Incidentally Encoded Temporal Associations Produce Priming in Implicit Memory

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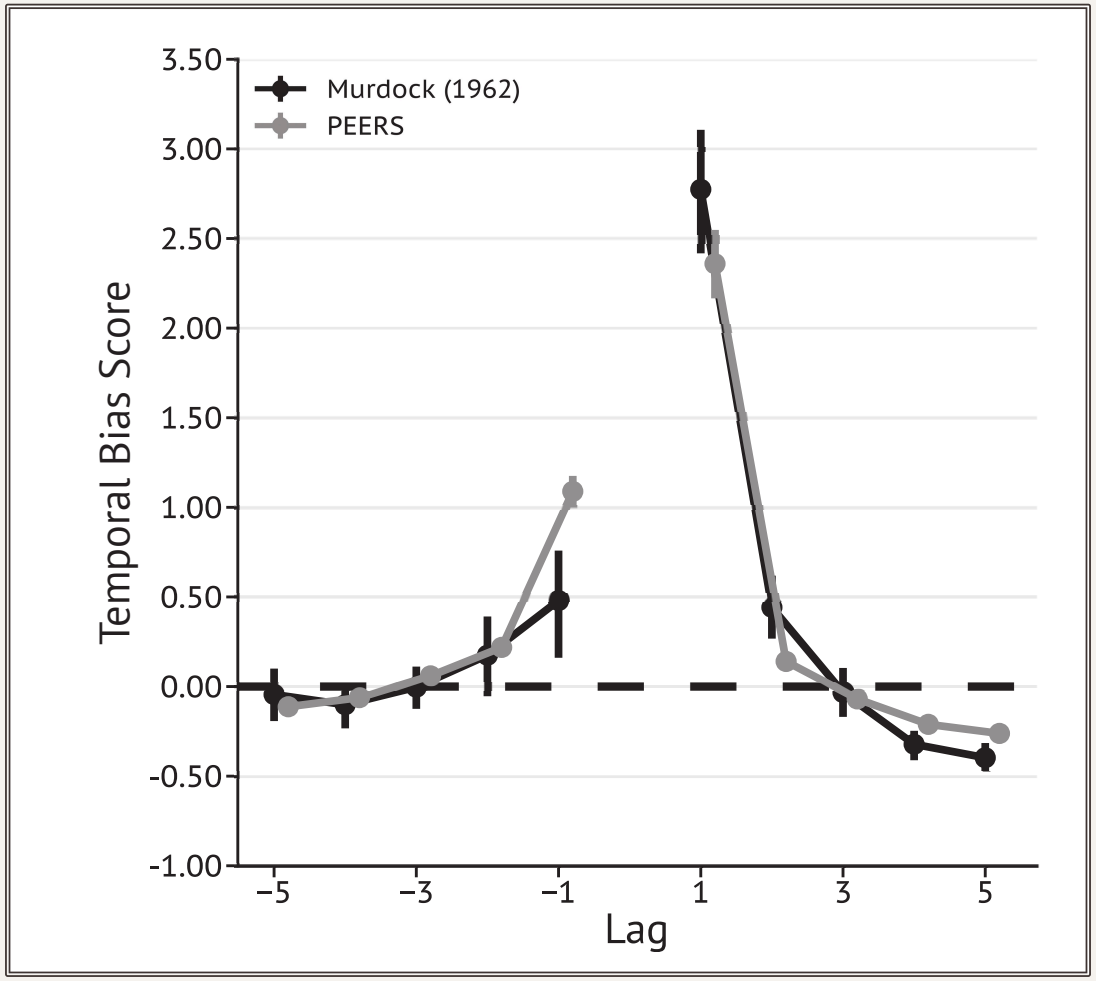
Temporal Contiguity Effect (TCE)

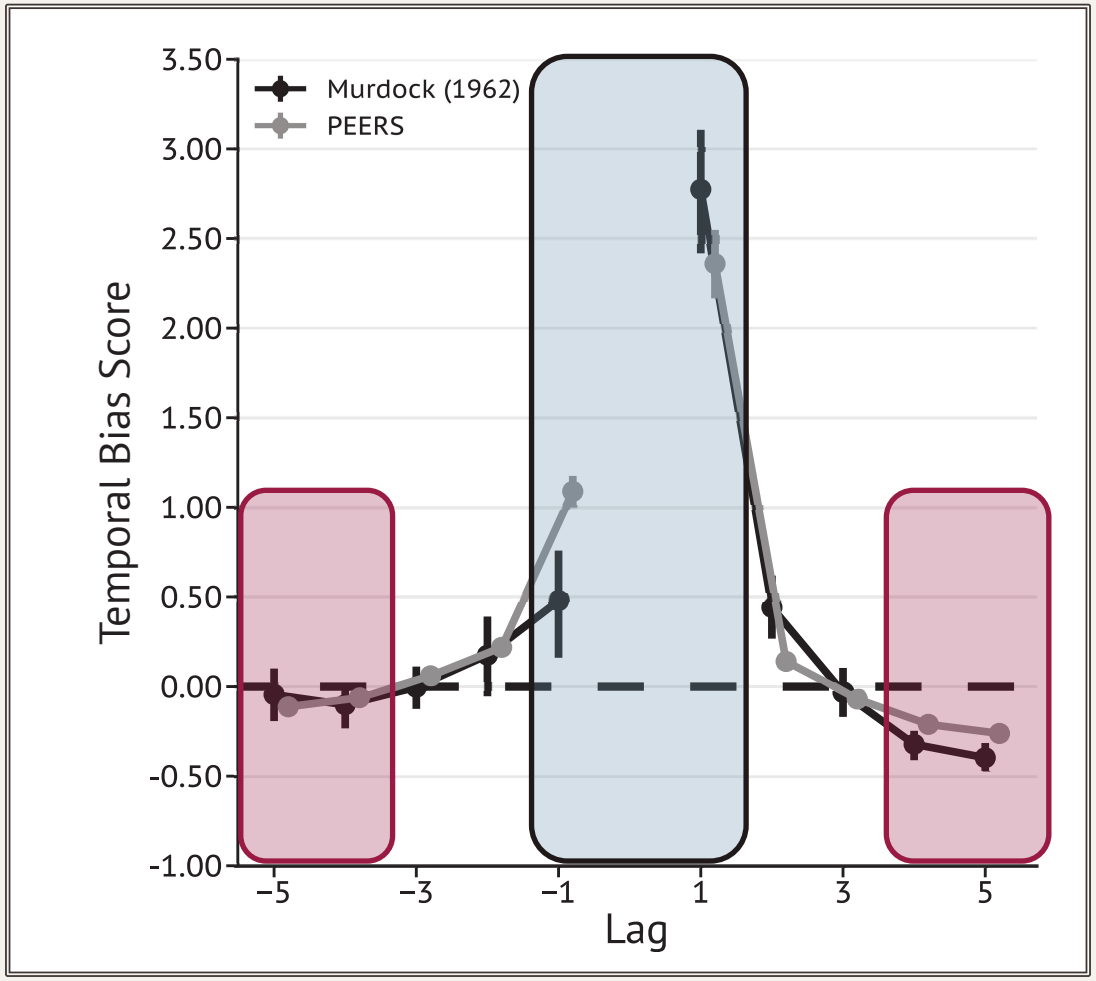
- Recalling one item tends to lead to next recalling another item originally experienced nearby in time (Kahana, 1996)

Temporal Contiguity Effect



Mundorf et al. (2021)

Temporal Contiguity Effect



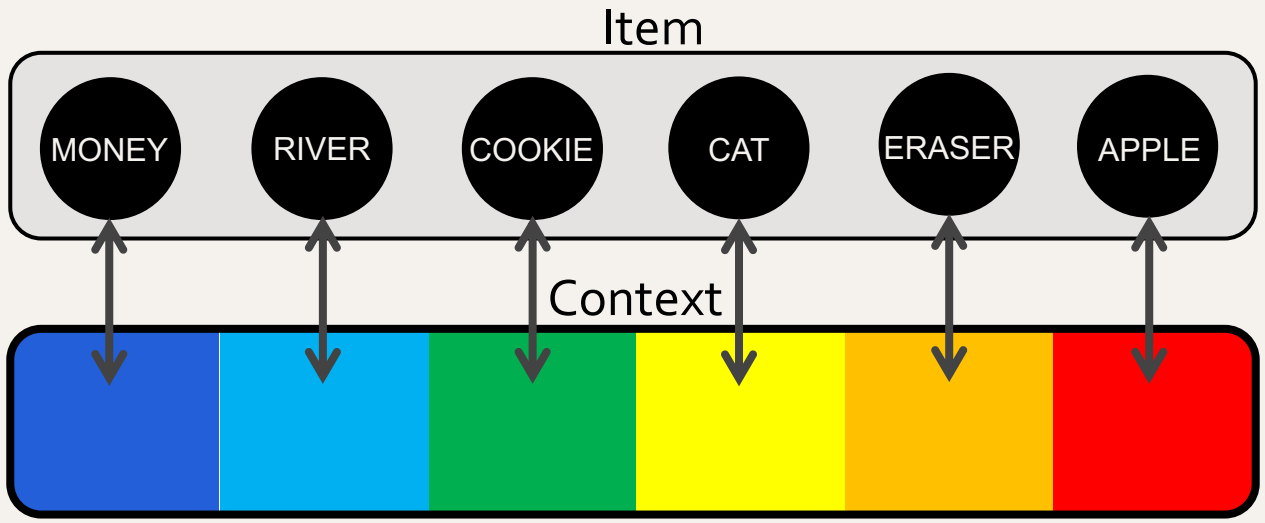
Mundorf et al. (2021)

Temporal Contiguity Effect (TCE)

- Recalling one item tends to trigger next recalling another item originally experienced nearby in time
- Influence on theories of episodic memory
  - Theories based on strategic control processes (e.g., Hintzman, 2016)
  - Theories emphasizing automatic TCE-generating processes (e.g., Davelaar et al., 2005; Howard & Kahana, 2002; Lehman & Malmberg, 2013)

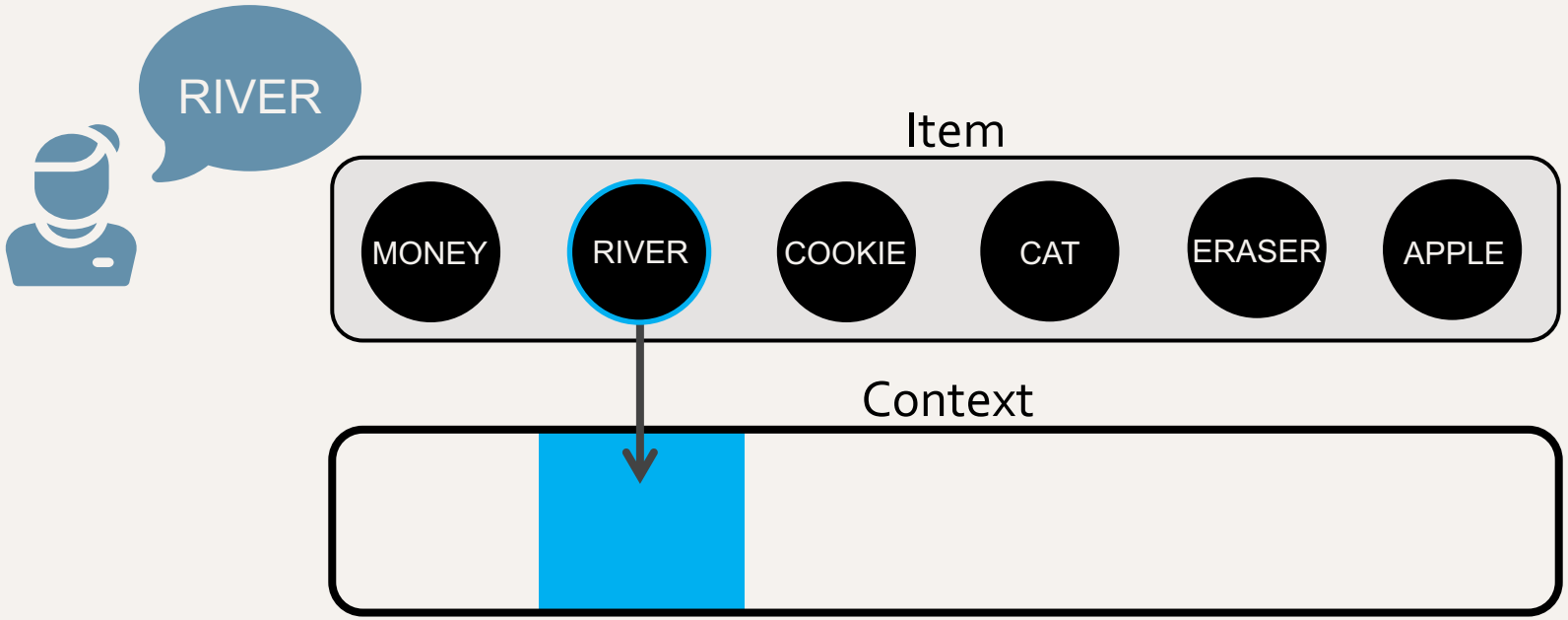
Retrieved Context Theory

- Episodic memories form by associating items with the current state of a drifting mental context
  - Associations form **automatically**
  - Mental context drifts as items are processed



Retrieved Context Theory

- Recall cued by current state of context
  - Once an item is recalled, its associated context is **automatically** reinstated
  - Context is a better cue for items experienced nearby in time



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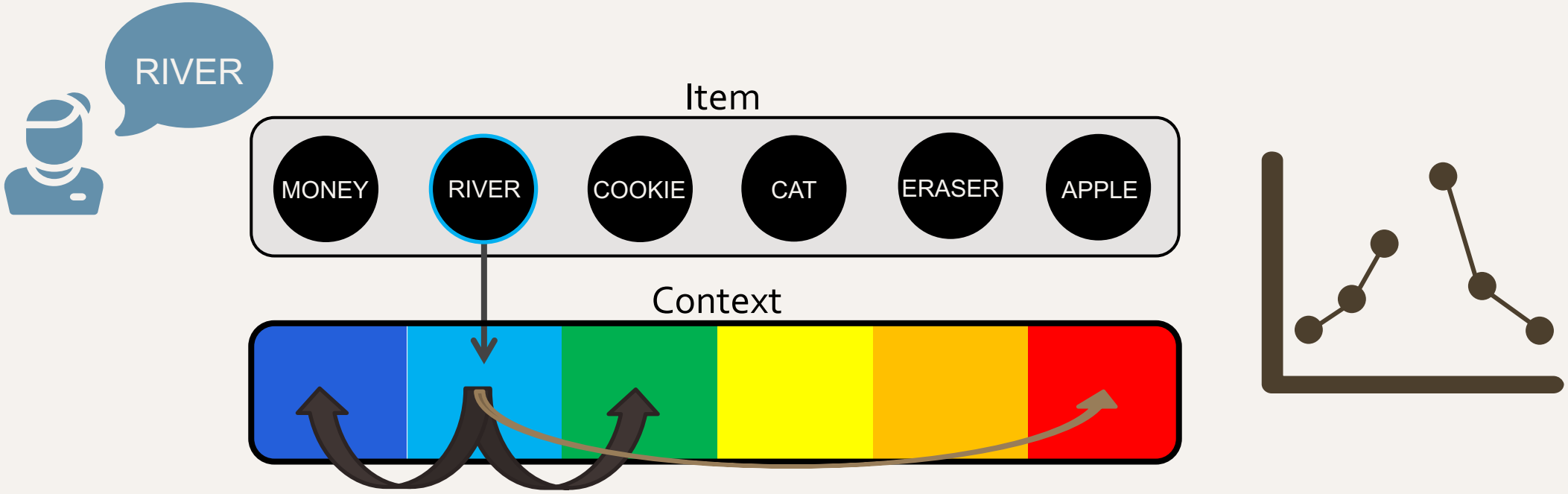


Retrieved Context Theory

- Critical Mechanisms:
  - **Automatic association formation during encoding**
  - Automatic reinstatement of associations during retrieval

Temporal information is **encoded** automatically

Prediction: TCE even when encoding is incidental

- Small but significant TCE following incidental encoding

(Diamond & Levine, 2020; Healey, 2018; Mundorf et al. 2021)

Retrieved Context Theory

- Critical Mechanisms:
  - Automatic association formation during encoding
  - **Automatic reinstatement of associations during retrieval**

Temporal information is **retrieved** automatically

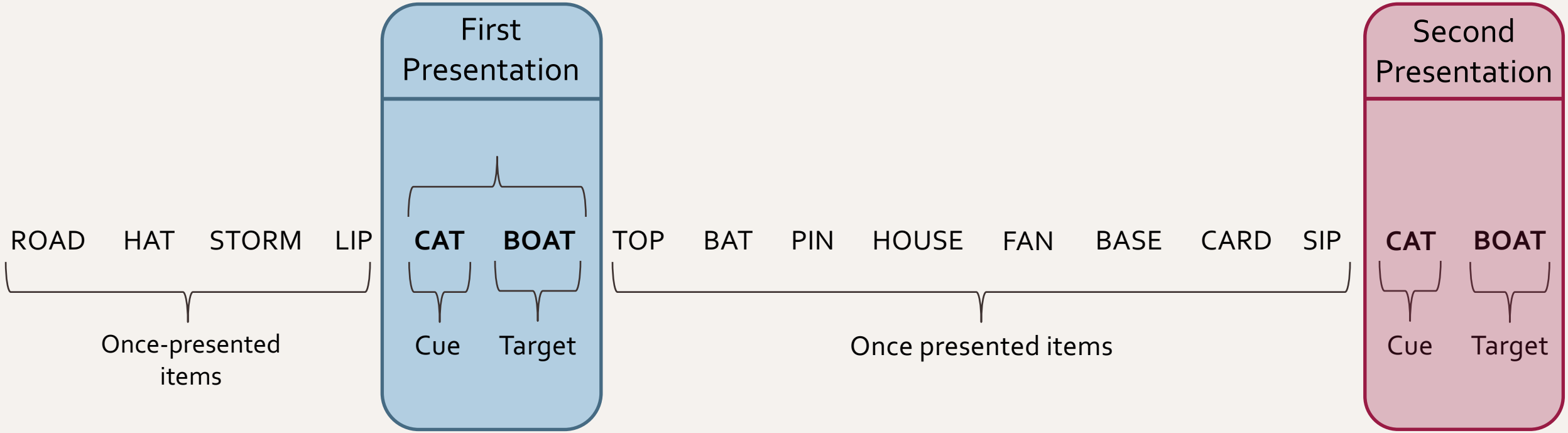
Prediction: TCE even when retrieval is unintentional

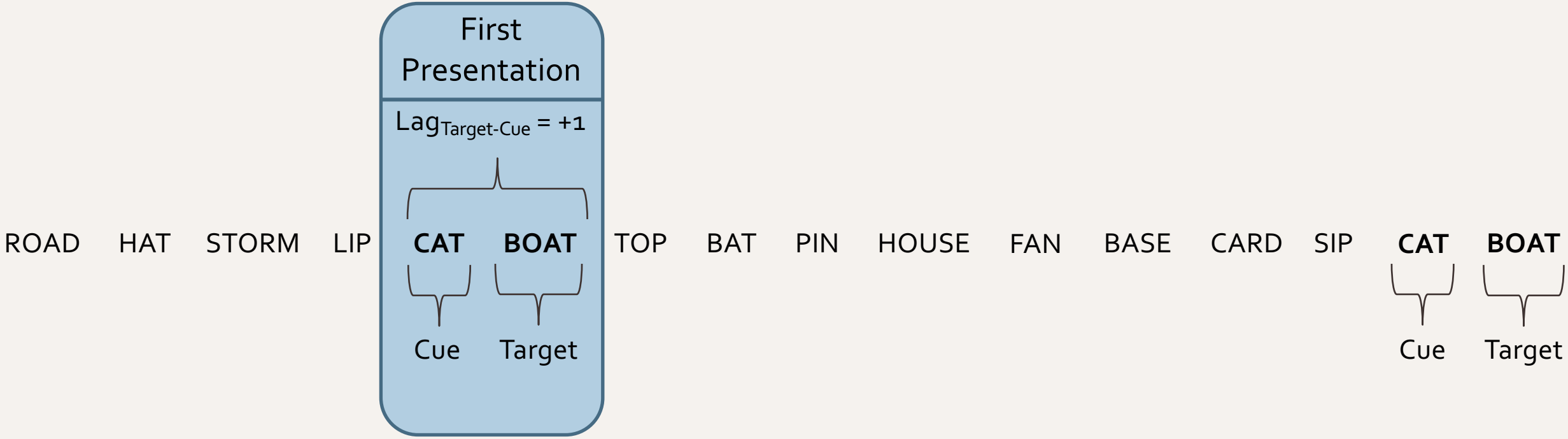
Predictions for Repetition Priming

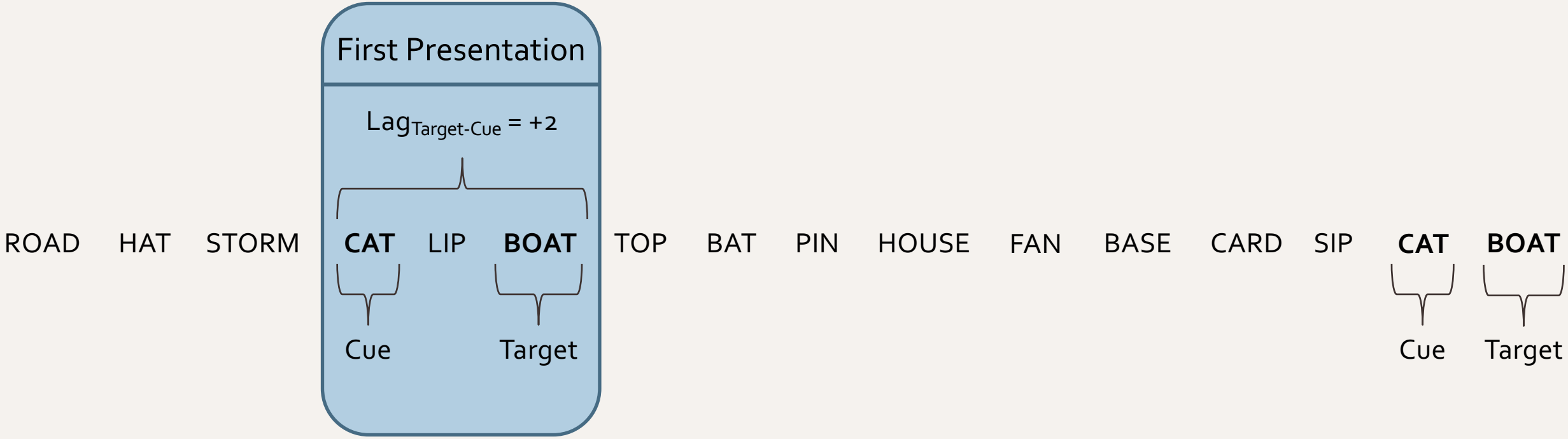
- Associative repetition priming: repeating one item tends to cue faster responses to other items experienced nearby in time (McKoon & Ratcliff, 1979; 1986)
  - For items explicitly studied as a pair (CUE-TARGET)
- Retrieved Context Theory predicts associative repetition priming
  1. Associative repetition priming even for items not explicitly paired together
  2. Associative repetition priming affected by the temporal distance between items during initial exposure

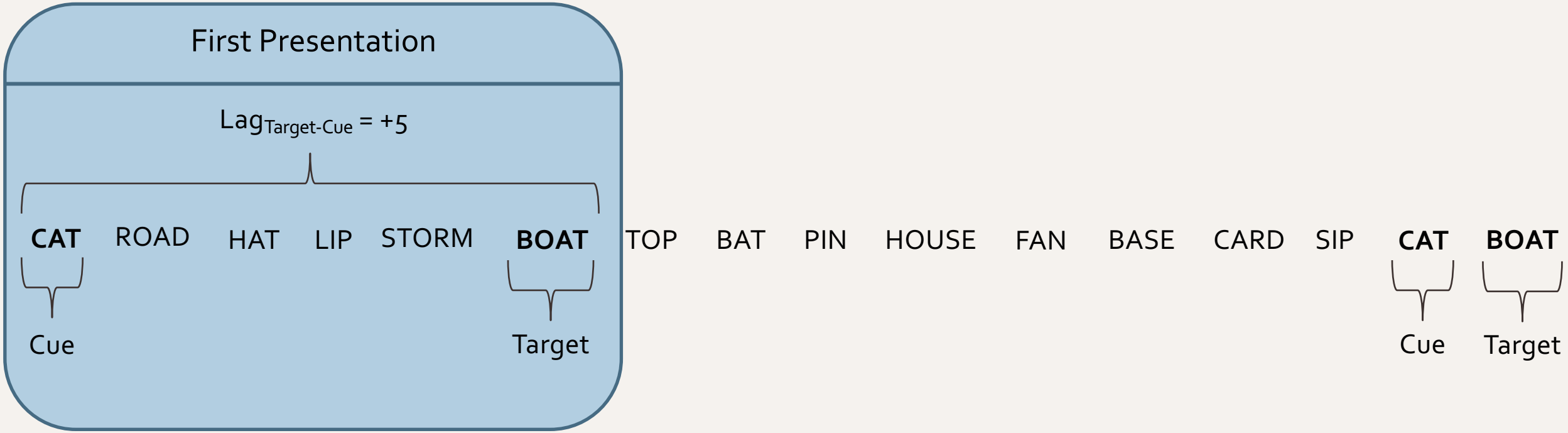
Methods

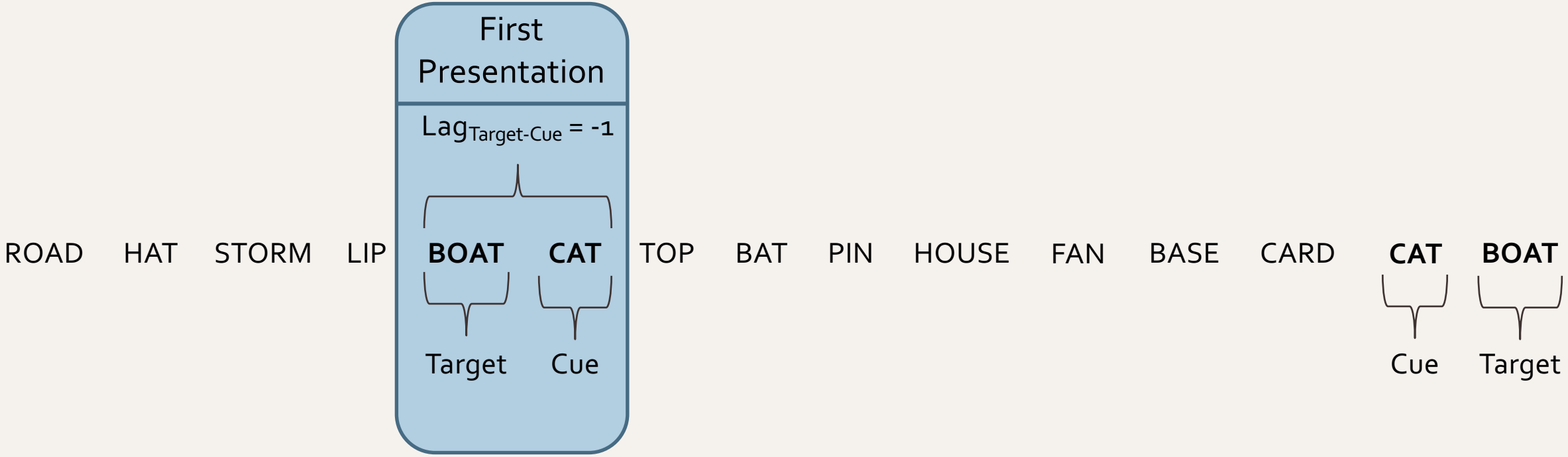
- Participants (*N* = 602) read 505 words aloud
  - Vocal responses recorded
  - 385 words presented once, 60 words presented twice

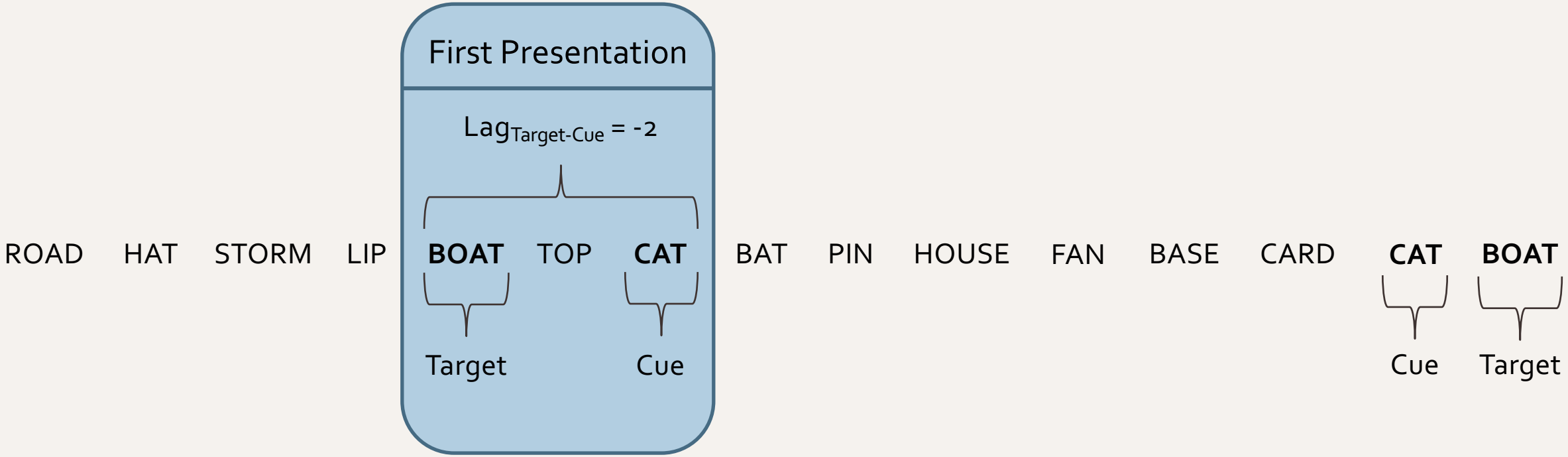

First Presentation
Second Presentation
ROAD HAT STORM LIP
CAT BOAT
TOP BAT PIN HOUSE FAN BASE CARD SIP
CAT BOAT
Once-presented items
Cue Target
Once presented items
Cue Target

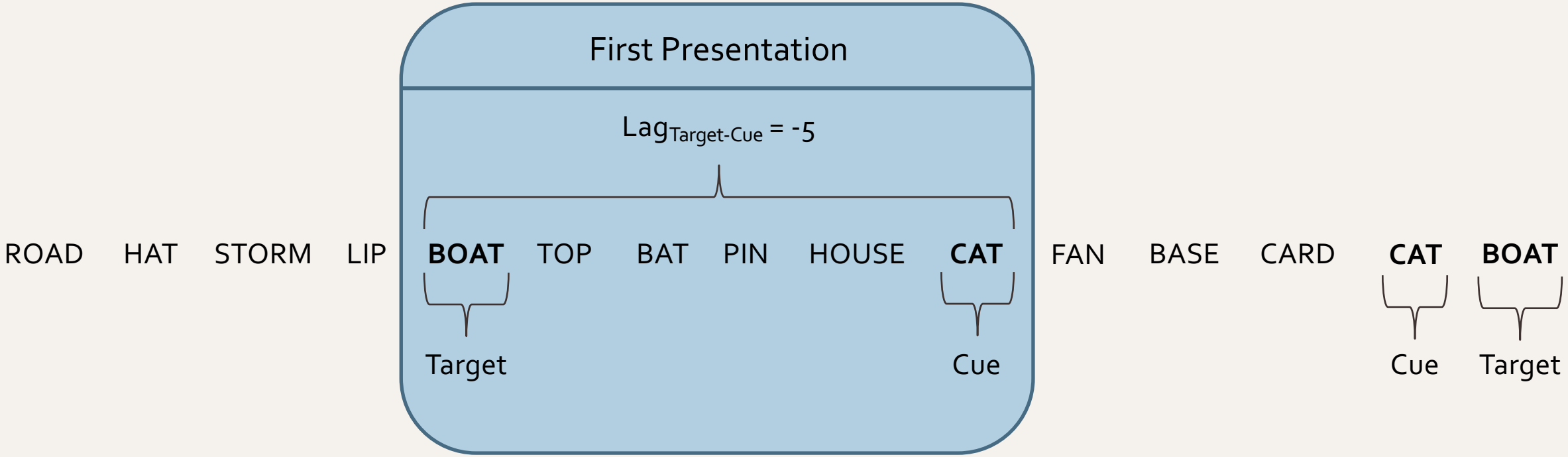

First Presentation
Lag Target-Cue = +1
ROAD
HAT
STORM
LIP
CAT
BOAT
TOP
BAT
PIN
HOUSE
FAN
BASE
CARD
SIP
CAT
BOAT
Cue
Target
Cue
Target


First Presentation
Lag Target-Cue = +2
ROAD HAT STORM CAT LIP BOAT TOP BAT PIN HOUSE FAN BASE CARD SIP CAT BOAT
Cue
Target
Cue
Target


First Presentation
Lag Target-Cue = +5
CAT
ROAD
HAT
LIP
STORM
BOAT
TOP
BAT
PIN
HOUSE
FAN
BASE
CARD
SIP
CAT
BOAT
Cue
Target
Cue
Target


First Presentation
Lag Target-Cue = -1
ROAD
HAT
STORM
LIP
BOAT
CAT
TOP
BAT
PIN
HOUSE
FAN
BASE
CARD
CAT
BOAT
Target
Cue
Cue
Target


First Presentation
$Lag_{Target-Cue}$ = -2
ROAD
HAT
STORM
LIP
BOAT
TOP
CAT
BAT
PIN
HOUSE
FAN
BASE
CARD
CAT
BOAT
Target
Cue
Cue
Target


First Presentation
$Lag_{Target-Cue}$ = -5
ROAD
HAT
STORM
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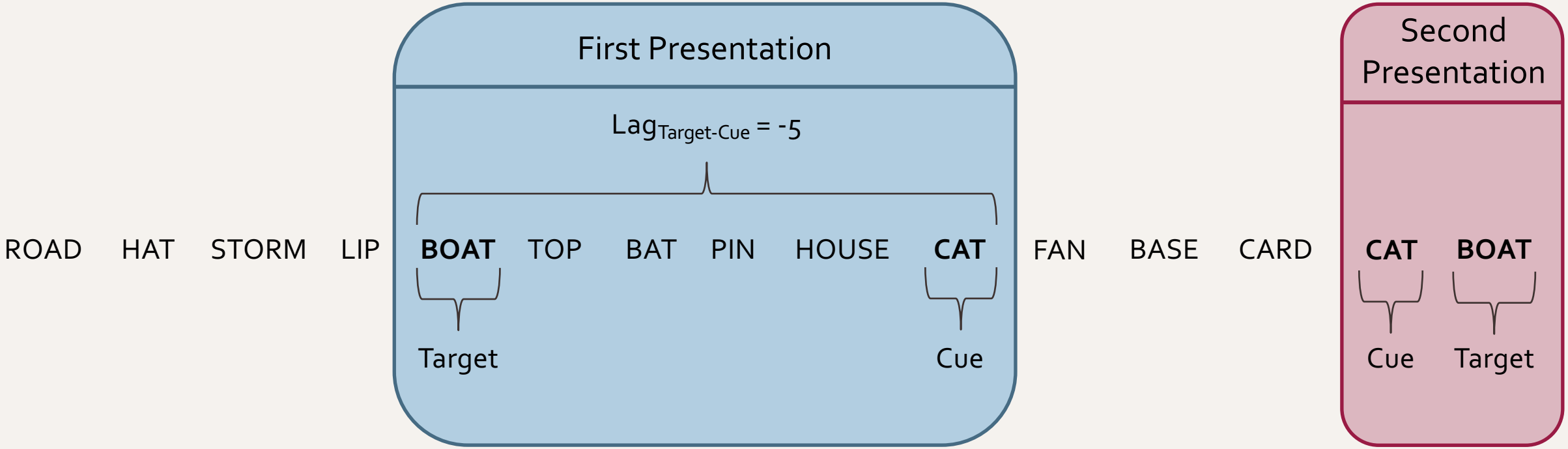

First Presentation
$Lag_{Target-Cue}$ = -5
ROAD HAT STORM LIP BOAT TOP BAT PIN HOUSE CAT FAN BASE CARD
Target
Cue
Second Presentation
CAT BOAT
Cue
Target

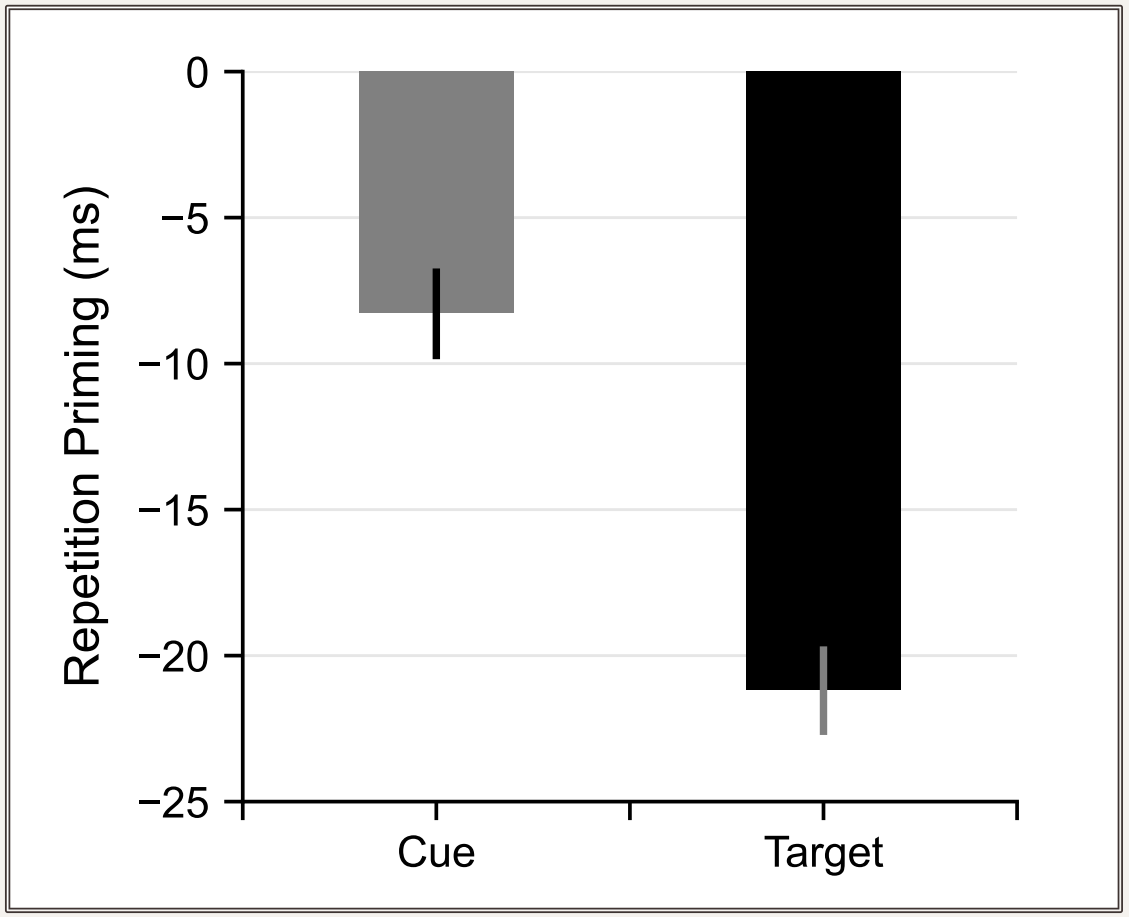
Methods

- Participants (*N* = 602) read 505 words aloud
  - Vocal responses recorded
  - 385 words presented once, 60 words presented twice
- Surprise final free recall
- Reading onset

Prediction 1: Associative repetition priming even for items not explicitly paired together

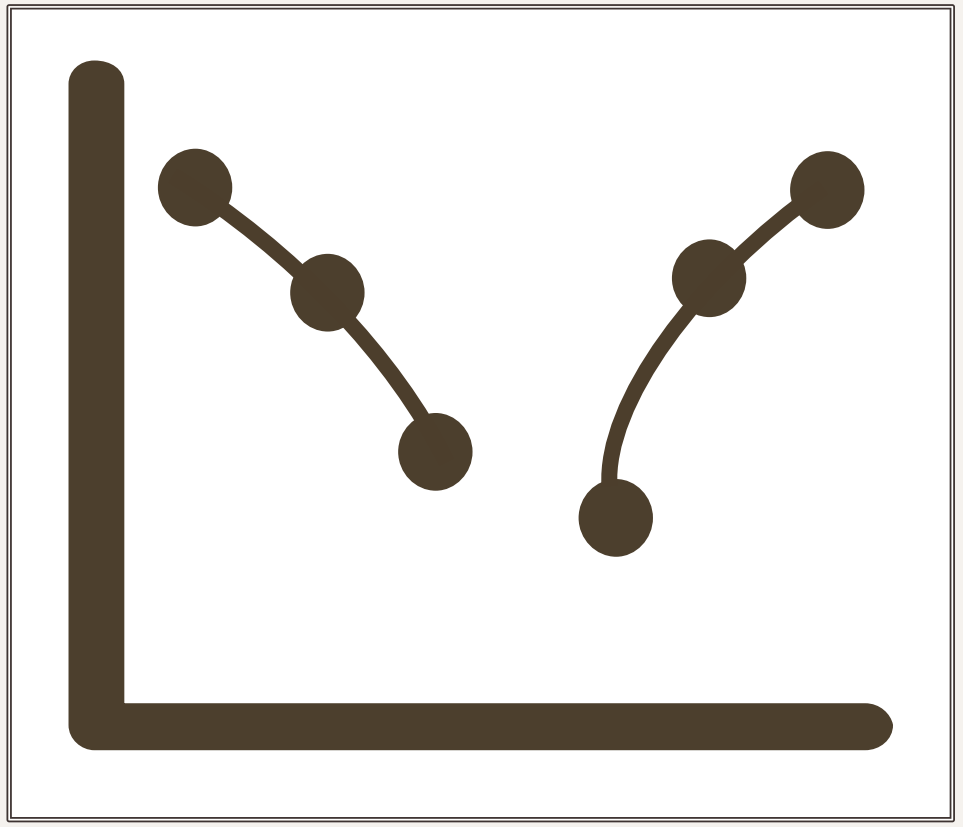
Repetition Priming:

Second Presentation Reading Onset - First Presentation Reading Onset



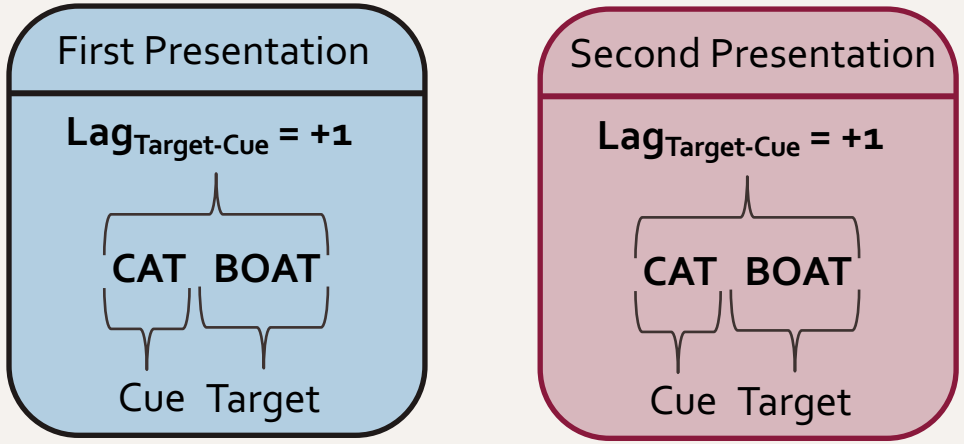
Error bars represent bootstrapped 95% CI

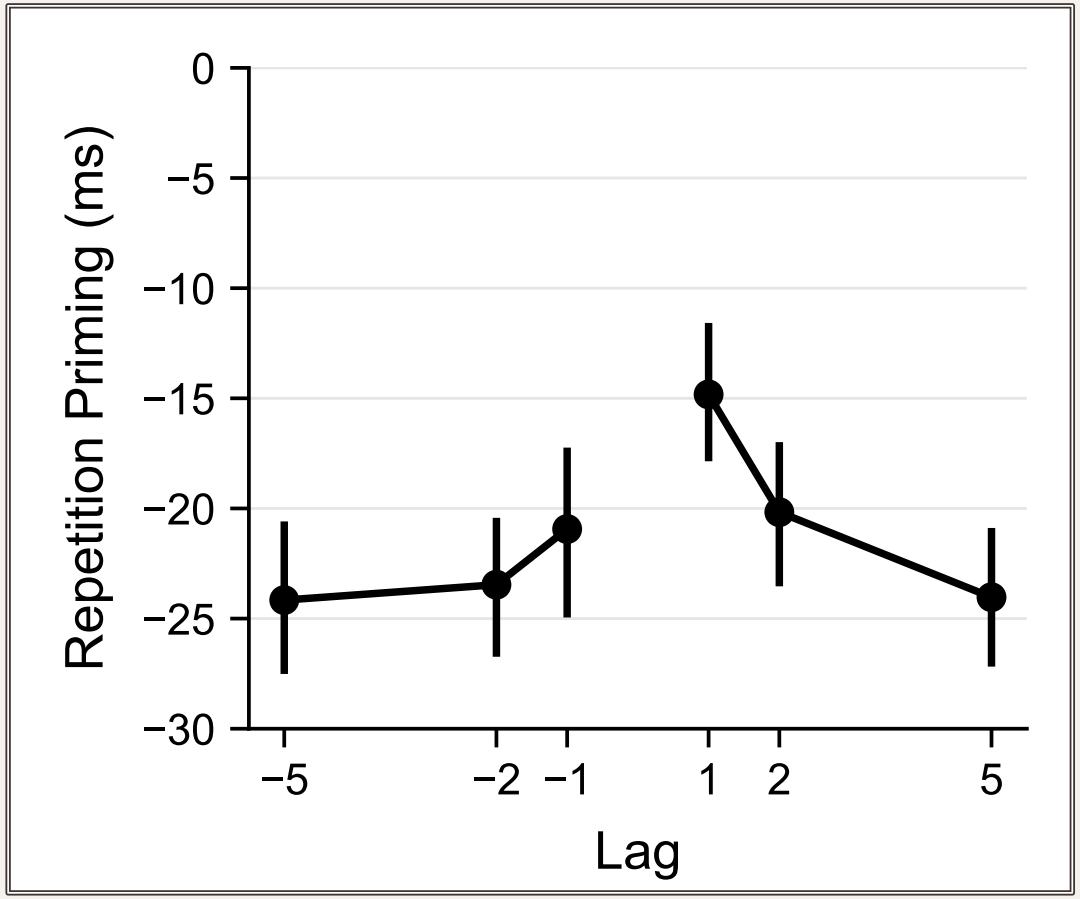
Prediction 2: Associative repetition priming affected by initial lag



Prediction 2: Associative repetition priming affected by initial lag

- Repetition priming for target at all initial lags
- Effect of lag on magnitude of repetition priming effect
  - **Less** repetition priming at initial *lag = +1*





Error bars represent bootstrapped 95% CI

Temporal Information Automatically Retrieved

- Temporal information is both automatically encoded and automatically retrieved
- Generally consistent with Retrieved Context Theory
  1. Associative repetition priming even for items not explicitly paired together
  2. Associative repetition priming affected by the temporal distance between items during initial exposure
     - **Less** repetition priming when Cue and Target experienced in the same order on both presentations

References

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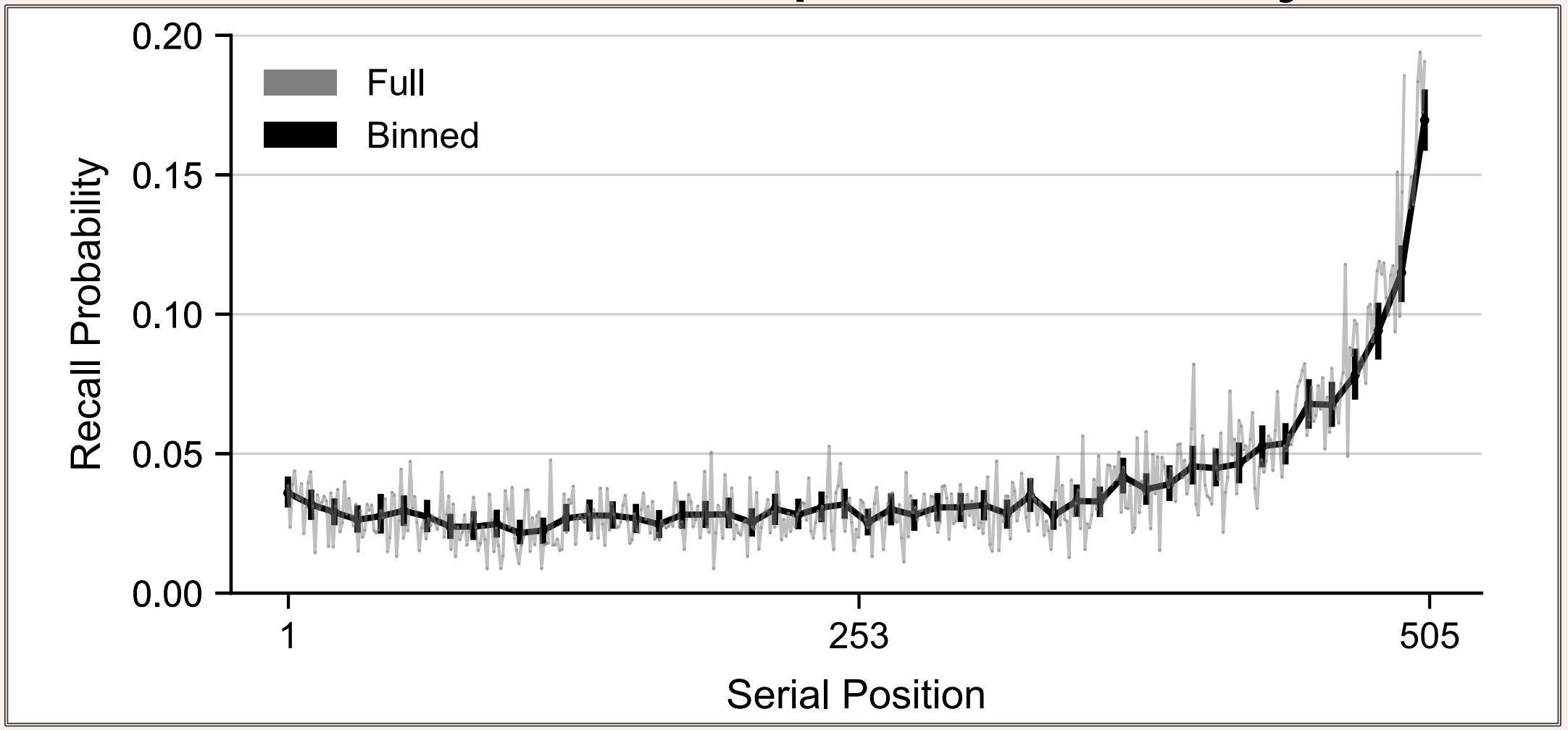
Results – Explicit Memory



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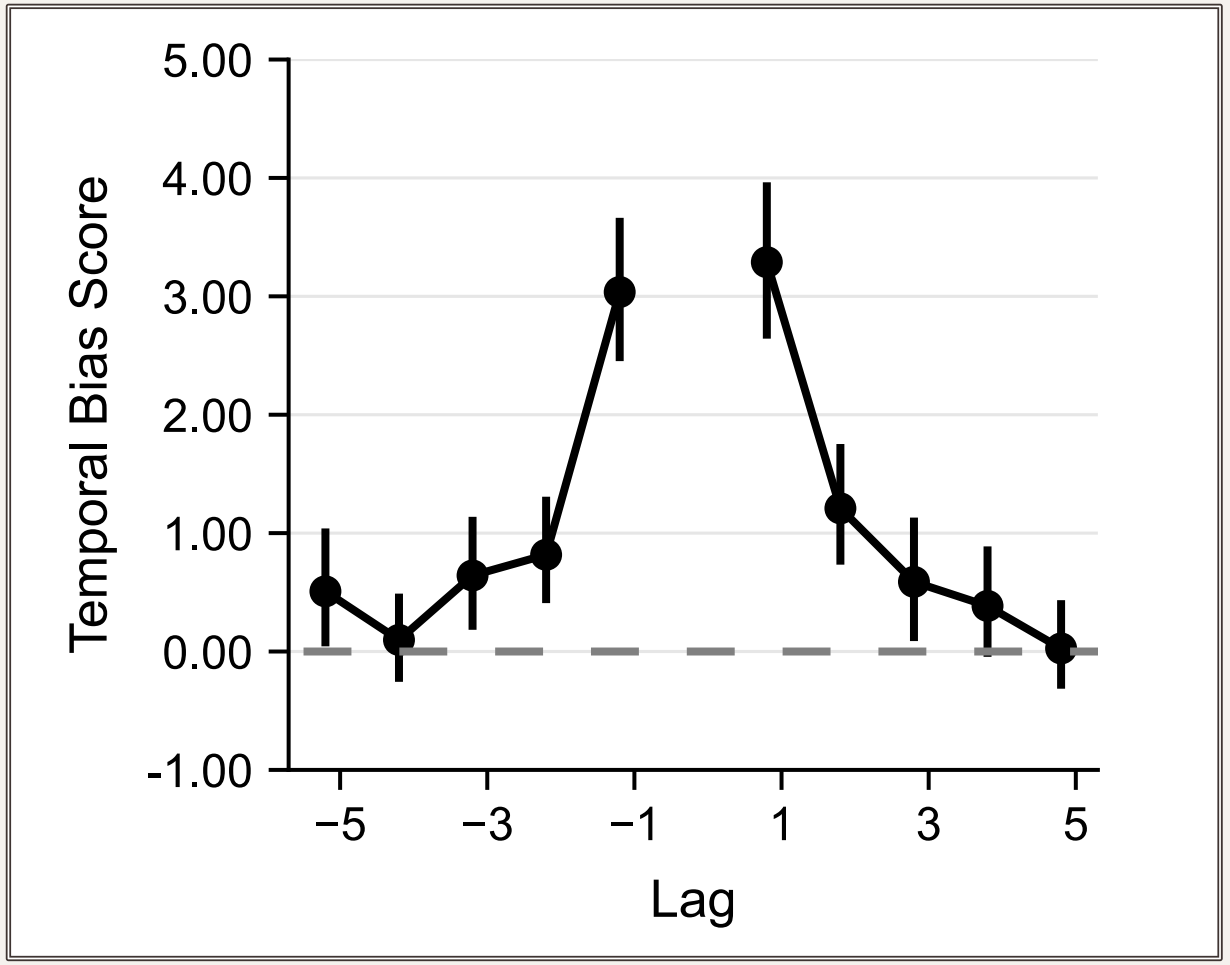

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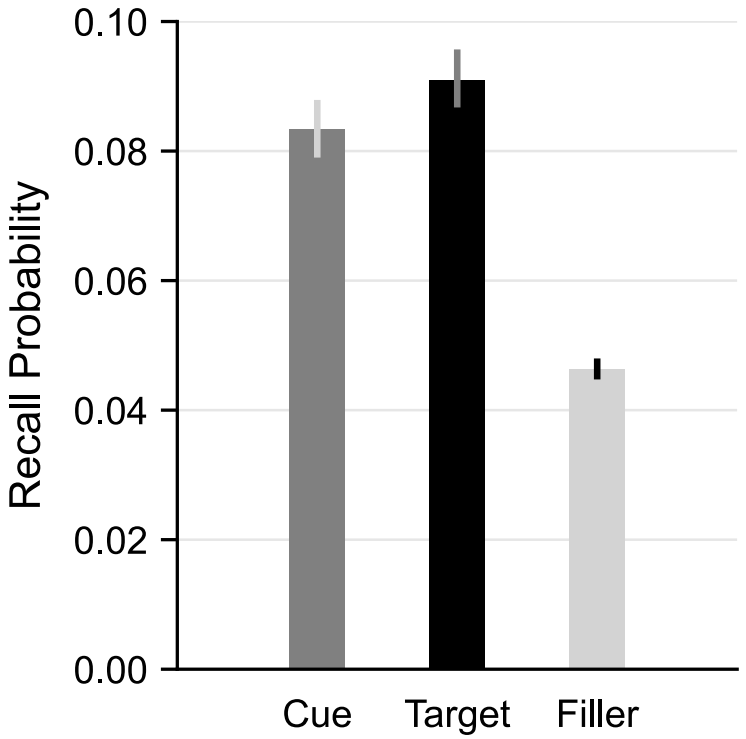
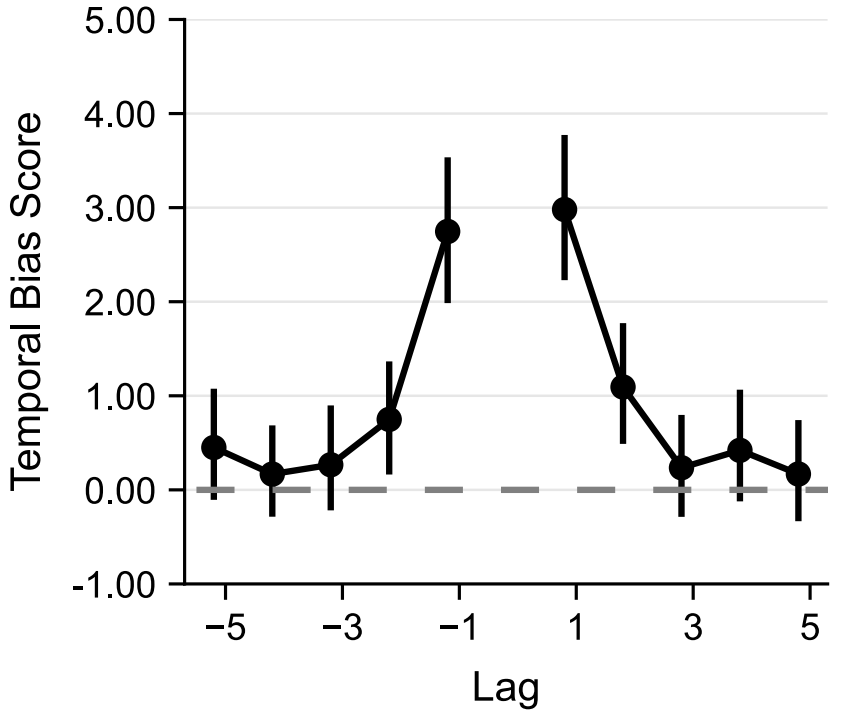
Explicit results





Demographics

- 83.4% of full sample included in analyses
  - Excluded for suspecting a memory test
- 78.7% female
- Mean age was 19.7 years (*SD* = 1.9)