



# Cognition: Methods and Models

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PSYC 2040

L8: Memory II

Part 1

# recap: Mar 28/31, 2023



- what we covered:
  - short and long-term memory
  - Katie Byrnes!
- your to-dos were:
  - *finish*: L7 quiz/writing assignments
  - *work on*: project milestone #4





# today's agenda

- feedback discussion
- tasks and memory phenomena

# feedback: conceptual questions

- starting this week, **revamping** the format
- conceptual **reflections**
- use that space to:
  - post a question or respond to a question
  - reflect on a key idea or concept
  - highlight a key passage/term(s)
  - connect to previous material
  - be creative about how **you** want to use this space to maximize your learning
- Qs might be addressed on thread OR class

Bloom's Critical Thinking Cue Questions  
Cue Questions Based on Blooms' Taxonomy of Critical Thinking

| LOWER-ORDER THINKING SKILLS<br>(BASIC THINKING)  | HIGHER-ORDER THINKING SKILLS<br>(ABSTRACT THINKING)   |
|--|---|
| <p><b>3. APPLYING</b> (Using learned knowledge in new situations or to solve a real life problem)</p> <ul style="list-style-type: none"><li>• How would you use ...?</li><li>• What examples can you find to ...?</li><li>• How would you solve _____ using what you have learned ...?</li><li>• How would you organize _____ to show ...?</li><li>• How would you show your understanding of ...?</li><li>• What approach would you use to ...?</li><li>• How would you apply what you learned to develop ...?</li><li>• What other way would you plan to ...?</li><li>• What would result if ...?</li><li>• How can you make use of the facts to ...?</li><li>• What elements would you choose to change ...?</li><li>• What facts would you select to show ...?</li><li>• What questions would you ask in an interview with...?</li></ul> | <p><b>6. CREATING</b> (Putting ideas together to form a new and different whole)</p> <ul style="list-style-type: none"><li>• What changes would you make to solve ...?</li><li>• How would you improve ...?</li><li>• What would happen if ...?</li><li>• How can you elaborate on the reason ...?</li><li>• What alternative can you propose ...?</li><li>• How can you invent ...?</li><li>• How would you adapt _____ to create a different ...?</li><li>• How could you change (modify) the plot (plan) ...?</li><li>• What could be done to minimize (maximize) ...?</li><li>• What way would you design ...?</li><li>• What could be combined to improve (change) ...?</li><li>• How would you test or formulate a theory for ...?</li><li>• What would you predict as the outcome of ...?</li><li>• How can a model be constructed that would change ...?</li><li>• What is an original way for the ...?</li></ul> |
| <p><b>2. UNDERSTANDING</b> (Comprehension; Explaining the meaning of information)</p> <ul style="list-style-type: none"><li>• How would you classify the type of ...?</li><li>• How would you compare ...? contrast ...?</li><li>• How would you rephrase the meaning ...?</li><li>• What facts or ideas show ...?</li><li>• What is the main idea of ...?</li><li>• Which statements support ...?</li><li>• How can you explain what is meant ...?</li><li>• What can you say about ...?</li><li>• Which is the best answer ...?</li><li>• How would you summarize ...?</li></ul>   | <p><b>5. EVALUATING</b> (Making judgments about the merits of ideas, materials, or phenomena based on criteria)</p> <ul style="list-style-type: none"><li>• Why do you agree with the actions? The outcomes?</li><li>• What is your opinion of ...? (Must explain why)</li><li>• How would you prove ...? disprove ...?</li><li>• How can you assess the value or importance of ...?</li><li>• What would you recommend ...?</li><li>• How would you rate or evaluate the ...?</li><li>• What choice would you have made ...?</li><li>• How would you prioritize ...?</li><li>• What details would you use to support the view ...?</li><li>• Why was it better than ...?</li></ul>   |
| <p><b>1. REMEMBERING INFORMATION</b> (Knowledge; recalling facts and information)</p> <ul style="list-style-type: none"><li>• What is ...?</li><li>• How is ...?</li><li>• Where is ...?</li><li>• When did _____ happen?</li><li>• How did _____ happen?</li><li>• How would you explain ...?</li><li>• How would you describe ...?</li><li>• What do you recall ...?</li><li>• How would you show ...?</li><li>• Who (what) were the main ...?</li><li>• What are three ...?</li><li>• What is the definition of...?</li></ul>    | <p><b>4. ANALYZING</b> (Breaking down a whole into component parts; Examining critically)</p> <ul style="list-style-type: none"><li>• What are the parts or features of ...?</li><li>• How is _____ related to ...?</li><li>• Why do you think ...?</li><li>• What is the theme ...?</li><li>• What motive is there ...?</li><li>• What conclusions can you draw ...?</li><li>• How would you classify ...?</li><li>• How can you identify the different parts ...?</li><li>• What evidence can you find ...?</li><li>• What is the relationship between ...?</li><li>• How can you make a distinction between ...?</li><li>• What is the function of ...?</li><li>• What ideas justify ...?</li></ul>   |

# feedback: conceptual questions

| Component   | Points |
|---|--------|
| In-class participation and/or attending office hours  | 2      |
| Attendance (attending 90% of classes)                 | 1      |
| Canvas discussion board (active in 80% of the boards) | 2      |
|   | 5      |

# feedback: time spent

- some students review the material **multiple times** during the week and right before the quiz
  - other students spend more time on the writing
  - on average 4-6 hours
- 4 hours reviewing content, making flashcards, 2 hours reviewing with flashcards
  - 1 hour reading, 15 min conceptual question, 1 hour reviewing content, 10 minutes taking quiz
  - 1 hour reading, 1 hour conceptual question, 1 hour review and take quiz
  - 1 hour reading, 1.5 hour project, .5 quiz
  - 1.5 hour reading, 1.5 hour review notes, .5 hour discussion board, 1.5 hour study
  - 1 hour reading, 45 min conceptual question, 30 min quiz
  - 2 hour reading, 1 hour quiz & question
  - 30 min reading, 10 min question, 1 hour reorganizing and studying notes, 1 hour quiz/writing, 1 hour project

# feedback: **writing** assignments

- weekly writing assignments will now have the option of doing **assessment-style questions**
- but...you can also choose to do one of the other assignments that engage you in different ways!

## Writing Option 1: Why do our memories fail us? React to a podcast (6 points)

This learning module reviewed several memory phenomena and principles. In this assignment, you will explore why and how we falter with memories. You will listen to the Hidden Brain podcast episode, [Did That Really Happen? How Our Memories Betray Us](#).

In at least 250 words, your assignment is to react to the discussion in the podcast.

## Writing Option 2: Writing a QALMRI (6 points)

In this assignment, you will write a 250-word QALMRI for the following article:

- Roediger, H. L., & McDermott, K. B. (1995). Creating false memories: Remembering words not presented in lists. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 21(4), 803.

## Writing Option 3: Answer two short-answer questions (6 points)

Answer the following questions:

- Describe the generation effect and at least one study that provided evidence for this effect. Your description of the study should include specific details about the independent & dependent variable(s), as well as key findings and inferences.
- Describe a hit and a correct rejection using a real-world example. You can use the signal-to-noise table to explain your example.

# feedback: **in-class** pace/participation

- we will try some other ways to make sure you are able to ask questions and have the space to do this!
- I will have two versions of slides:
  - before class: “incomplete” version, to encourage notetaking (if you prefer it)
  - during/after class: “complete” version with more text



# the course is designed to support you

- retrieval practice
  - class participation via activities/reflections
  - weekly quizzes on each learning module
  - mid-semester assessments
  - key takeaways
- elaborative encoding
  - writing assignments that push you to think more deeply about the content
  - conceptual discussion questions
  - final projects that help you connect concepts learned in class via newer formats
- spaced practice
  - mid-semester assessments that cover broader content
  - weekly quizzes





# today's agenda

- feedback discussion
- tasks and memory phenomena



# a demonstration

- I will read aloud a list of words for you to remember
- you will then be asked to recall these words

# answers

- how many words did you recall?
- this list is part of an experiment designed to test “false memories” conducted by Roediger & McDermott (1995), now famously called the Deese-Roediger-McDermott paradigm

butter  
food  
eat  
sandwich  
rye  
jam  
milk  
flour  
jelly  
dough  
crust  
slice  
wine  
loaf  
toast

# recall task

- a recognition task involves a **study (encoding) phase** and a **test (retrieval) phase**
- **study** phase: participants are exposed to stimuli
- **test** phase: participants are asked to actively generate all items they studied
- how would you measure memory performance? total words, intrusions, etc.

BUTTER  
FOOD  
EAT  
SANDWICH

recall!

BUTTER

BREAD

# recognition task

BUTTER  
FOOD  
EAT  
SANDWICH

- a recognition task involves a **study (encoding) phase** and a **test (retrieval) phase**
- **study** phase: participants are exposed to stimuli
- **test** phase: participants decide whether they have seen a given item (old) or not (new)
  - some items are **targets**, some are **foils/lures**
- how would you measure memory performance?
  - the proportion of correct/old items
- limitations? pair up and discuss!

BUTTER

OLD

NEW

BREAD

OLD

NEW

# recognition task: hits and false alarms

- observing **only the correct responses** could be **misleading** if the person simply answers “old” for all items
- **hits and false alarms together** provide a **clearer picture**

| response | item                  |                      |
|----------|-----------------------|----------------------|
|          | OLD ( <b>B</b> UTTER) | NEW ( <b>B</b> READ) |
| OLD      | hit                   | false alarm          |
| NEW      | miss                  | correct rejection    |

# signal vs. noise

- the idea of hits and false alarms comes from [signal detection theory](#) with broader applications to decision-making and statistics

|                  | world truth                   |                                     |
|------------------|-------------------------------|-------------------------------------|
| your data        | true effect                   | noise                               |
| effect found     | hit ( <b>power</b> )          | false alarm ( <b>type I error</b> ) |
| effect not found | miss ( <b>type II error</b> ) | correct rejection                   |



# **activity: signal vs. noise**

- groups of 2
- you will be presented with a research situation and you need to come up with a signal vs. noise formulation of the situation

# **activity: signal vs. noise**

- a researcher is trying to understand if there are gender differences in the ability to manage money. They conduct an experiment where they record the amount of money saved by different genders in a given month.

# activity: signal vs. noise

- construct the signal vs. noise table for this experiment design

|                      | world truth          |                            |
|----------------------|----------------------|----------------------------|
| your data            | true effect ???      | noise ????                 |
| effect found ???     | hit (power)          | false alarm (type I error) |
| effect not found ??? | miss (type II error) | correct rejection          |

# signal vs. noise

- construct the signal to noise table for this experiment design

|  | world truth  |   |
|--|--|---|
| your data  | true effect (there are gender differences in the real world) | noise (there are no gender differences) |
| effect found (the data sample shows gender differences)        | hit (power)  | false alarm (type I error)              |
| effect not found (the data sample shows no gender differences) | miss (type II error)   | correct rejection                       |

# memory phenomena

- what counts as a memory phenomenon?
  - anything to do with memory!
- several phenomena have roots in associationism and/or behaviorism
  - phenomena we've already discussed?
- we will learn about these phenomena in claim-evidence fashion
- you should add on our general format when you review (IV/DV/finding/inference)!

# frequency



- claim: more frequent stimuli are better remembered
- evidence: Hintzman (1969)
  - participants studied words with different exposure (two vs three times)
  - frequency did not affect recognition accuracy
    - ceiling effects: performance is extremely high or perfect
    - floor effects: performance is extremely low or at zero
  - frequency affected recognition times, i.e., more frequently encountered words were recognized faster

# frequency: recall vs. recognition



- claim: the effect of frequency can vary based on the **retrieval context**
- evidence: Balota and Neely (1980)
  - tested participants on high and low-frequency words via recognition or recall
  - the word frequency effect/paradox
    - recall: HF words are better **remembered** than LF words
    - recognition: LF words are better **recognized** than HF words

## Frequency effects in recognition and recall

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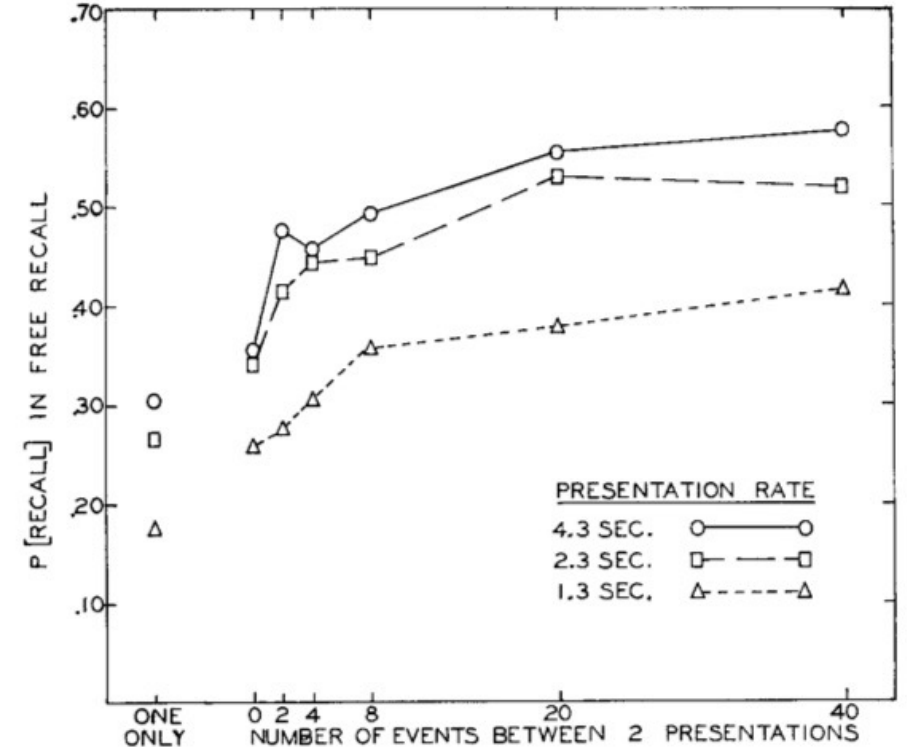
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### Abstract

Stimulus frequency, which is often evaluated using normative word frequency, is among the variables that have the most diverse and puzzling effects on memory. Word frequency can either facilitate or impair memory performance depending on the study and testing conditions. Understanding why and under what conditions frequency has positive or negative effects on performance is crucial for understanding basic properties about the human memory system. As a result, the study of word frequency has led to the development of multiple memory models. This chapter summarizes the current knowledge concerning word frequency effects on item recognition, associative recognition, free recall, cued recall, serial recall and source memory. We also discuss how word frequency interacts with manipulations concerning presentation rate, list-composition, age of the participants, memory load, midazolam injections, response deadlines and remember-know judgements. This review of frequency effects in memory identified four major classes of empirical findings, which can be further subdivided into a total of 21 key phenomena that any theory should account for. Based on these phenomena, we identify three high-level principles that characterize the diverse effects of frequency on memory – the probe dependency principle, the dual process principle, and the resource demands principle.

# presentation rate and spacing

- claim: repetitions and spacing improve memory retention
- evidence: Melton (1970)
  - participants studied words at different presentation rates (1.3, 2.3, and 4.3 seconds), and spaced repetitions (0, 2, 4, 8, 20, 40)
  - recall improved with longer presentations, more repetitions, and greater spacing between repetitions



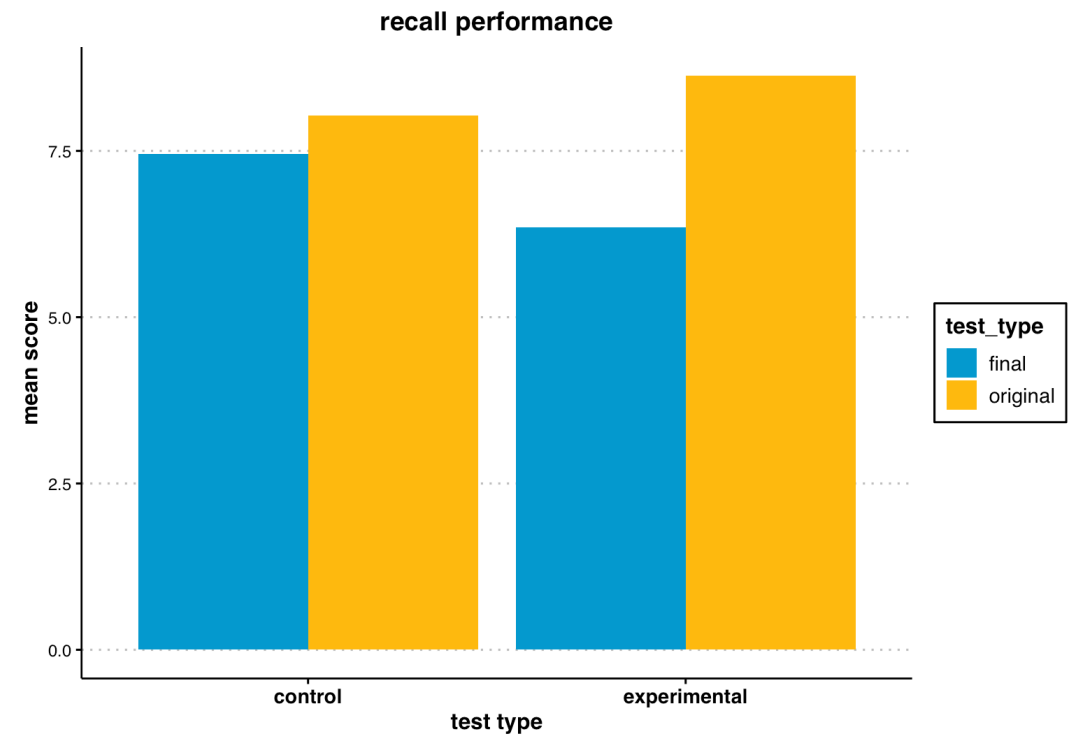
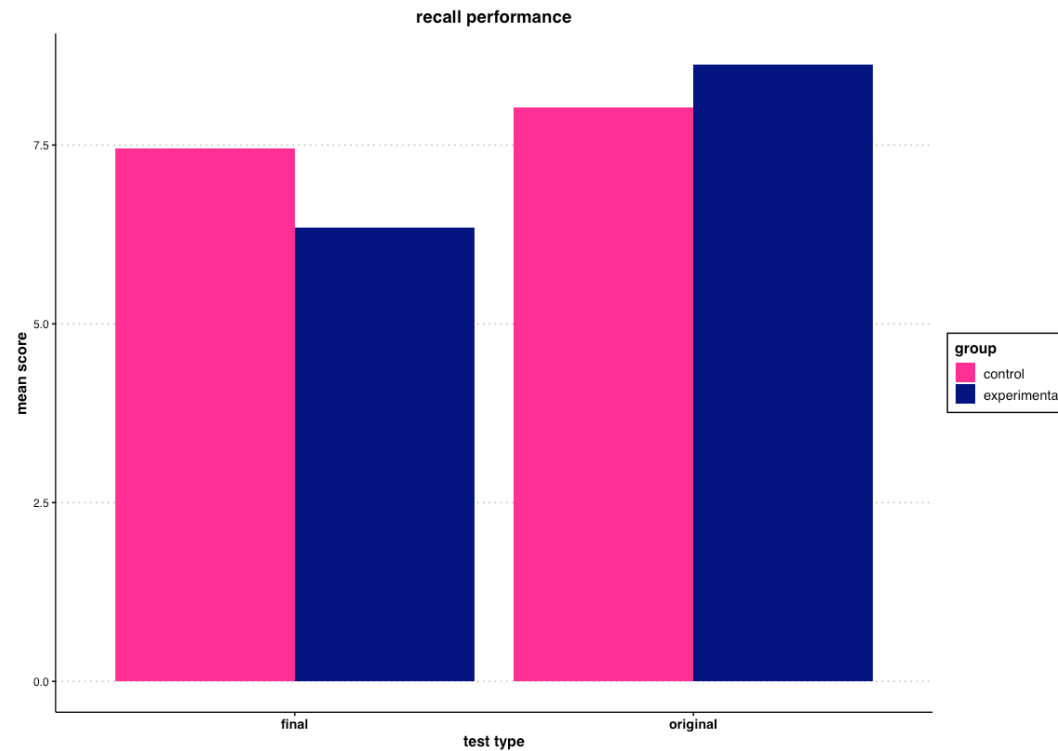


# retroactive interference

- claim: newer events influence prior learning
- evidence: Postman (1952)
  - original learning: participants encoded 24 nonsense syllables and were tested
  - interpolated learning: 24 new nonsense syllables (experimental group) OR New Yorker magazine (control group)
  - final phase: participants were tested on original syllables
  - participants were better on original test than final test
  - experimental group showed more forgetting than control group, due to interference from the second list of nonsense syllables
- activity in pairs: what would a plot of these findings look like?

# retroactive interference

- claim: newer events influence prior learning



# proactive interference

- claim: prior learning influences new learning
- evidence: Underwood (1957)
  - a “meta-analysis” of several studies
  - y-axis: percent of items recalled from a current list
  - x-axis: number of previous lists learned
  - recall was worse as more lists were learned before current list

INTERFERENCE AND FORGETTING

53

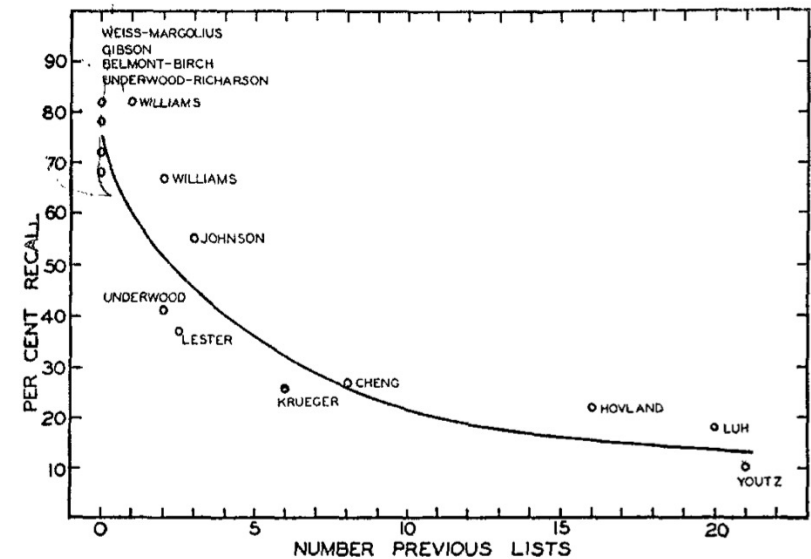


FIG. 3. Recall as a function of number of previous lists learned as determined from a number of studies. From left to right: Weiss and Margolius (35), Gibson (9), Belmont and Birch (3), Underwood and Richardson (33), Williams (36), Underwood (27, 28, 29, 30), Lester (17), Johnson (14), Krueger (16), Cheng (6), Hovland (11), Luh (18), Youtz (37).

# distinctiveness: Von Restorff

laf -- rig  
# -- +  
dok -- pir  
89 -- 46  
red square -- green square  
zül -- dap  
S -- B  
tög -- fem

- claim: memory is better for distinctive items
- evidence: Von Restorff (1933)
  - participants were tested on 5 lists
  - lists used counterbalancing to ensure that effects were not influenced by the characteristics of items of order, but only the composition of the list (context)
  - “isolated” pairs were better remembered than massed items across all lists, i.e., distinctive pairs were better remembered

LIST 1  
4 NONSENSE } MASSED  
1 SYMBOL }  
1 NUMBER } ISOLATES  
1 COLOR }  
1 LETTER }

# conceptual question #distinctiveness

This section discusses distinctiveness as a significant factor in the ability to remember things. This reminds me of Paivio's use of concrete vs abstract words in assessing memory. Are these two topics connected? **Could concreteness be considered more distinctive?** How does lived experience factor into this pattern?

# meaningfulness: self-reference

- claim: relating **information to yourself** improves retention
- evidence: Rogers et al. (1977)
  - participants encoded lists of adjectives via **4 conditions** (structural, phonemic, semantic, and self-reference)
  - recall for adjectives was highest for the self-reference condition

Table 1  
*Examples of the Rating Tasks*

| Task           | Cue question        | Manipulation   |
|----------------|---------------------|--|
| Structural     | Big letters?        | The adjective was either presented in the same size type as the question or twice as large.                          |
| Phonemic       | Rhymes with xxxx?   | xxxx was a word that either rhymed or did not rhyme with the adjective.  |
| Semantic       | Means same as yyyy? | yyyy was either a synonym or unrelated word to the presented adjective.  |
| Self-reference | Describes you?      | Subjects simply responded <i>yes</i> or <i>no</i> to indicate the self-reference quality of the presented adjective. |

| Rating     | Rating task |             |          |                | Total |
|------------|-------------|-------------|----------|----------------|-------|
|            | Structural  | Phonemic    | Semantic | Self-reference |       |
|            |             | Mean recall |          |                |       |
| <i>yes</i> | .28         | .34         | .65      | 1.78           | 3.05  |
| <i>no</i>  | .06         | .34         | .68      | 1.06           | 2.14  |
| Total      | .34         | .68         | 1.33     | 2.84           | 5.19  |



# big takeaways

- get in groups of 3 and report key takeaways from today
- [takeaways document](#)

# next class



- **before** class:
  - *finish*: L8 readings
  - *post*: conceptual question
- **during** class:
  - conceptual questions
  - memory phenomena (contd.) and principles!