Understanding Age Related Memory Impairments: A Model-Based Approach to Theory Development

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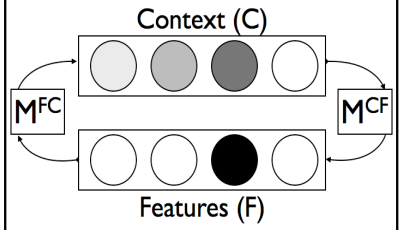
Introduction

- Examination of older adults' (60+) episodic memory using free recall reveals a subtle pattern, including both impaired and spared aspects of performance
- Impaired: Recall probability; temporal contiguity; intrusions
- Spared: initiation of recall
- Can prominent aging theories capture these aspects of performance when implemented in a model of episodic memory?

The context maintenance and retrieval model: Continuous-memory version (CMR2)



- Item Presentation
  - Item activates its features
  - New F-C and C-F associations formed
  - Context is updated via F-C associations
- Item Retrieval
  - Current context is used as a cue
  - Activated items compete for retrieval
  - Retrieved item updates context

Conclusions

- When implemented in CMR2, no theory captured the full pattern of impaired and spared performance
- Without an explicit model, it is difficult to tell if a theory's predictions match the data
- The challenge lies in simultaneously capturing the direction and magnitude of multiple effects

References:
Data from: Kahana, et al. (2002) *JEP:LMC*, 28, 530–540.
Associative deficit theory: Naveh-Benjamin, M. (2000) *JEP:LMC*, 26, 1170–1187.
Inhibitory deficit theory: Lustig, et al. (2007). In, *The place of inhibition in cognition*. 145-162.
Processing-speed theory: Salthouse, T. A. (1996) *Psychological Review*, *103*, 403–428.

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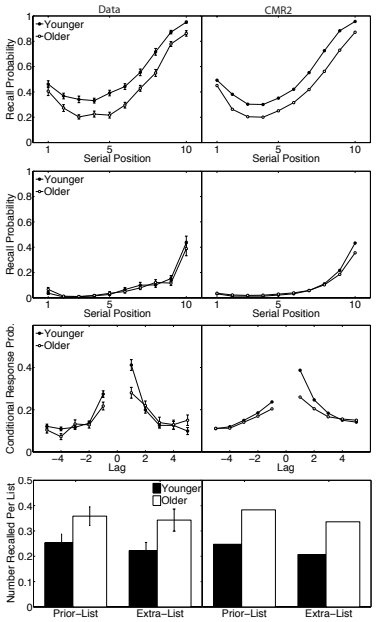
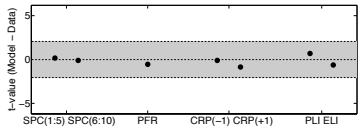
Data and Model Fit

- Free recall data from Kahana et al. 2002
- Allowing all parameters to vary, CMR2 can capture all aspects of impaired and spared memory performance



- Assessing fit: model vs. data t-tests

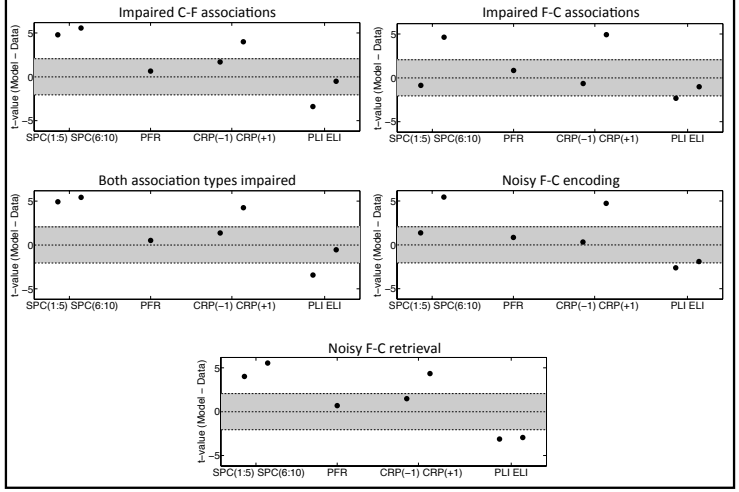


Testing Aging Theories

- Rather than allowing all parameters to vary, we vary only theoretically motivated subsets of parameters
- Translate prominent theories into model terms – map cognitive processes implicated by the theory onto model parameters
- If the theory is adequate, we should be able to simulate older adult free recall data by varying only those parameters

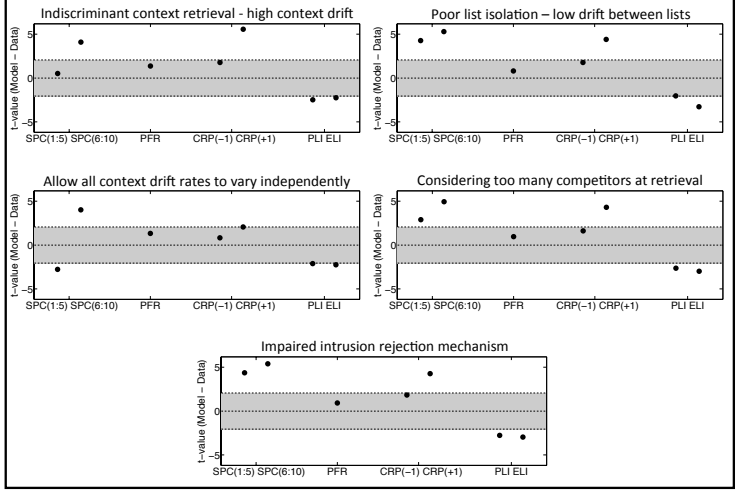
Associative Deficit Theory

Older adults have difficulty forming new associations



Inhibitory Deficit Theory

Older adults have difficulty inhibiting irrelevant memories



Processing-Speed Theory

Older adults' cognitive processing is slowed