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Towards a Cognitive Model of Collaborative Memory

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Roadmap

I. Theoretical Background
   1. Collaborative Recall and Inhibition
   2. Possible Mechanisms for Collaborative Inhibition
      a. Social Factors
      b. Production Blocking
      c. Retrieval Disruption Hypothesis
   3. Collaborative Effects

II. Modeling Collaborative Memory
   1. SAM
      a. How SAM works
      b. Modifications for Collaborative Recall
   2. Model Fits
      a. Uncategorized Data
      b. Categorized Data

III. Conclusion

1. Collaborative Inhibition in Free Recall

2. Collaborative Inhibition in Free Recall

What is the underlying mechanism?

1. **Social Factors**: motivation and social interaction, social loafing
2. **Production Blocking**: waiting to contribute blocks recall ability (forgetting while waiting)
3. **Retrieval Disruption Hypothesis**: idiosyncratic search strategies disrupted by “cues” from group members

2a. Social Factors

- Social loafing, the tendency for group members to not work as hard in a group setting as they would have alone (Latane, Williams, & Harkins, 1979).
- Implied by previous group research
  - Bystander intervention (Latane & Nida, 1981)
  - Physical activities (rope pulling; Ingham, Levinger, Graves, & Peckham, 1974)
  - Cognitive tasks (brainstorming; Diehl & Stroebe, 1987)

2b. Production Blocking

- The process of waiting to contribute while other group members produce responses blocks the ability to recall information
- Originates from brainstorming literature
- Cue type (part-set vs. extra-list) and cue presentation (beginning of recall vs. throughout recall) manipulations suggest two types of inhibition (Andersson et al., 2006)
- **Production blocking can’t be ruled out, but can’t fully account for collaborative inhibition**

2c. Retrieval Disruption Hypothesis

- Idiosyncratic search strategies disrupted by “cues” from group members
- Originates from mechanistic explanation for part-set cuing effect
- Cues from group members are thought to be part-set cues

Part-set Cuing Effect

- Individual memory analogue to collaborative inhibition
- When an individual is presented with a random selection of a memorized list as cues, their recall for the remaining words on the list is inhibited
- Cues *must* be randomized to see inhibitory effect

2c. Retrieval Disruption—Experimental Support

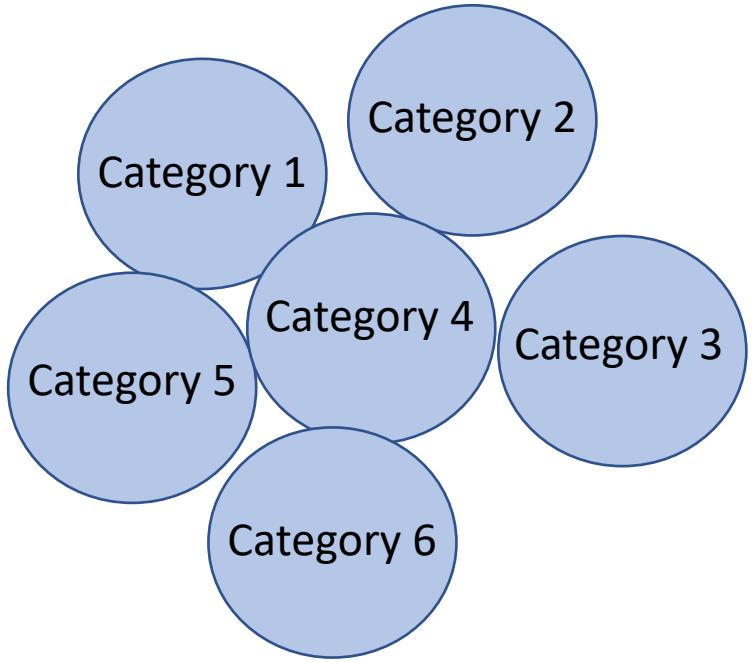
- Basden et al. (1997) predict that collaborative inhibition is stronger when study materials were less organized

2c. Retrieval Disruption—Experimental Support

Large vs. Small category sizes, List Size = 90

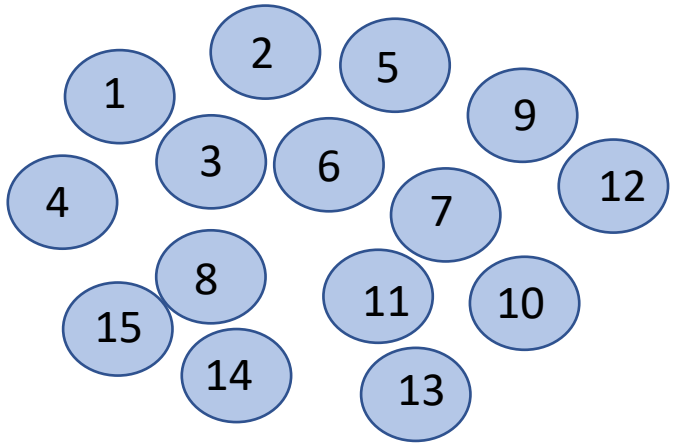
Large (cat size = 15),

Less organized



Small (cat size = 6),

More organized



2c. Retrieval Disruption—Experimental Support

- Basden et al. (1997) predict that collaborative inhibition is stronger when study materials were less organized
- Collaborative inhibition is temporary (Finlay, Hitch, Meudell, 2000)
- Collaborative inhibition is reduced after collaborative encoding (Finlay, Hitch, Meudell, 2000)
- Collaborative inhibition is non-existent in cued recall (Finlay, Hitch, Meudell, 2000)

3. Collaborative effects

- **Category Size:** as category size increases, CI increases
- **Relationships/Communication**: spouses with good communication = decreased CI
- **Memory Task Type:** CI found in episodic free recall but not recognition or semantic recall
- **Age:** young children show more CI than older children
- **Expertise:** experts experience collaborative facilitation
- **Group Size:** as group size increases, CI increases

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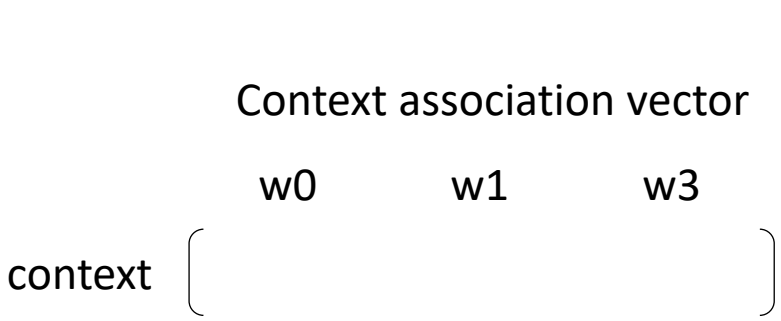
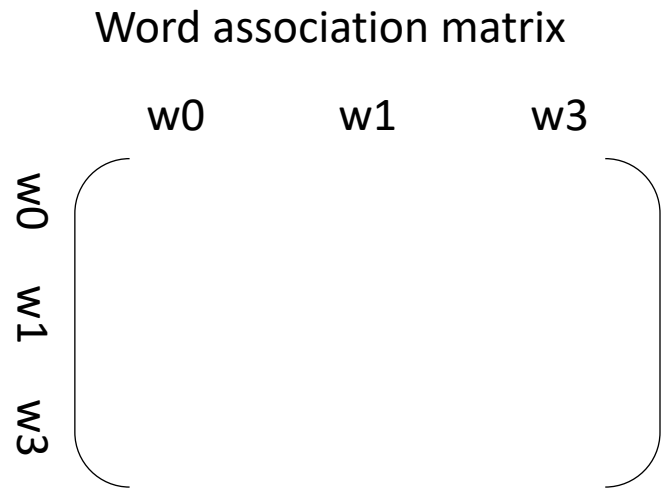
1. Search of Associative Memory (SAM)

- Cue-dependent probabilistic search theory of retrieval
- Typically applied to simulations of free recall and free recall with cues
- well-studied and most widely used in the literature
- Can successfully model part-set cuing effect in individual memory (Raaijmakers & Shiffrin, 1981)

1a. How SAM works—Encoding





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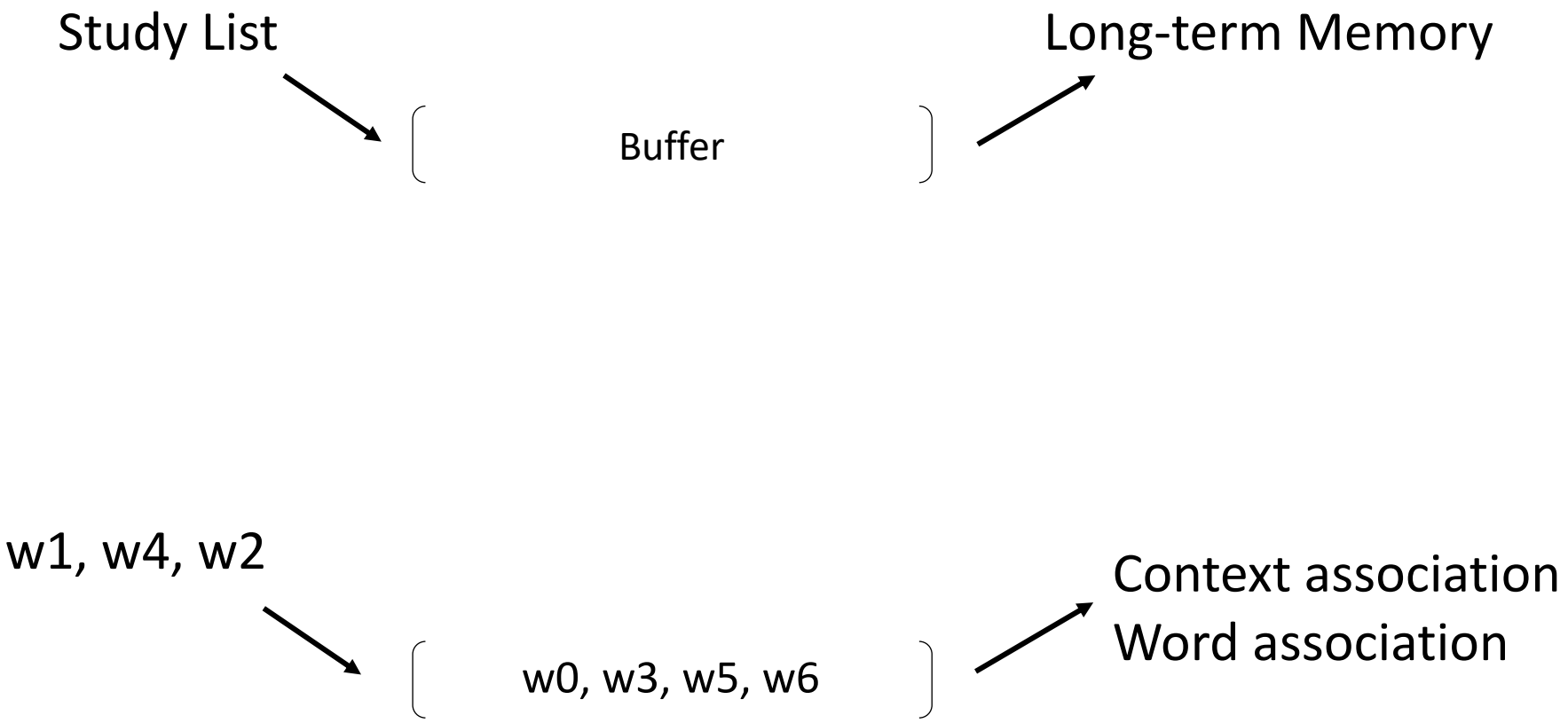
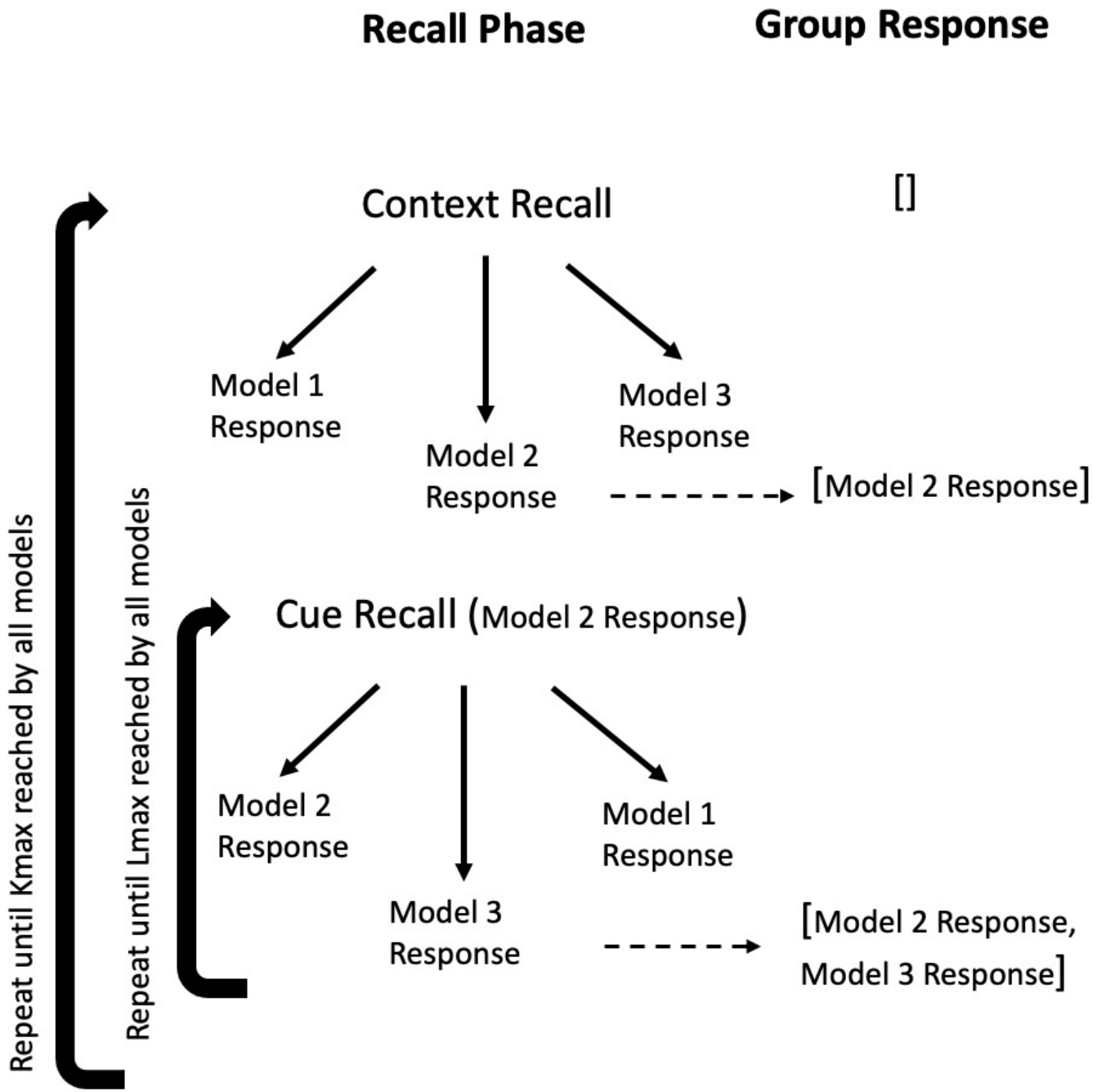


1a. How SAM works—Retrieval

1. Begins Free recall using context as cue
2. Retrieves word-image (more likely when word has high context association)
    1. Increase context-word association, word-self association
3. Uses retrieved word as new cue
4. Retrieves a different word (previously unseen)
    1. Updates word-word, word-self, and word-context association
5. Stop when Kmax is reached (total retrieval failures)

1b. Modifications to SAM for Collaboration

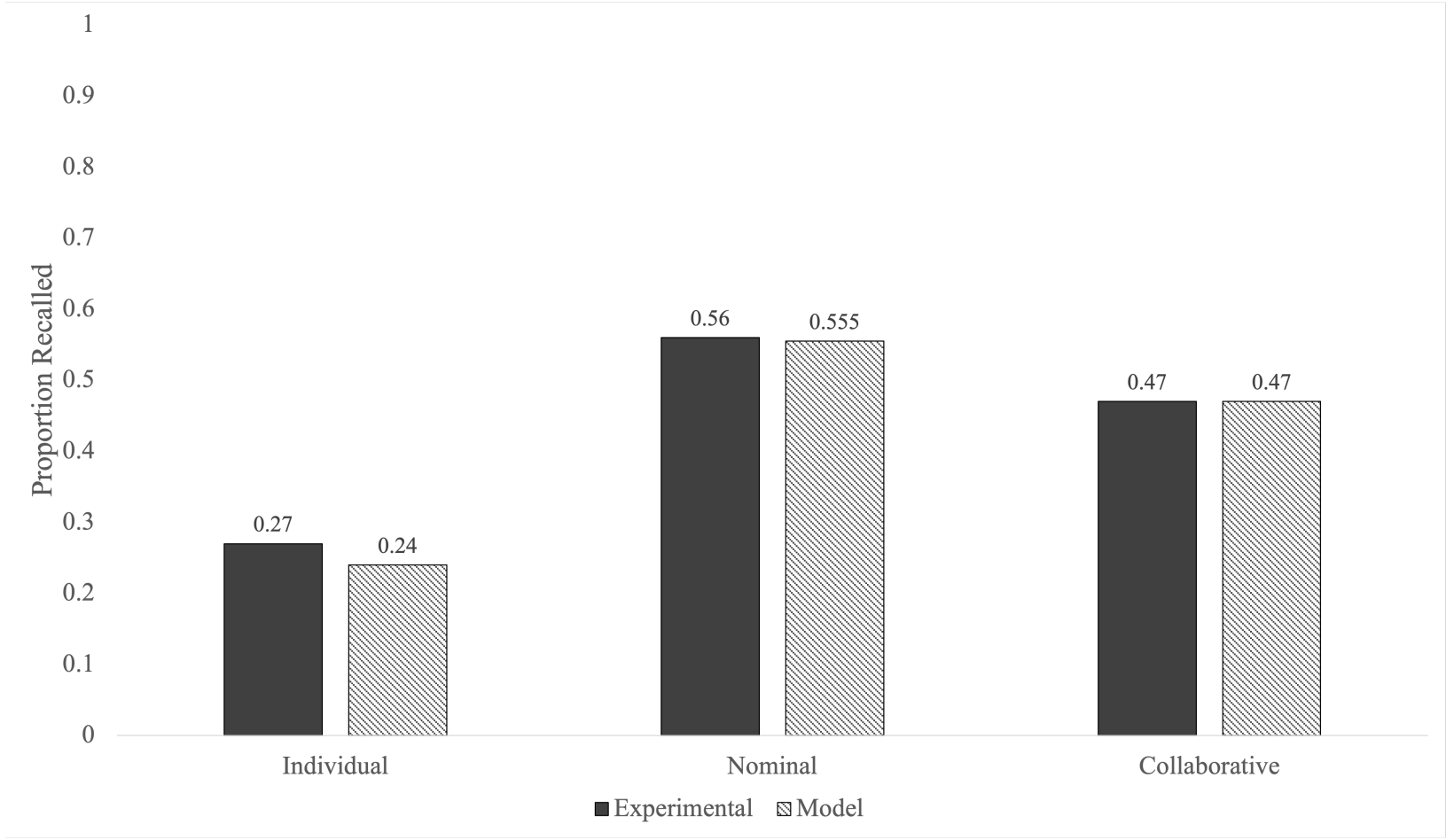
- Multiple SAM models collaborating influence each other
- Encoding is the same
- Retrieval:
    1. Begin with context recall, each model recalls, fastest model response chosen
    2. Previous group response used as word-cue for all models, fastest model response chosen


Recall Phase
Group Response
[]
Context Recall
Model 1 Response
Model 2 Response
Model 3 Response
[Model 2 Response]
Cue Recall (Model 2 Response)
Model 2 Response
Model 3 Response
Model 1 Response
[Model 2 Response, Model 3 Response]
Repeat until Lmax reached by all models
Repeat until Kmax reached by all models

2. Model Fit

- Parameters allowed to vary: **sam_e, sam_f, sam_g, Kmax, Lmax**
  - **sam_e**: incrementing parameter for context to word association
  - **sam_f**: incrementing parameter for word to other word association
  - **sam_g**: incrementing parameter for word to itself association
  - **Kmax**: maximum number of retrieval failures before search process is stopped
  - **Lmax**: max number of retrieval attempts using word cues instead of context

2a. Model Fit—Uncategorized Lists (40)



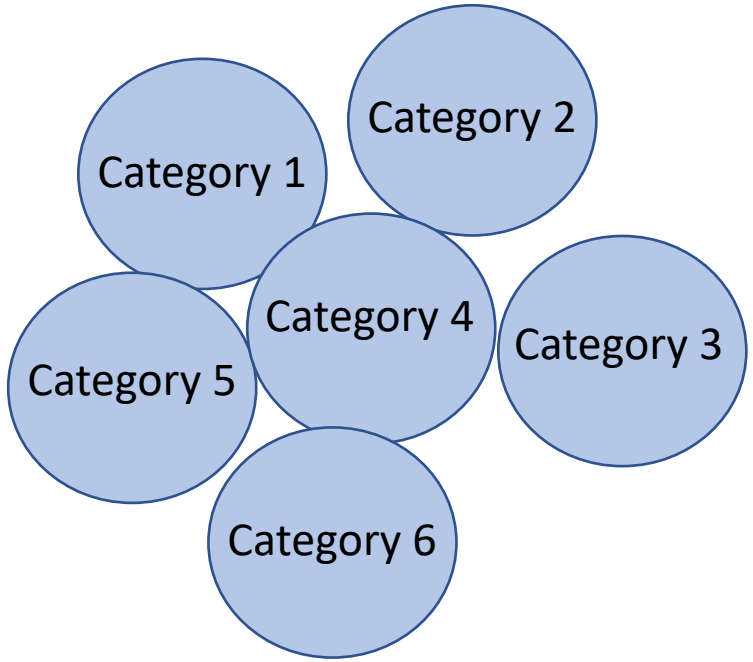
SAM model fit to uncategorized list data taken from the original Weldon and Bellinger (1997) paper detailing collaborative inhibition. Subjects were tested in groups of 3 on a list of 40 unrelated words.

2b. Categorized List Paradigm

Large vs. Small category sizes, List Size = 90

Large (cat size = 15),

Less organized



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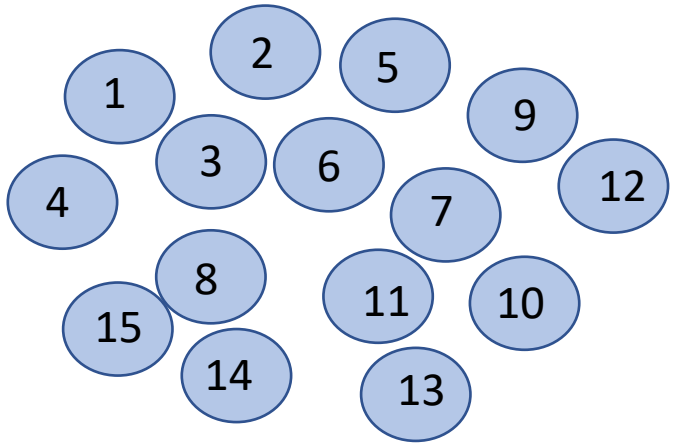
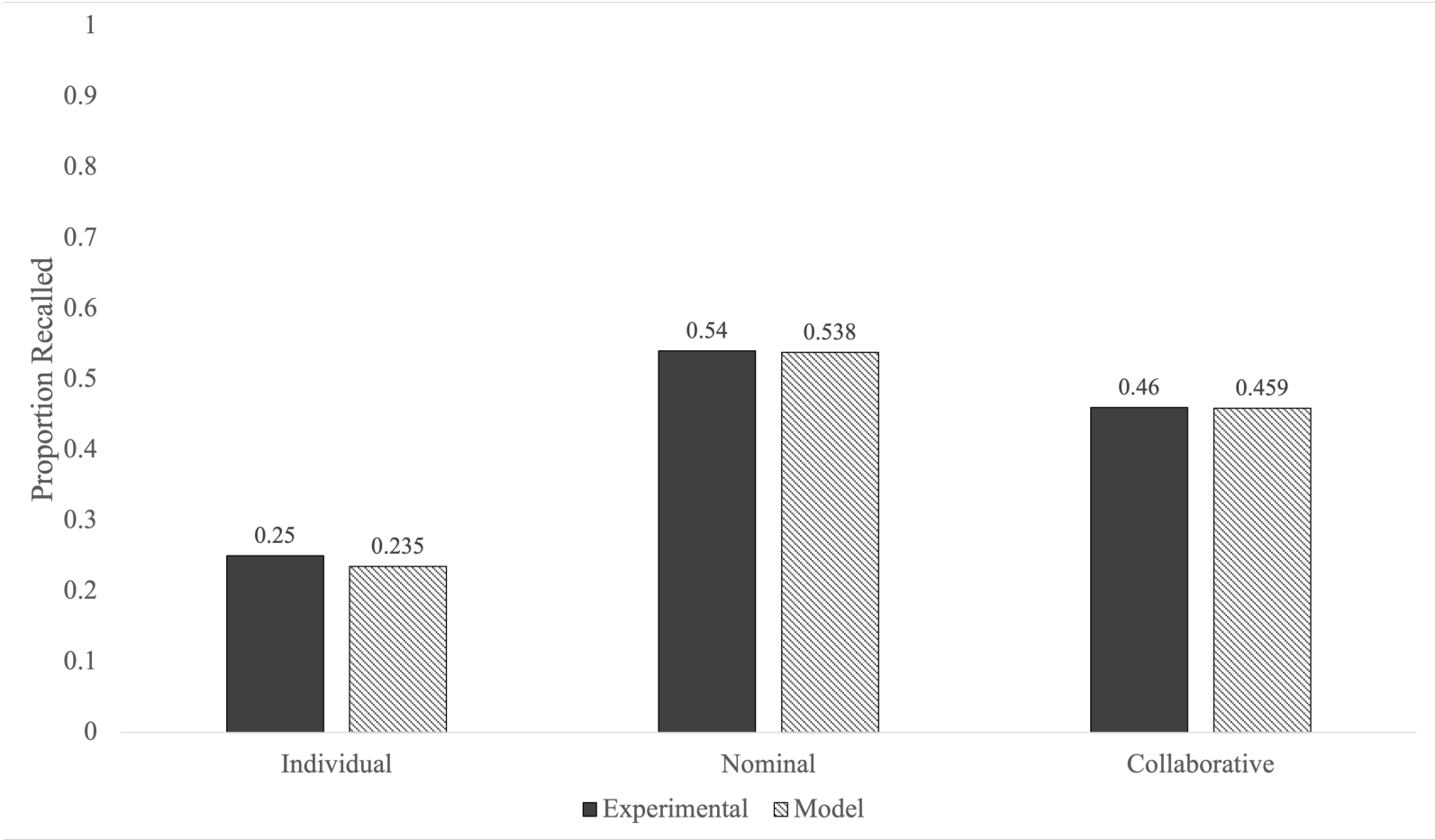
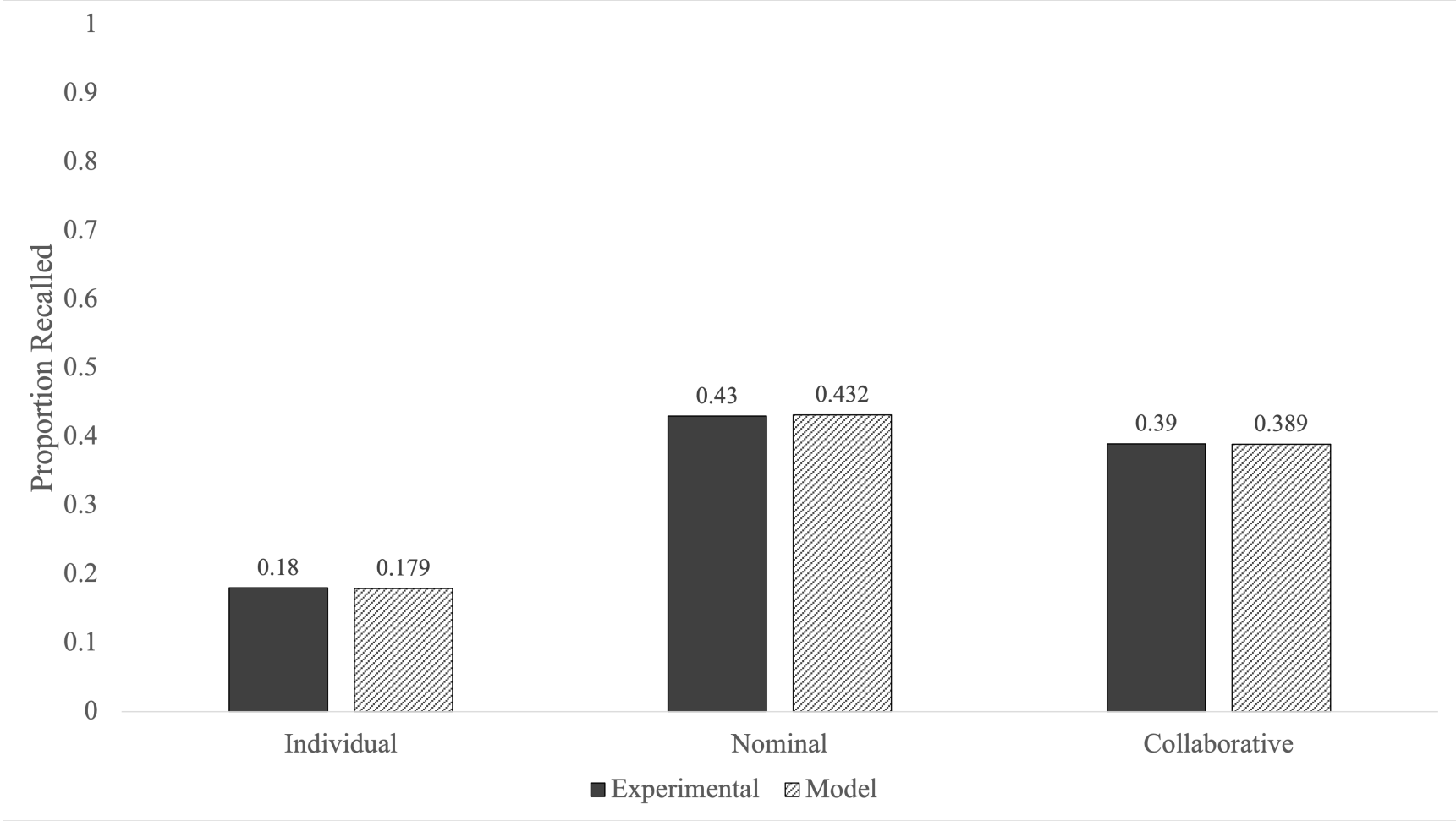


2b. Model Fit—Categorized Lists (Large Category)



SAM model fit to categorized list data from Basden et al. (1997). Subjects in groups of 3 were asked to recall from a list of 90 words grouped into 6 total categories with 15 items in each category.

2b. Model Fit—Categorized Lists (Small Category)



SAM model fit to categorized list data from Basden et al. (1997). Subjects in groups of 3 were asked to recall from a list of 90 words grouped into 15 total categories with 6 items in each category.

What to Takeaway

- First attempt to create a cognitive model for collaborative memory
- SAM can easily produce patterns of collaborative inhibition
- Can easily use these models to investigate phenomena within collaborative memory field

Future Project Goals

- Model group size (4+)
- Model Expertise
- Add Semantic Vectors/use semantic similarity as associations between words

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