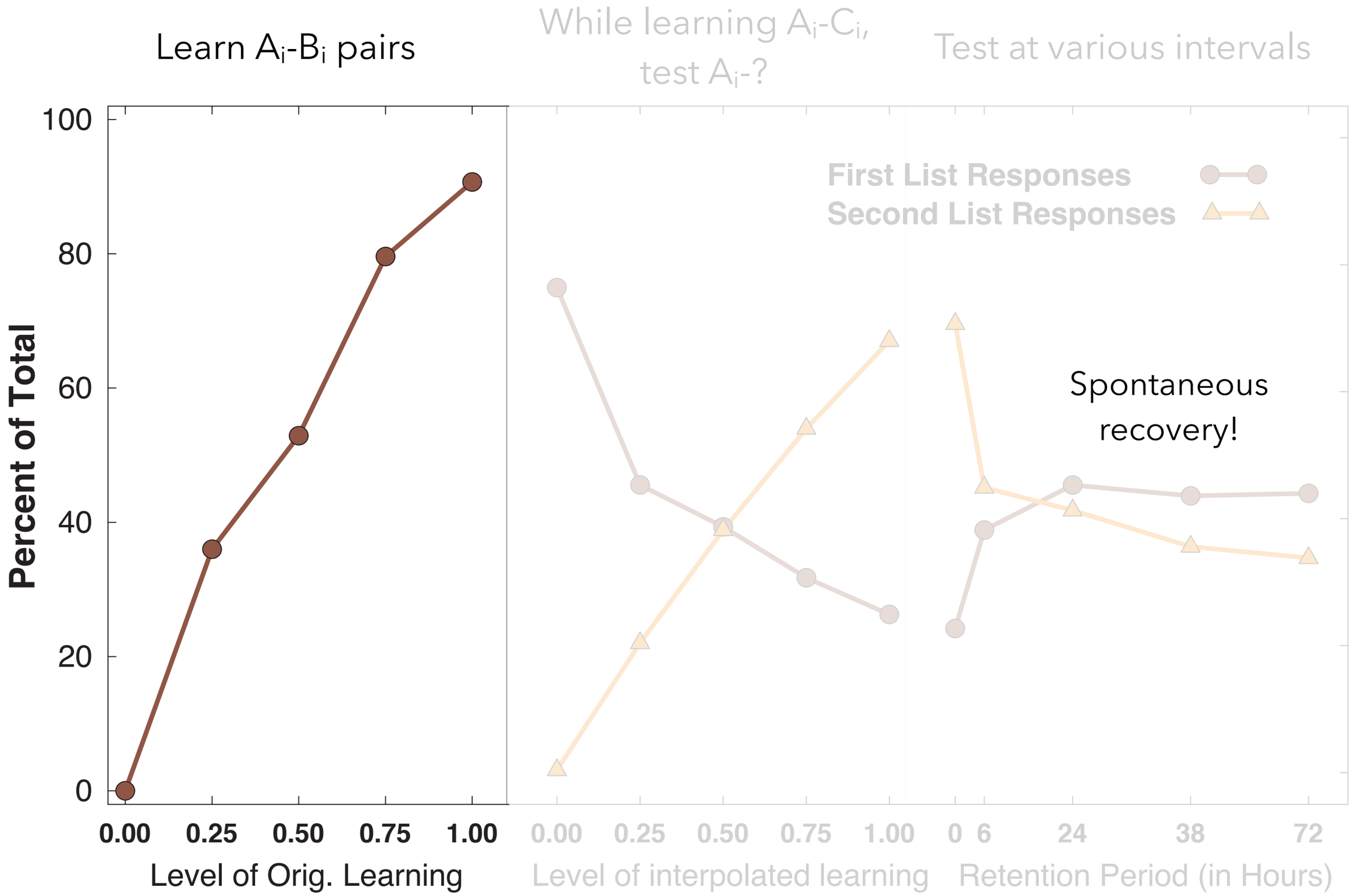
- But even if old and new memories co-exist peacefully, you could still get competition at **retrieval**

- These alternatives are tricky to tell apart! We'll return to this idea later…

AB-AC Interference Paradigm

- Briggs (1954): "Modified free recall"
- Study a list of A_i-B_i pairs to a criterion of 100% (anticipation trials)
- Study a list of A_i-C_i pairs (again using the anticipation method):
    - Show A_i and ask participant to say the first item they can think of in response (either B_i or C_i)
- Re-test at varying retention intervals

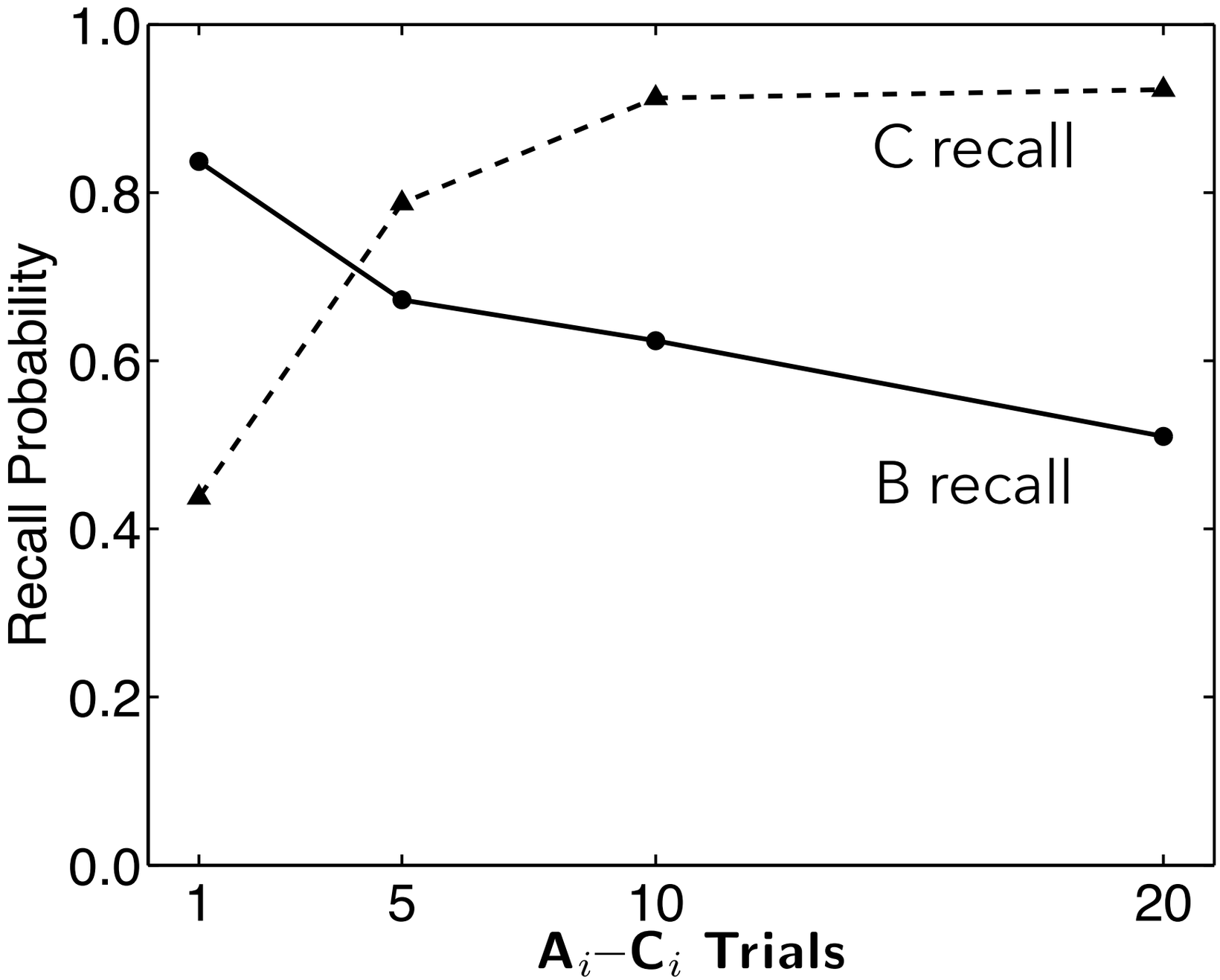
AB-AC Interference Paradigm



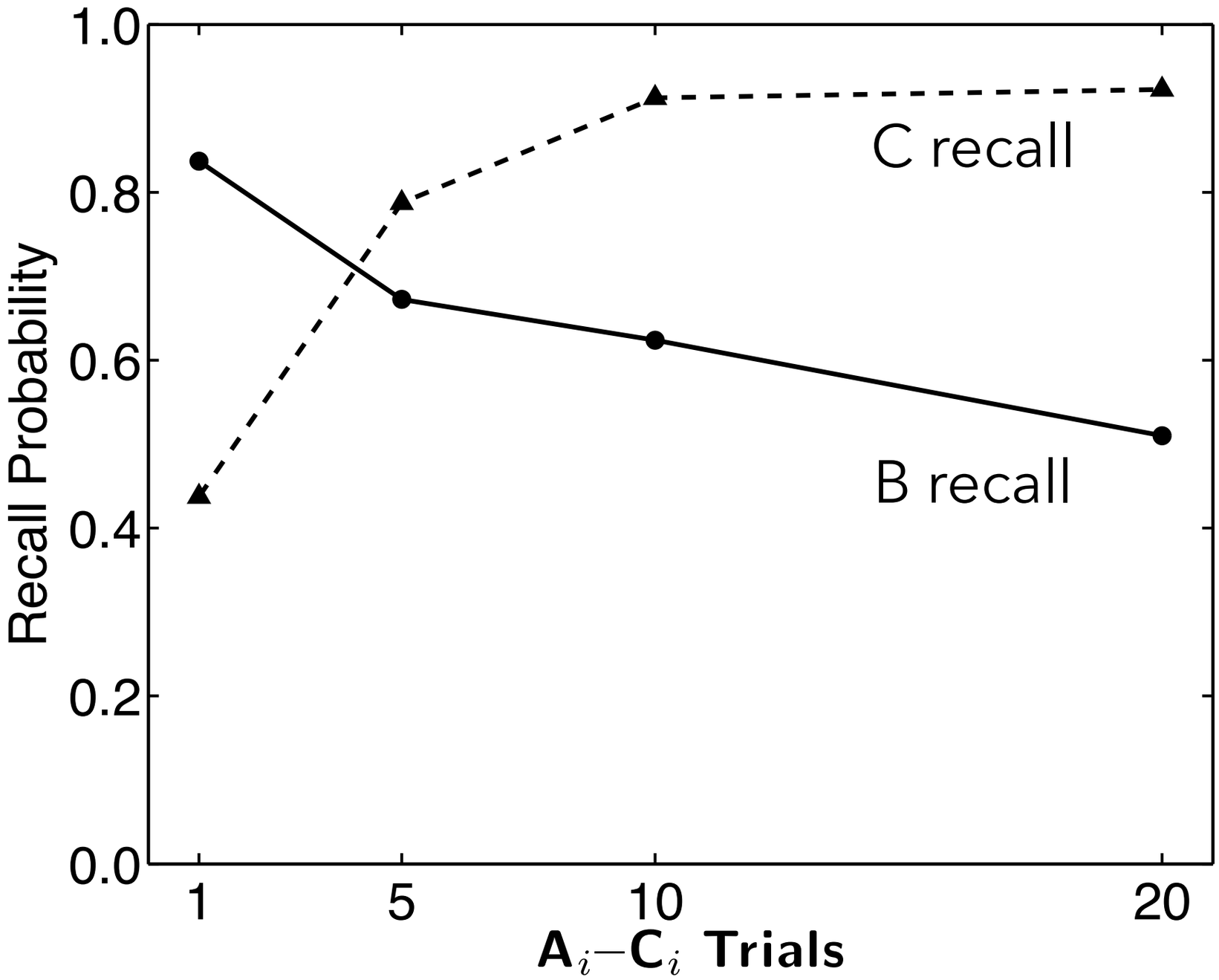
Mechanisms of interference

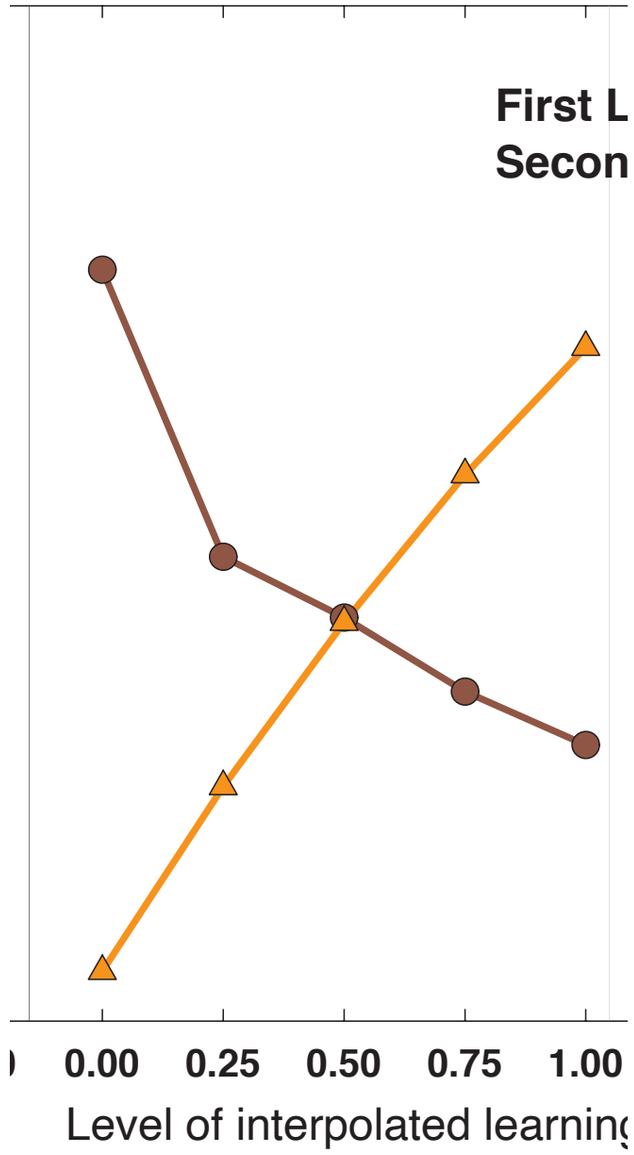
- New memories might overwrite/damage old memories
- But even if new and old memories could co-exist peacefully, they could compete at **retrieval**
- In Briggs's study, participants could only report one thing in response to the A cue
- Barnes & Underwood (1959): if competition is responsible for the decrease in B responses, what if we allowed the participant to make *two* responses? That should minimize competition! ("Modified modified free recall"– MMFR)

Slower forgetting of B_i in the MMFR procedure



Slower forgetting of B_i in the MMFR procedure





Mechanisms of interference

- Barnes & Underwood (1959): if competition is responsible for the decrease in B responses, what if we allowed the participant to make *two* responses? That should minimize competition! ("Modified modified free recall"– MMFR)

- In MMFR, B responses still decrease, just not as much

- *Tentative conclusion (at the time):* forgetting involves both competition and unlearning

Interference and context

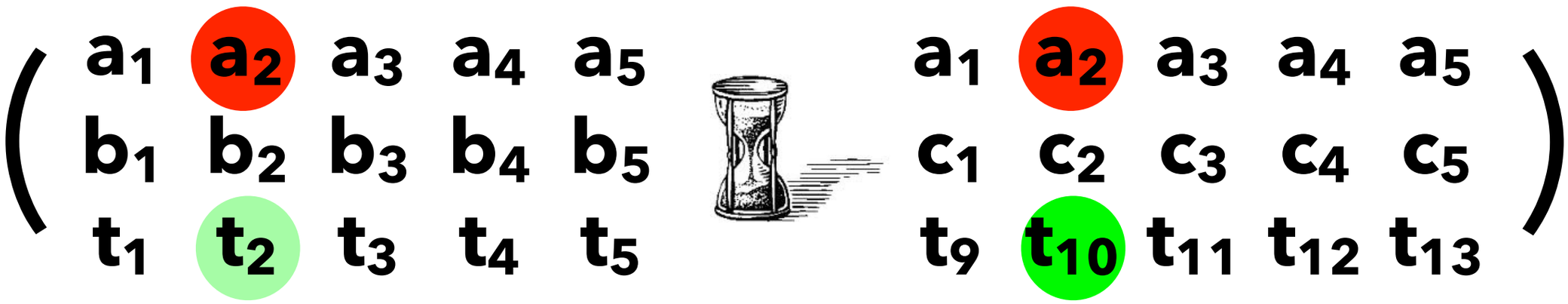
- Context gives us a mechanism for things becoming less accessible as time passes; it provides a nice alternative to trace decay

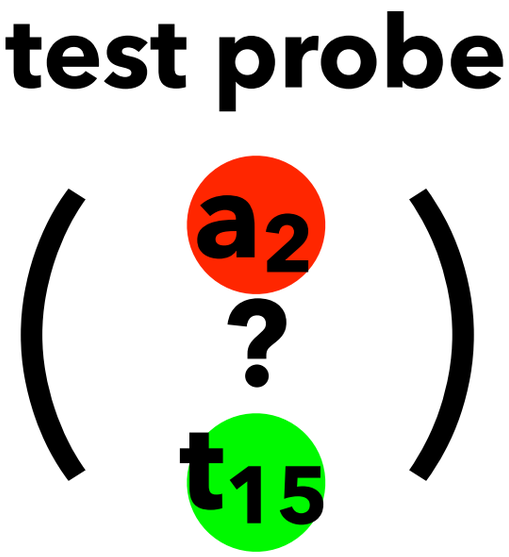
- If your retrieval cue contains context in it, memories with similar contexts will be more accessible than those with less similar contexts…

Concatenate Item Vectors

$$\left(\begin{array}{c} a_1 \\ \vdots \\ a_N \\ \hline b_1 \\ \vdots \\ b_N \\ \hline t_1 \\ \vdots \\ t_N \end{array}\right) = \left(\begin{array}{c} \mathbf{a} \\ \mathbf{b} \\ \mathbf{t} \end{array}\right)$$

Attribute similarity model of recall





Attribute similarity model of recall

- Predicts competition between B_2 and C_2
- Predicts recency
- Predicts competition from semantically related pairs
- Let’s explore these ideas further…

The Retrieval Induced Forgetting Procedure (RIF)

- Can competition between memories have a lasting effect on the memories themselves?

- Hypothesis: when memory traces compete at retrieval, the winning trace gets strengthened by the losing ones get weakened

- Let’s try a demo…

Anderson, Bjork, and Bjork (1994)

STUDY PERIOD

RED - BLOOD

FOOD – STRAWBERRY

RED - TOMATO

TOOL – PLIERS

TOOL - DRILL

FOOD - CRACKER

RETRIEVAL PRACTICE

TOOL – DR

RED - BL

CUED RECALL

FOOD

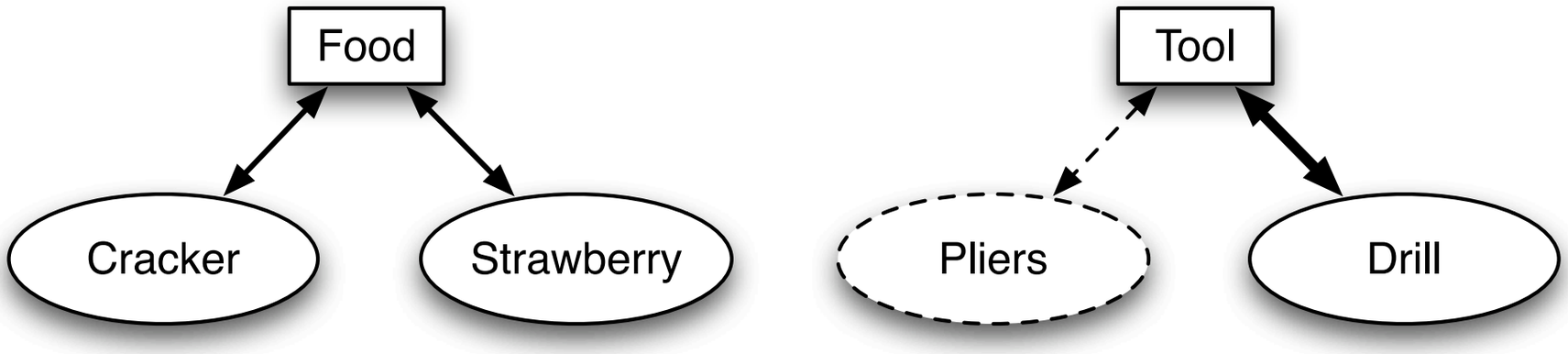
RED

TOOL

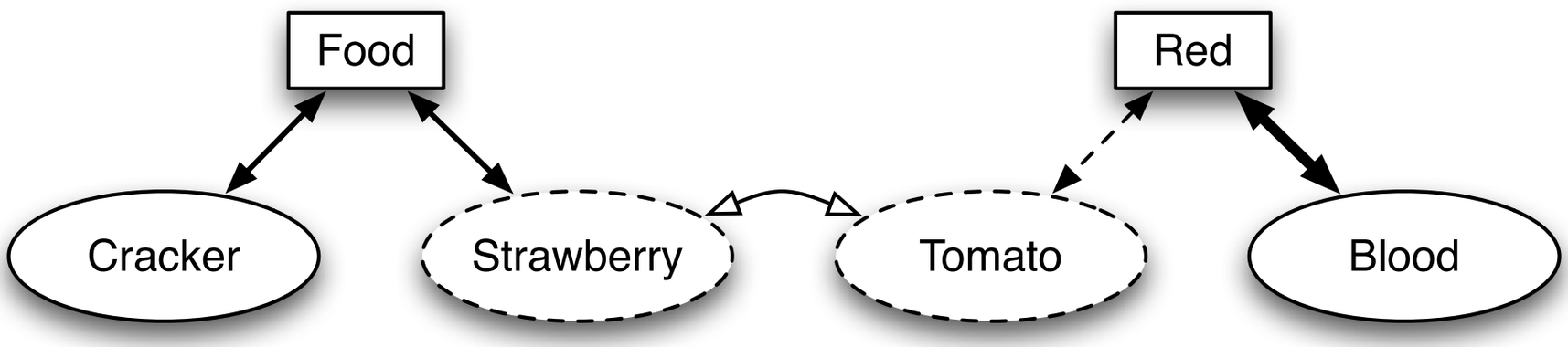
The Retrieval Induced Forgetting Procedure (RIF)

- Study phase: A-B and A-C pairs are inter-mixed
- Retrieval practice phase: only some pairs are practiced
- Cued recall phase: look at the effects of practice on the un-practiced pairs

Unrelated Condition



Related Condition



Destructive practice

- Practicing red–blood hurts red–tomato
    - This is similar to Briggs's response competition result (A-B/A-C pairs)
- Practicing red–blood doesn't affect unrelated pairs
- Practicing red–blood also hurts food–strawberry: strawberry is similar to tomato! Inhibition seems to spread through a semantic network

Destructive practice

- **Practicing red–blood hurts red–tomato**

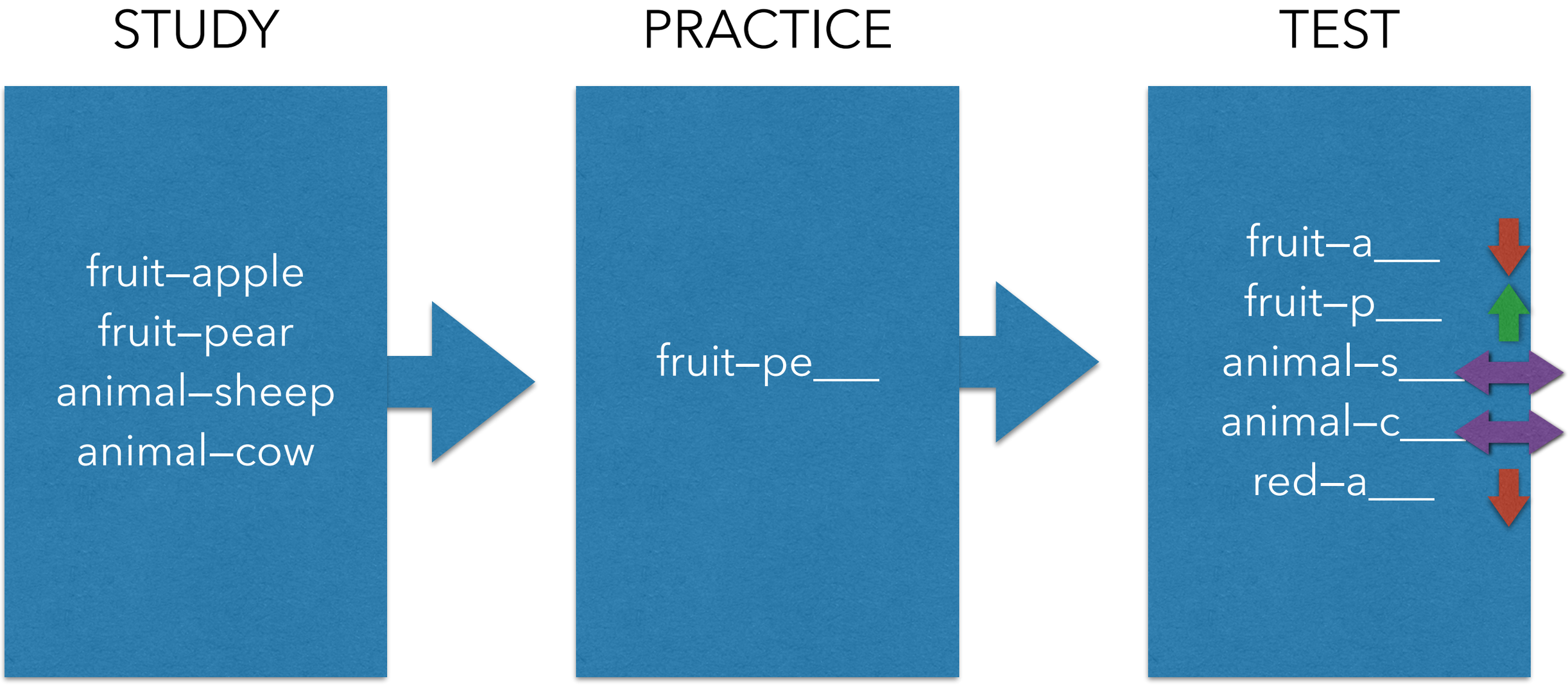
- Is it the association between red and tomato that gets damaged, or is it the memory for “tomato” itself?

- We can use an independent probe: salad–to___

- “Tomato” becomes less accessible even when we use an independent probe

- It looks like “tomato” itself is damaged

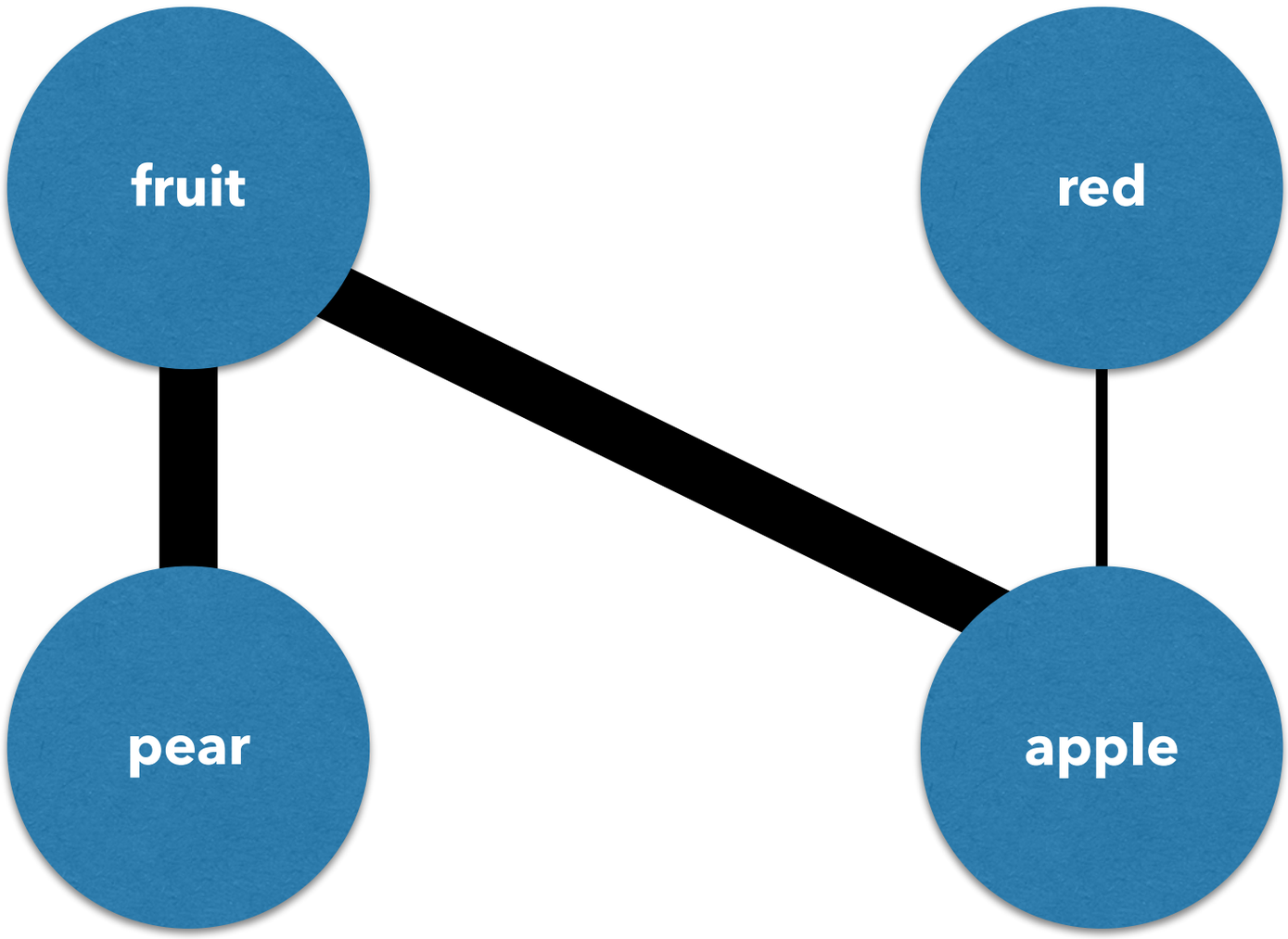
The mechanisms underlying RIF



Impairing "apple" generalizes to other cues besides fruit

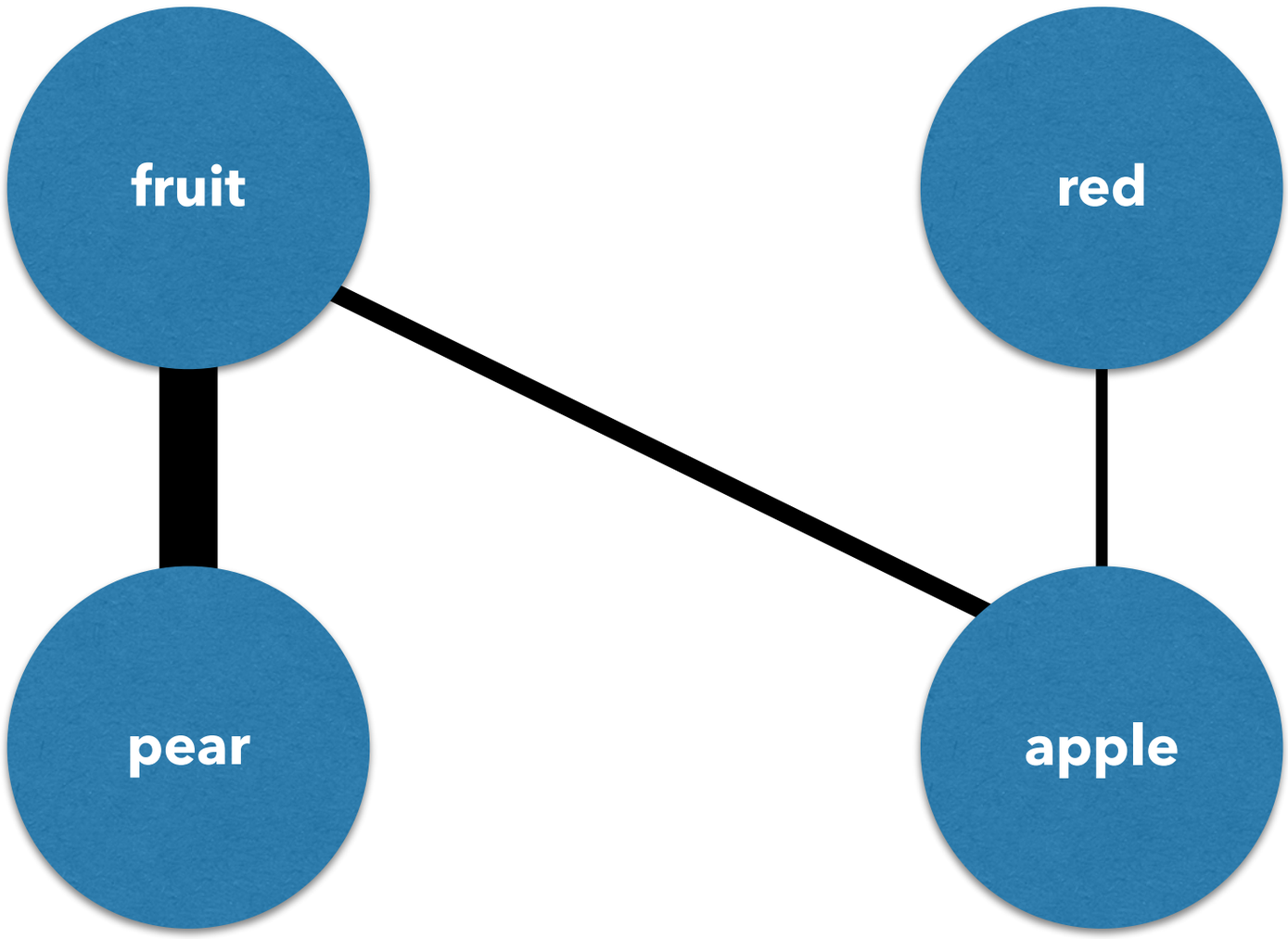
The mechanisms underlying RIF

Practicing fruit-pear impairs red-apple



The mechanisms underlying RIF

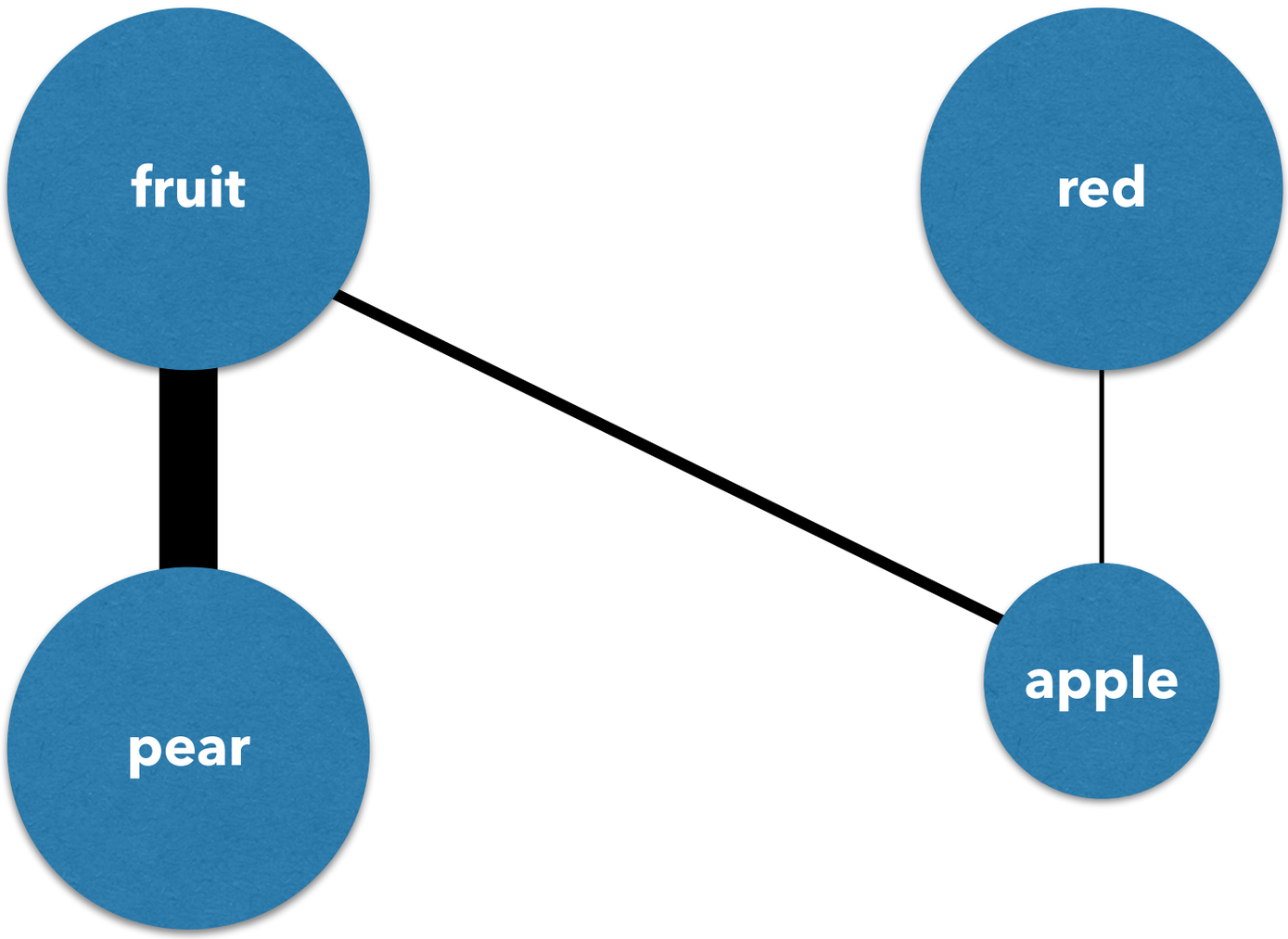
Possible explanation 1: associative weakening



- Predicts impaired recall of apple given “fruit–a___”
- Does **not** predict impaired recall of apple given “red–a___”

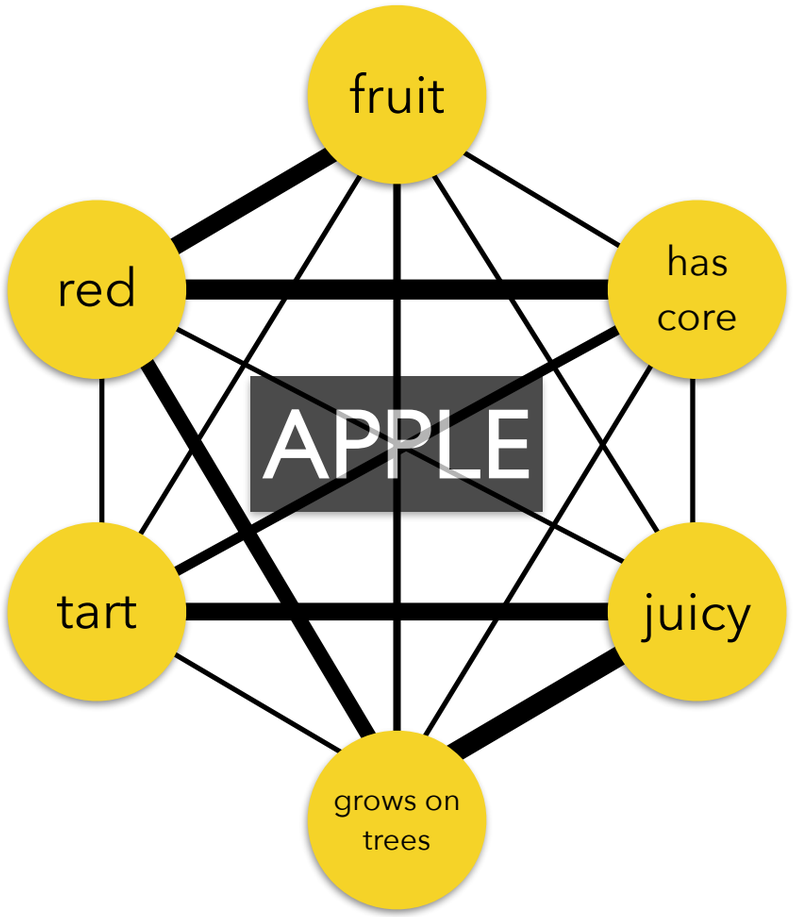
The mechanisms underlying RIF

Possible explanation 2: inhibition

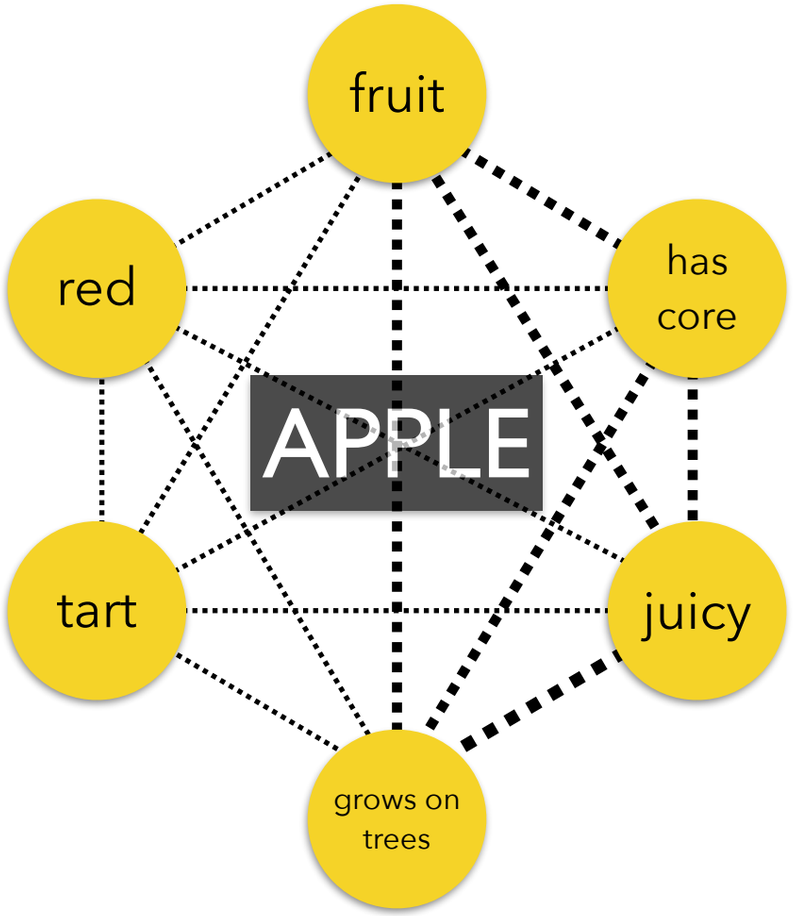


- Correctly predicts impaired recall of apple given both “fruit–a___” and “red–a___”

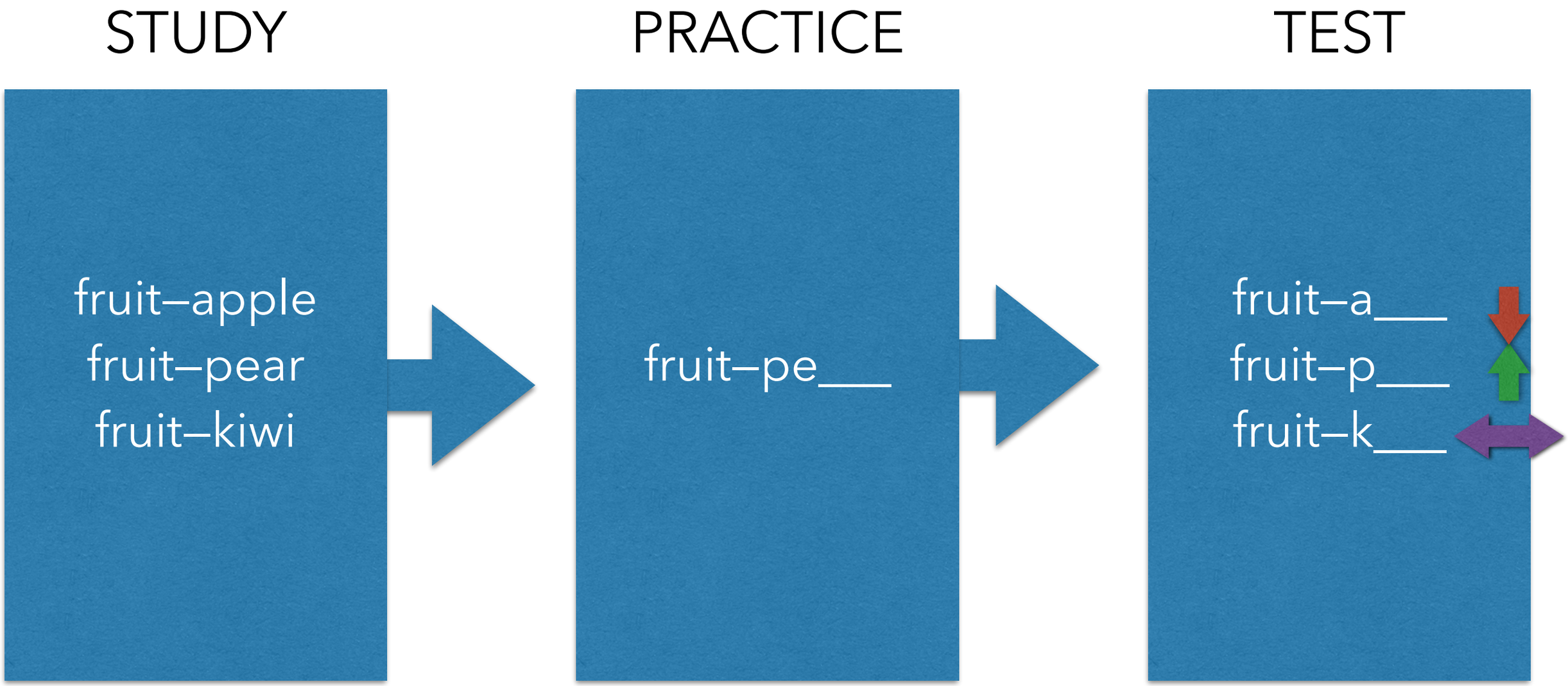
What does it mean to inhibit a memory?



What does it mean to inhibit a memory?

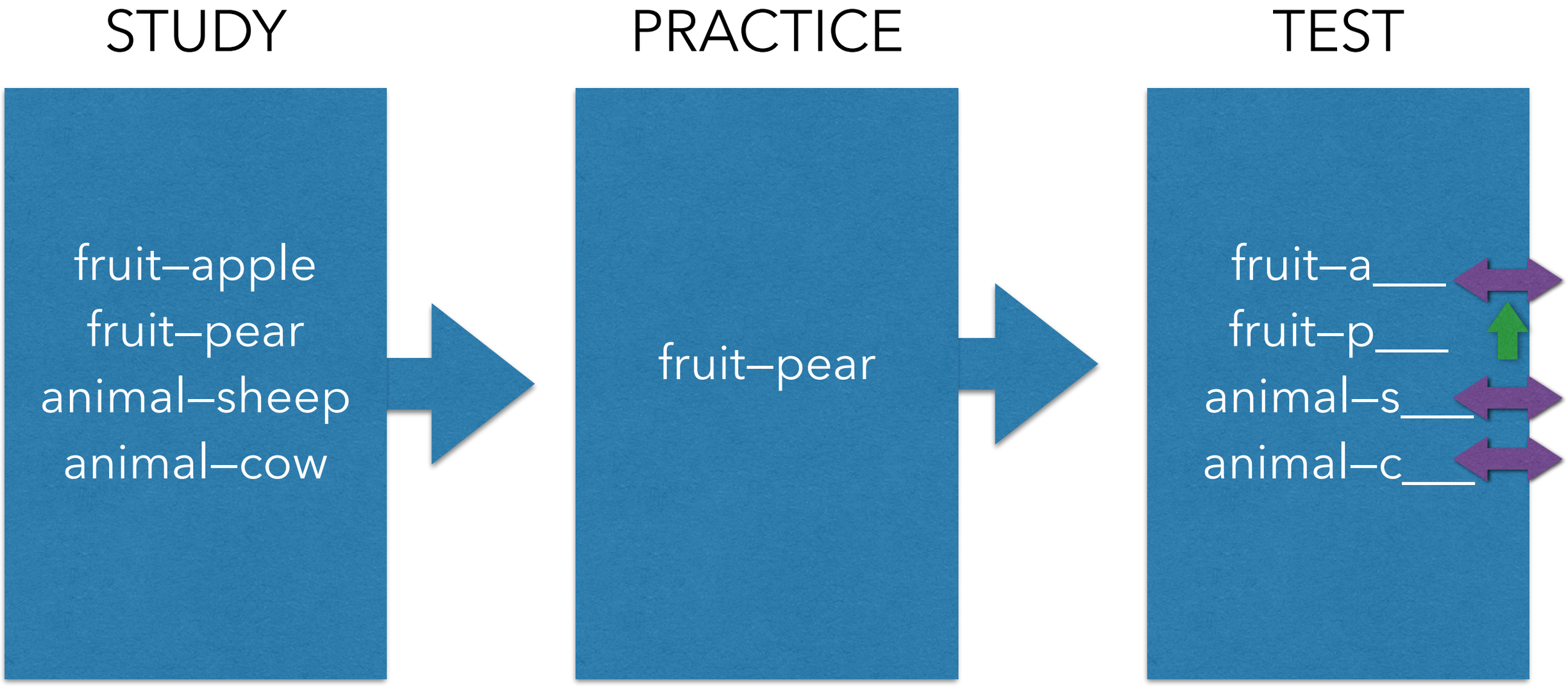


Strong vs. weak category exemplars



Kiwi competes less strongly, so it receives less punishment

Partial vs. full practice



With a more precise cue, apple doesn't have a chance to pop up, so it isn't punished

Summary and sneak peak

- Associations are how we “link” memories
- When many memories are associated they can interact and/or interfere, causing memory encoding and/or retrieval failures
- Chapter 5: models of associations