Effects of a Distinctiveness Manipulation on Metacognitive Retrieval Monitoring

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Encoding Affects Metacognitive Judgments

- Metacognitive judgments about memory like feeling-of-knowing (FOK) are influenced by variations in quality of encoding
  - (e.g., Hertzog et al., 2010; Lupker et al., 1991; Nelson et al., 1982; Sacher et al., 2014)

- Quality of encoding affects FOK accuracy (resolution) for unrecalled items
  - Resolution: within-person correlations of FOKs with recognition memory outcomes

- High-quality encoding operations (e.g., repetition, 'deep' orienting tasks, associative mediators [interactive imagery] create noncriterial recollection of encoded features & context that benefits FOK accuracy, even when target itself cannot be recalled
  - Hertzog et al., 2014; Isingrini et al., 2016

High Confidence Memory Errors

- (retrospective) Confidence Judgments (RCJs) after recognition memory tests are often relatively accurate with standard materials

- However, false memories are often characterized by high subjective confidence in incorrect memory responses

- DRM paradigm: critical lure recalled or recognized with high CJs

- Encoding for item distinctiveness (Hunt & Worthen, 2006) is one means of reducing false memories
  - (Hunt & Smith; Thomas & Summers;

Distinctiveness and Metacognition

- We follow the approach of Reed Hunt, Rebekah Smith, and colleagues in evaluating distinctiveness effects

- Distinctiveness: Distinctiveness can be created by processing item differences in the context of item similarity (Hunt, 2013)

- General question: will manipulating item distinctiveness affect FOK and RCJ resolution, in a manner that reduces the magnitude of false memory effects?

- Distinctiveness known to affect judgments of learning, but little is known about relation of distinctiveness encoding on FOKs and FOK accuracy
  - Challenge: FOK resolution for associatively related items is high (for all items) but at chance for unrecalled items (Eakin & Hertzog, 2012a, b)

First Session

- 4 concrete nouns drawn from taxonomic category presented in column

- Category queried, then explicitly presented exactly as cued in future

- One element highlighted in RED FONT to designate it is the target for future recall
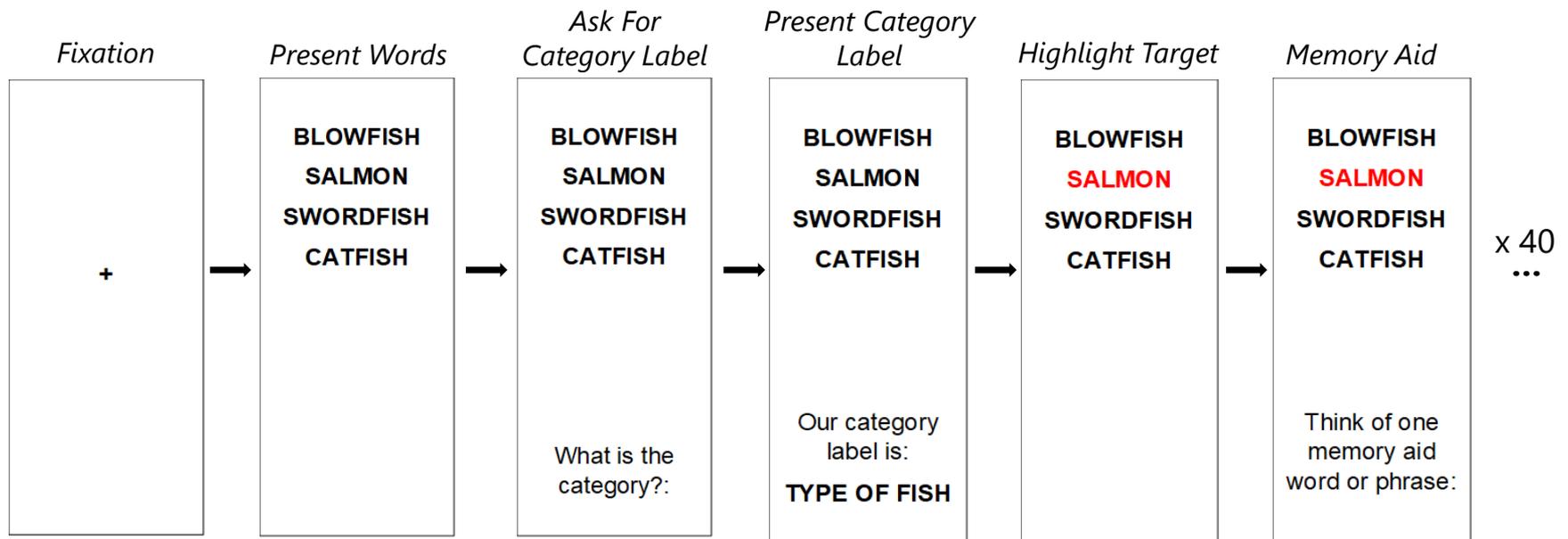
Between-Subjects Manipulation

- At final stage of item study individuals prompted to type in a feature that is shared by all 4 nouns (similar) or distinguishes the target from its companions (item distinctiveness)

Think of one memory aid word or phrase that you know is SHARED between the word in red and the other words:

OR

Think of one memory aid word that you know is DISTINCT about the word in red compared to the other words:

Feature Generation Examples

- Distinctiveness manipulation: Generate either a SHARED feature of all nouns OR a DISTINCTIVE feature for the designated target

- Example from Fish category, taken from actual responses

BLOWFISH
SALMON
SWORDFISH
CATFISH

Shared memory aid example:
- "Live under water"

Distinctive memory aid example:
- "Jumps up stream"

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Encoding Instruction Compliance

- Participants successfully followed instructions to produce shared vs distinctive feature

- Qualitative coding of participant responses

- Memory aid compliance:
  - Similarity: 93%
  - Difference: 96%

Second Session

- Hart Recall-Judge-Recognize task

- FOK after category-cued recall attempt for all items

- 5-Alternative Forced Choice recognition test (target, 2 OLD lures (presented at study), 2 NEW lures from category norms)

- RCJ collected after each recognition response

Fixation	Cued Recall	FOK	Fixation	5AFC	RCJ
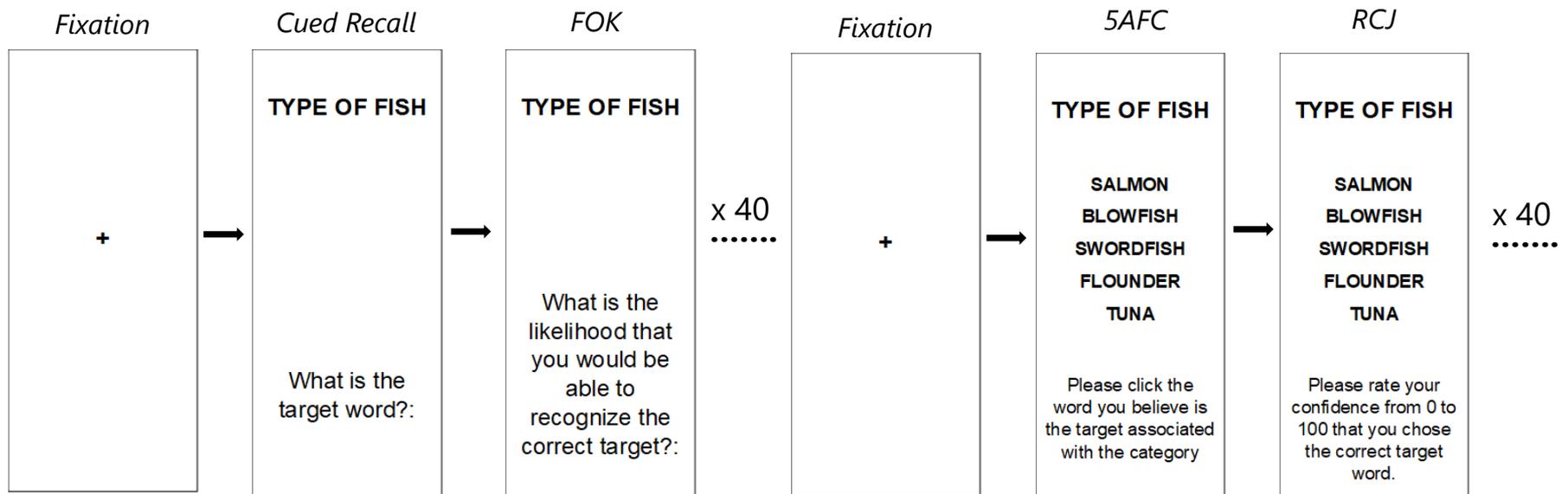
- Participants (N = 86) volunteers from Psychology participant pool randomly assigned to: Similar (n=43) vs. Difference (n=43) encoding

- Stimuli constructed from van Overschelde et al (2011) noun category norms omitting 2 highest typicality items but allowing typicality of selected nouns to vary

- Items selected at random to serve as target, co-presented nouns, and new lures in 5AFC test

- 7-day delay between Session 1 and 2 to bring memory performance for Difference encoding off ceiling
  - (selected after pilot data & based on previous FOK experiment in our lab manipulating repetition (Hertzog, Dunlosky, Sinclair, 2010)

Hypotheses

- Generating Distinctive feature (relative to Shared feature) at encoding will:

  1) Increase FOK magnitudes (FOKs sensitivity to type of encoding)

  2) Increase FOK accuracy (resolution: gamma correlations) for all items & for unrecalled items

  3) Increase RCJ accuracy, (resolution: gamma correlations) for all items by reducing false memory effect

  4) Reduce high-confidence 5AFC false alarms (false memories)

Distinctive encoding improves both recall and recognition memory with large effect sizes
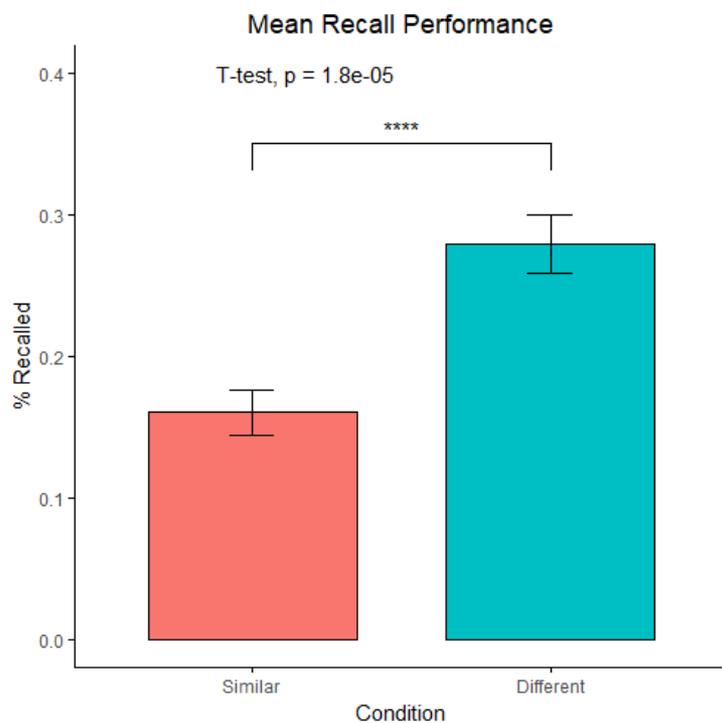
d = 0.980
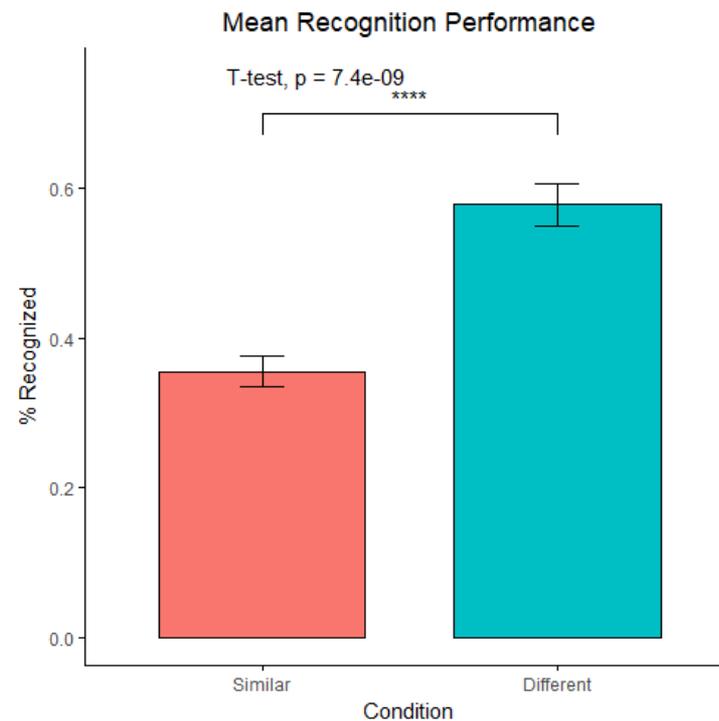
d = 1.387

Distinctive encoding affects mean FOKs for all items, but unreliable effect on FOKs for unrecalled items
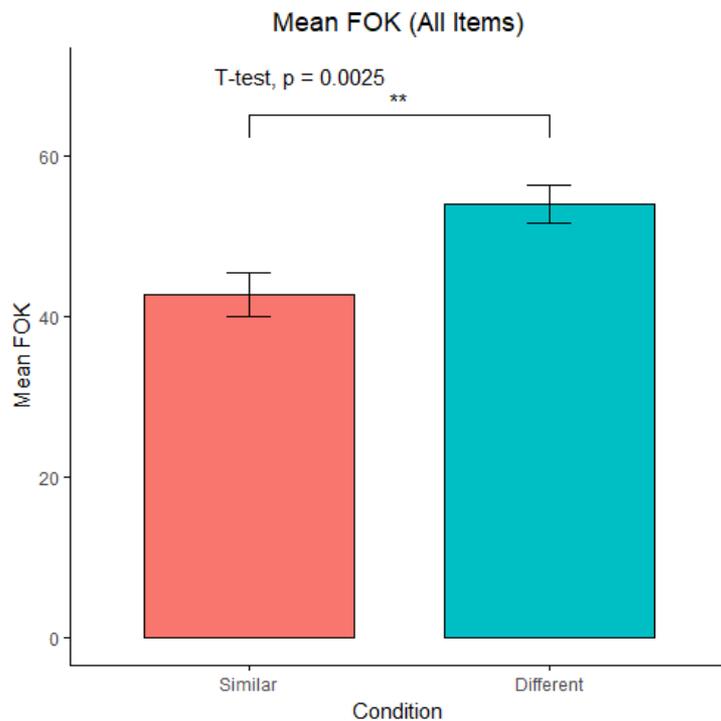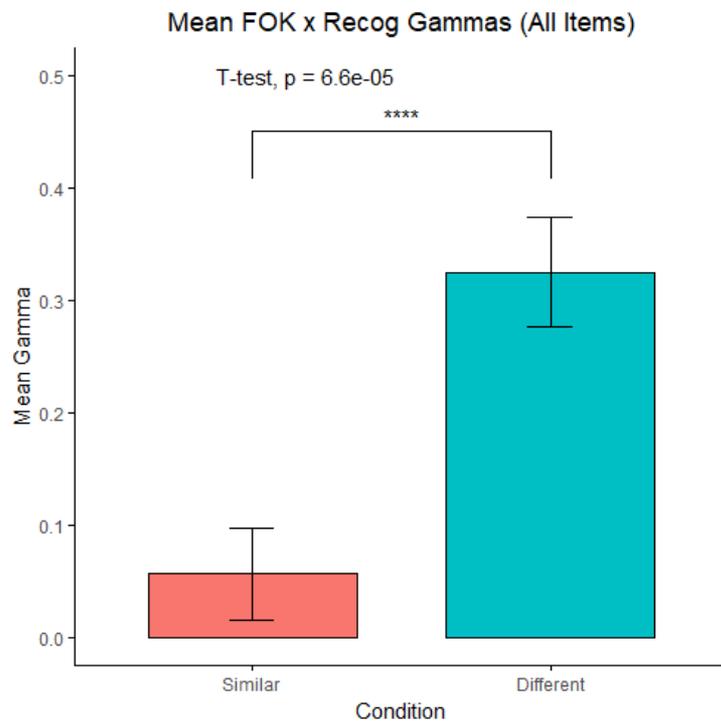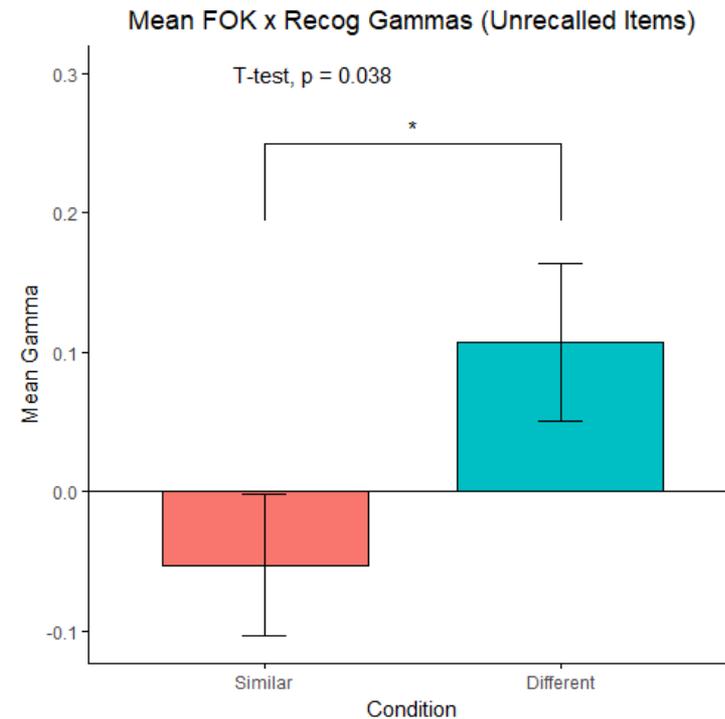

d = 0.672   *d* = 0.303
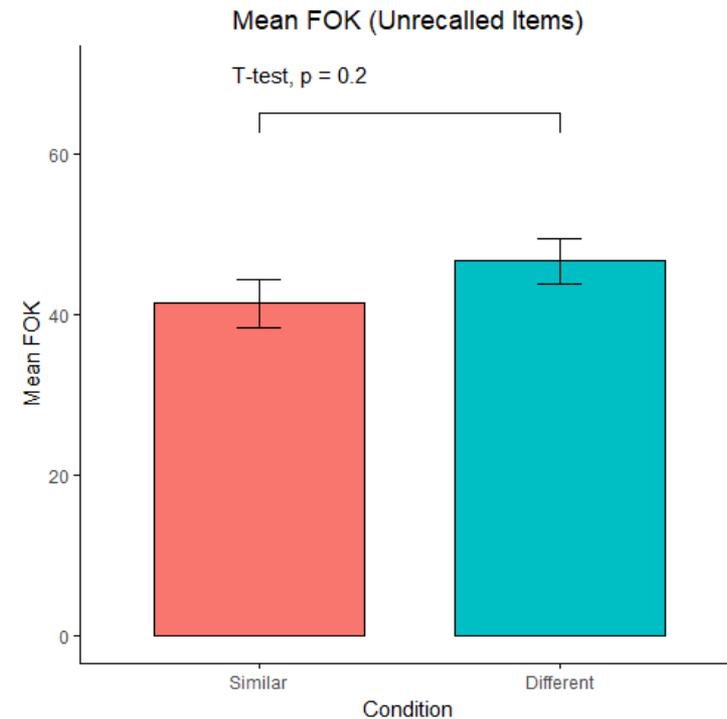
13

Distinctiveness affects FOK resolution for all items and for unrecalled items alone; chance gamma for Similar condition for all items
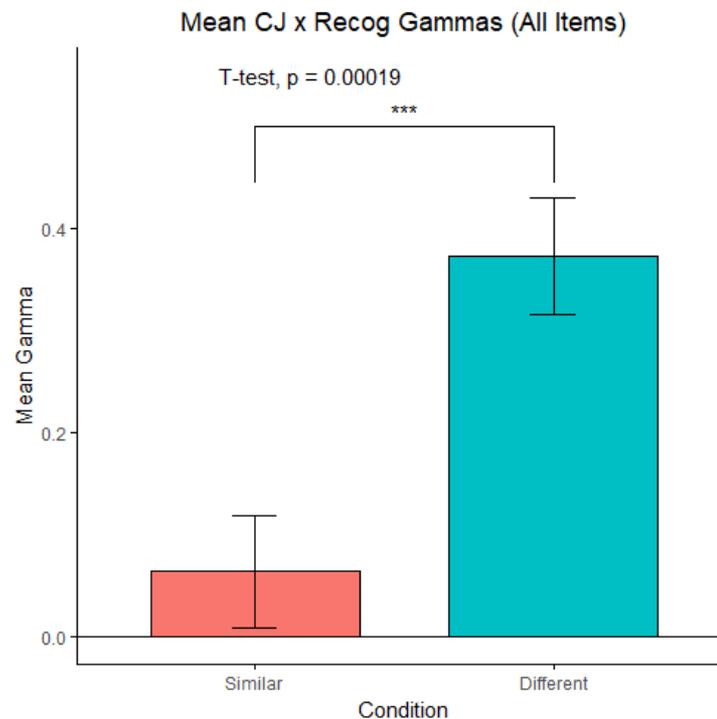

d = 0.917

d = 0.461

14
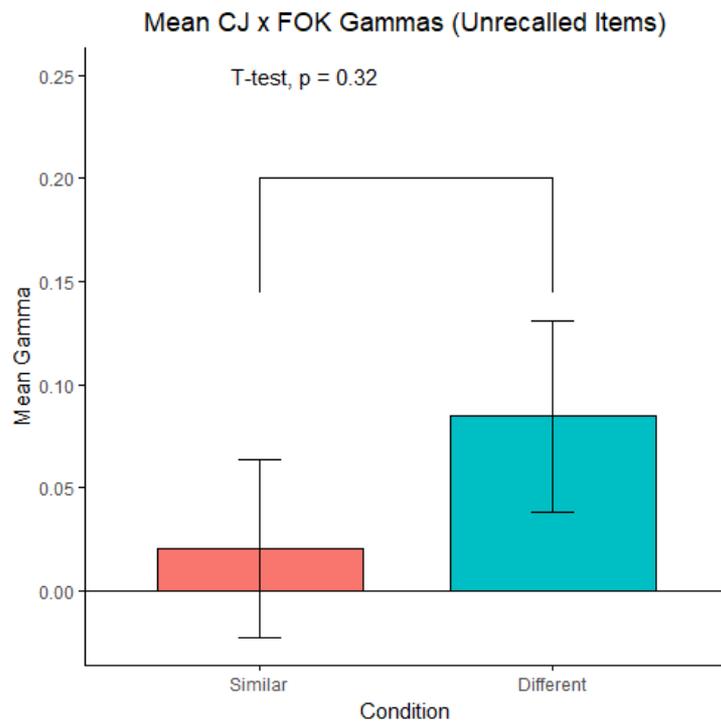
Distinctiveness affects RCJ resolution for all items

- Surprisingly low magnitude of gamma in Similarity condition!

Mean CJ x Recog Gammas (All Items)
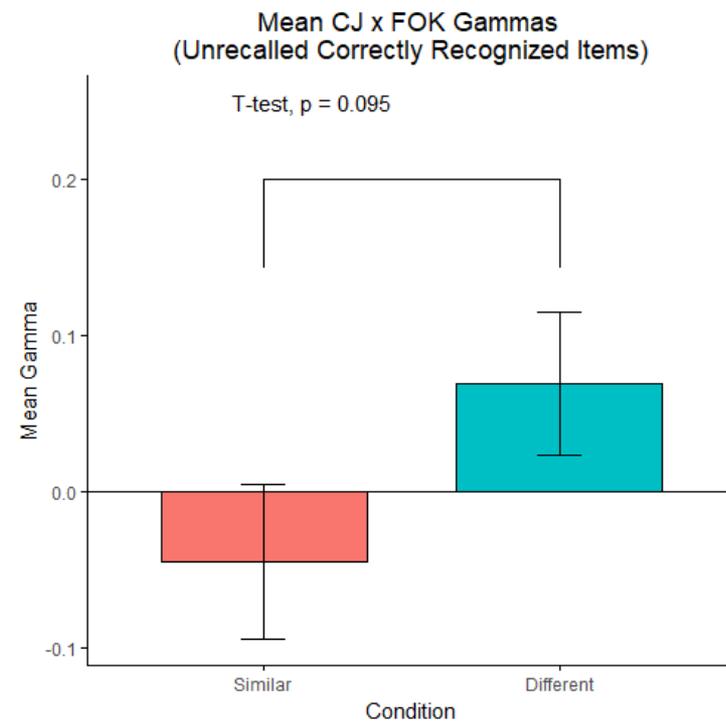
d = 0.846

FOK-RCJ correlation for correctly recognized items

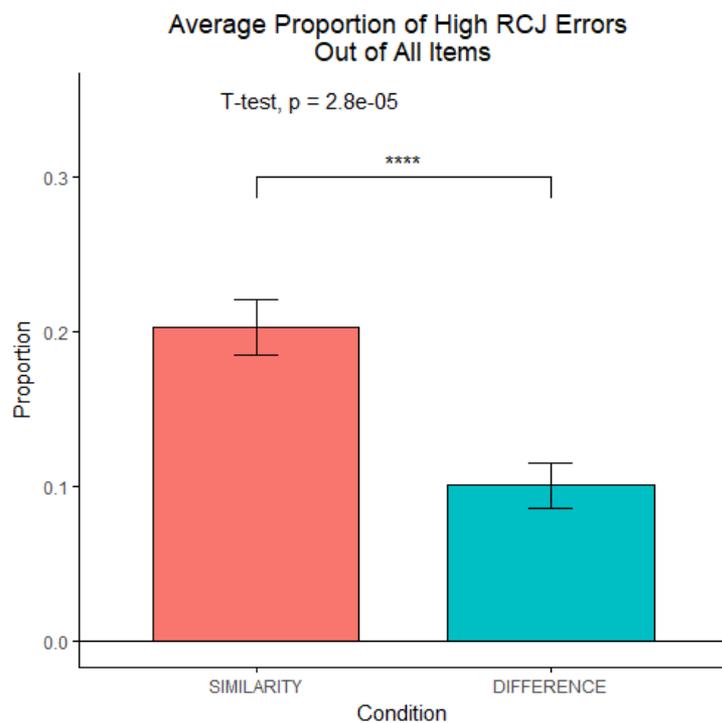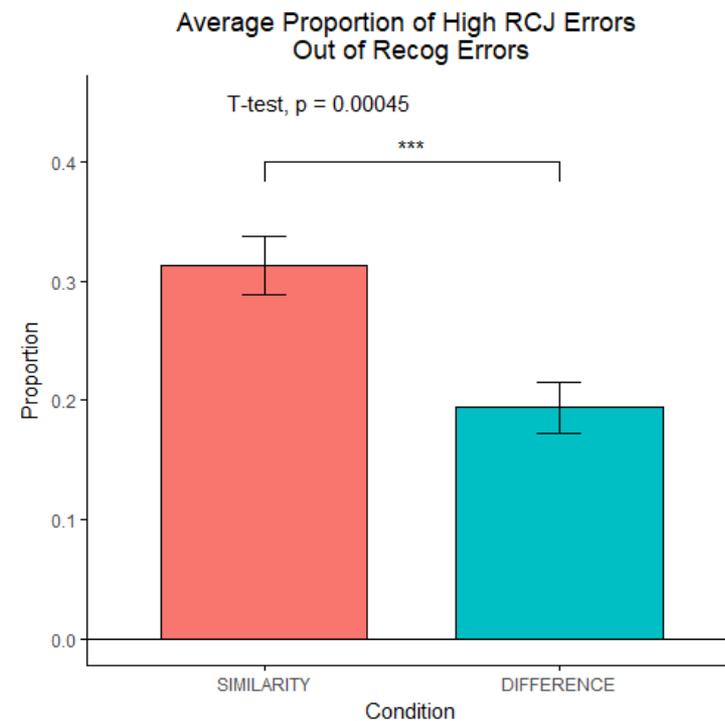- No reliable distinctiveness effect

$d = 0.221$ $d = 0.369$

False memory revealed by high-confidence memory errors that are more likely for Similarity encoding


Average Proportion of High RCJ Errors Out of All Items

T-test, p = 2.8e-05

****

d = 0.956

Average Proportion of High RCJ Errors Out of Recog Errors

T-test, p = 0.00045

***

d = 0.787

False memory effect generated by familiarity of co-presented exemplars (Old lures vs New lures)
Effect reduced by Difference encoding

Average Proportion of High RCJ Errors
Out of All Errors By Condition and Error Type
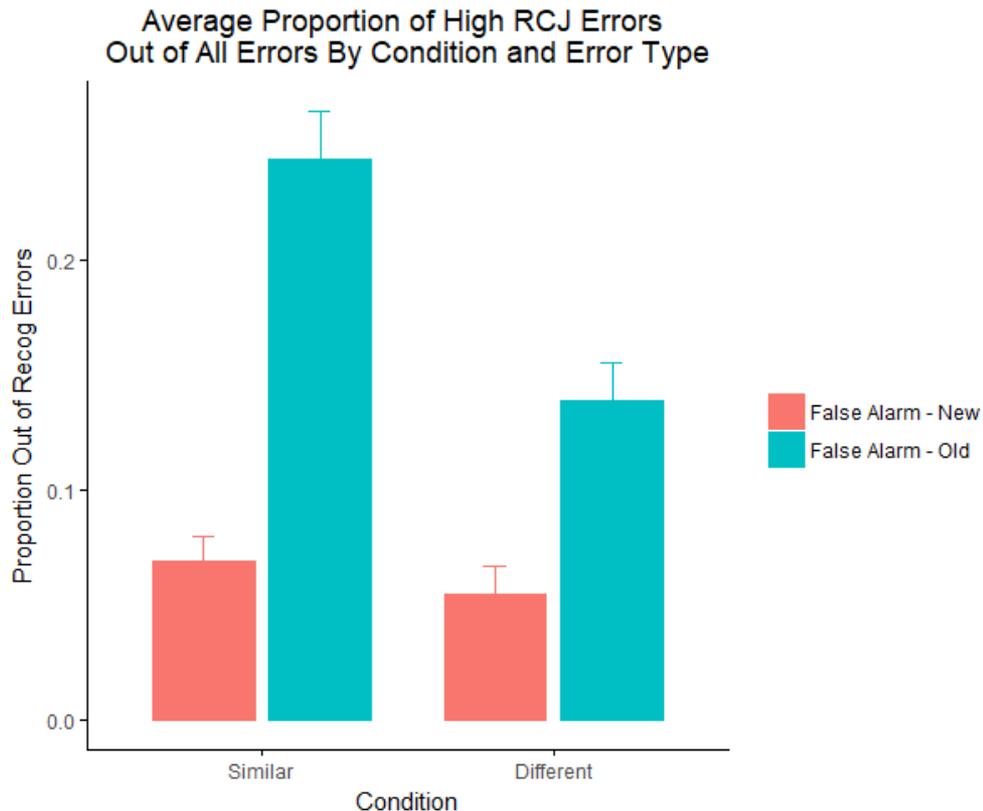
Main effect of Condition:
- $F(1,168) = 14.577$, $p > .05$, $\eta_p^2 = .080$

Main effect of Error Type:
- $F(1,168) = 68.203$, $p > .05$, $\eta_p^2 = .289$

Condition * Error Type Interaction:
- $F(1,168) = 8.559$, $p = .004$, $\eta_p^2 = .049$

Distinctiveness and False Memories

- Data favor 'late correction' view on distinctiveness effects on false memory

- Low RCJ resolution generated by familiarity of co-presented items (old lures), producing higher FA rates than for semantic associates (new lures)

- Difference encoding instructions reduces this effect, increasing RCJ resolution

Conclusions

- Distinctive processing reduces false memories and has a modest benefit for FOK resolution
  - Consistent with other data on encoding quality effects on FOKs

- Degree of false memory in Similarity condition surprisingly large
  - Effect of delay needs to be better established (Goldilocks zone)

- Phenomena amenable to additional experimental manipulation to evaluate how to further increase FOK accuracy with distinctiveness encoding
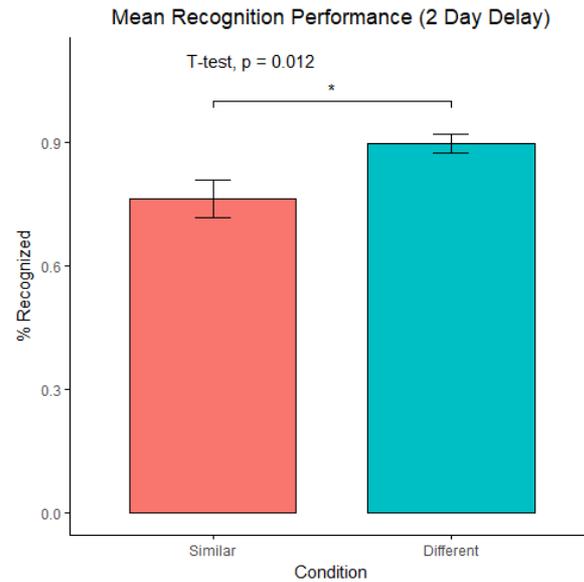
20

QUESTIONS

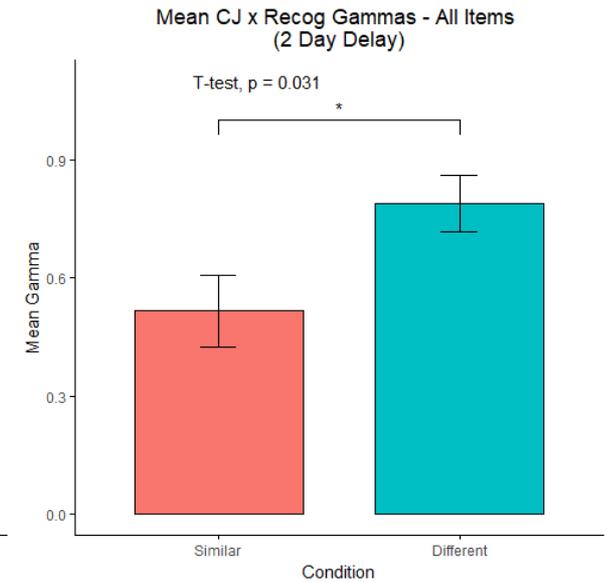## "Goldilocks Zone"

2 days is not long enough to get recognition memory for Difference encoded items off of ceiling!
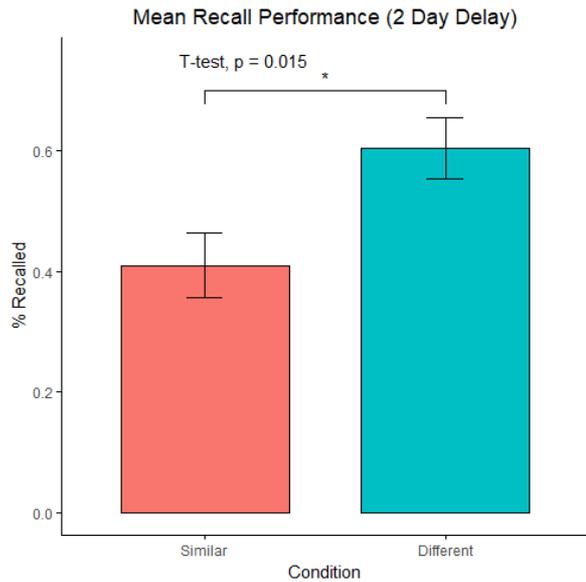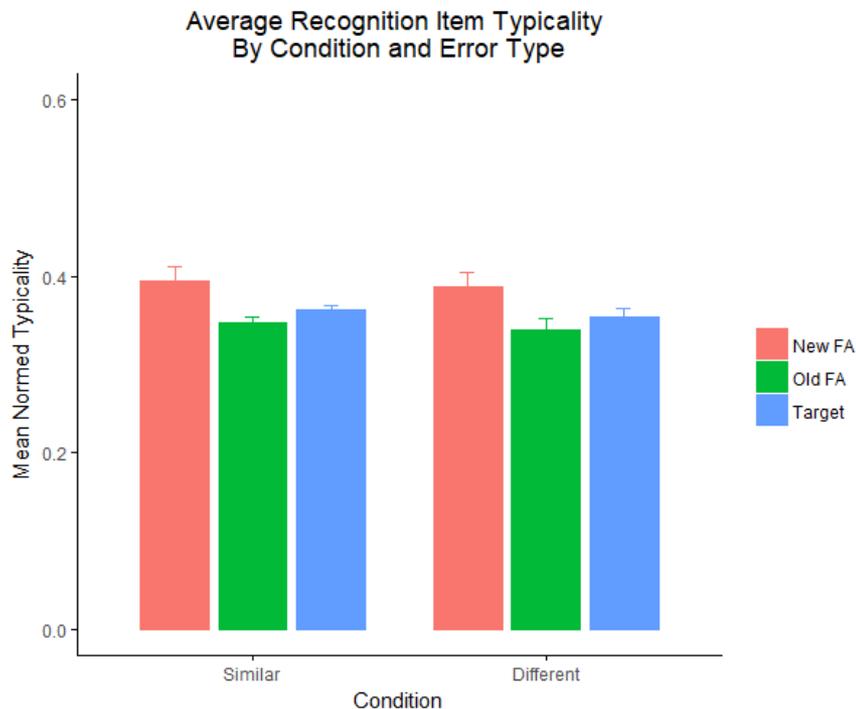

d = 1.011 d = 1.050 d = 0.968

Mean Typicality of 5AFC Responses

Average Recognition Item Typicality By Condition and Error Type

Main Effect of Error*
- $F_{(2,250)} = 8.683$, p > .005, $\eta_p^2 = .065$

Main Effect of Condition
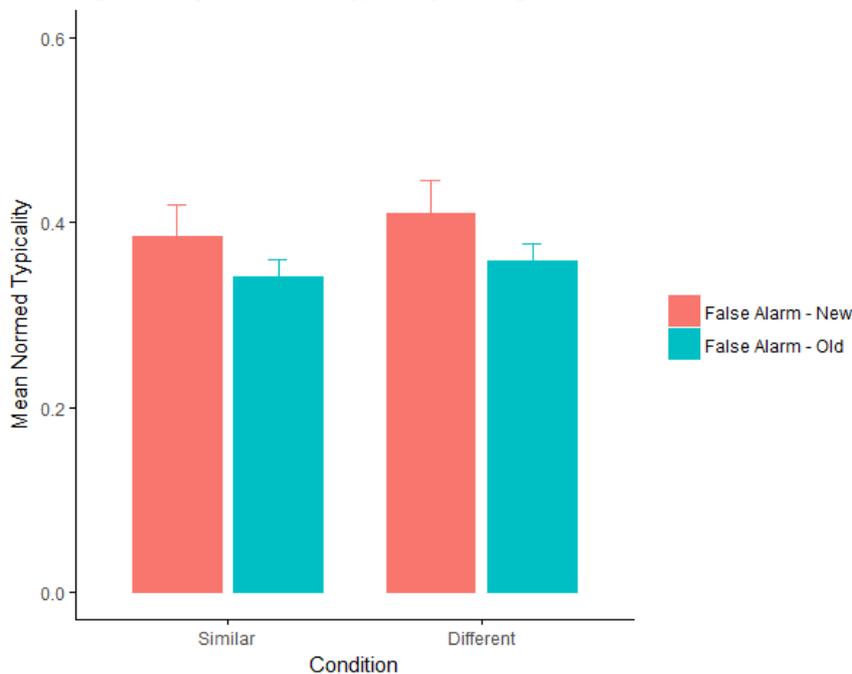- $F_{(1,250)} = .511$, p = .475, $\eta_p^2 = .002$

Error * Condition Interaction
- $F_{(2,250)} = .006$, p = .994, $\eta_p^2 < .001$

Mean typicality for recognition errors with RCJS > median RCJs

Average Recognition Item Typicality for High RCJ Errors

Effect of Error:
- $F(1,106) = 3.036$, $p = .08$, $\eta_p^2 = 0.028$

Effect of Condition:
- $F(1,106) = 0.367$, $p = .546$, $\eta_p^2 = 0.005$

Error * Condition Interaction:
- $F(1,106) = 0.026$, $p = .872$, $\eta_p^2 > .001$

- Typicality for false alarms for new category items is greater than those for false alarms for previously-seen category items.

- Keep in mind that despite the lack of difference, Similar condition had significantly more high-RCJ errors than Difference condition (see Slide 18).