Executive control deficits and memory brain state engagement in healthy aging

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Introduction

- Healthy older adults typically have an intact semantic memory but show deficits in episodic memory (Wingfield & Kahana, 2002)
- Healthy older adults have difficulty switching between tasks and inhibiting the retrieval of task-irrelevant information (Kray & Lindenberger, 2000; Hamm & Hasher, 1992; Corbett & Duarte, 2020)
- Memory encoding and retrieval brain states can be decoded from whole-brain activity patterns (Long & Kuhl, 2019; Smith, Moore & Long, 2022)
- Retrieving the past comes at the expense of encoding the present (Long & Kuhl, 2019)

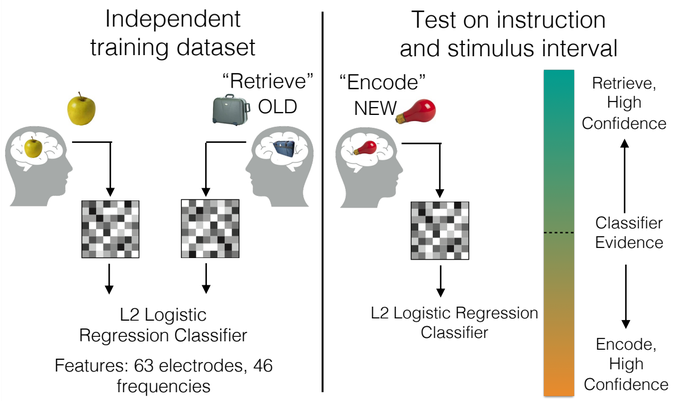
Hypothesis

- Older adults experience episodic memory impairments due to deficits in tasking-switching coupled with a bias towards the retrieval state

Participants

- Older adults: 60-85 years old, N = 42
- Young adults: 18-35 years old, N = 9†

Cross-study multivariate pattern analysis (MVPA) approach



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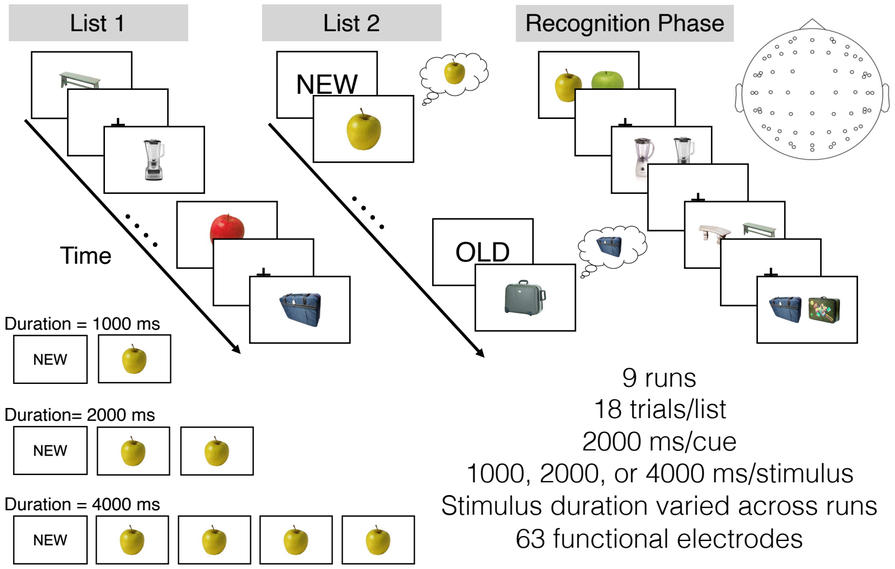
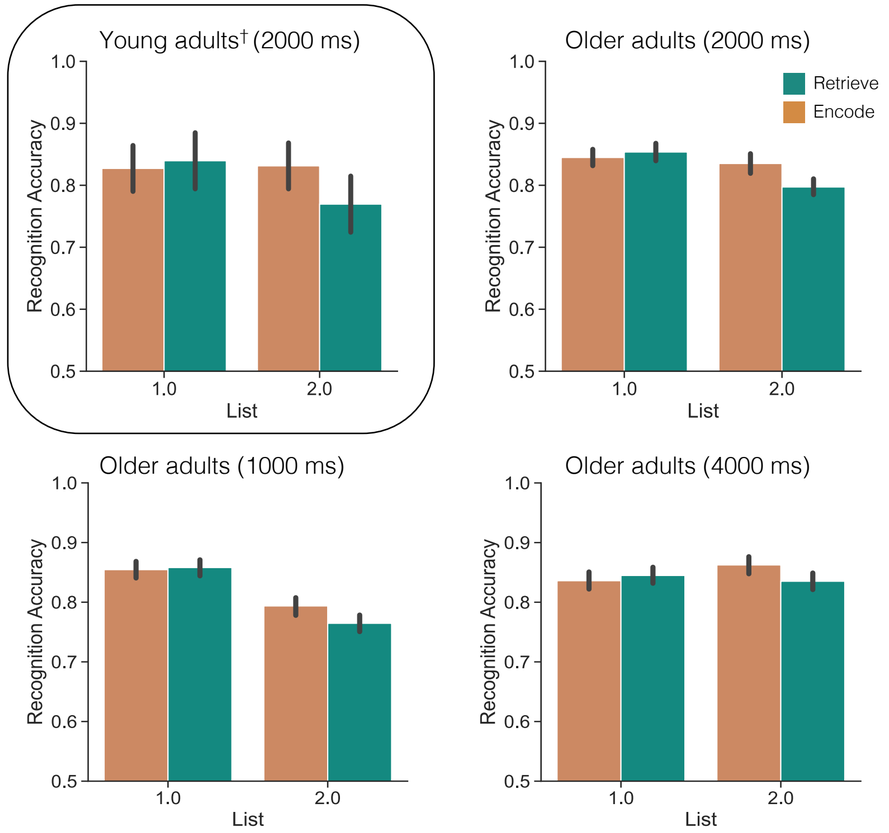
Mnemonic state task



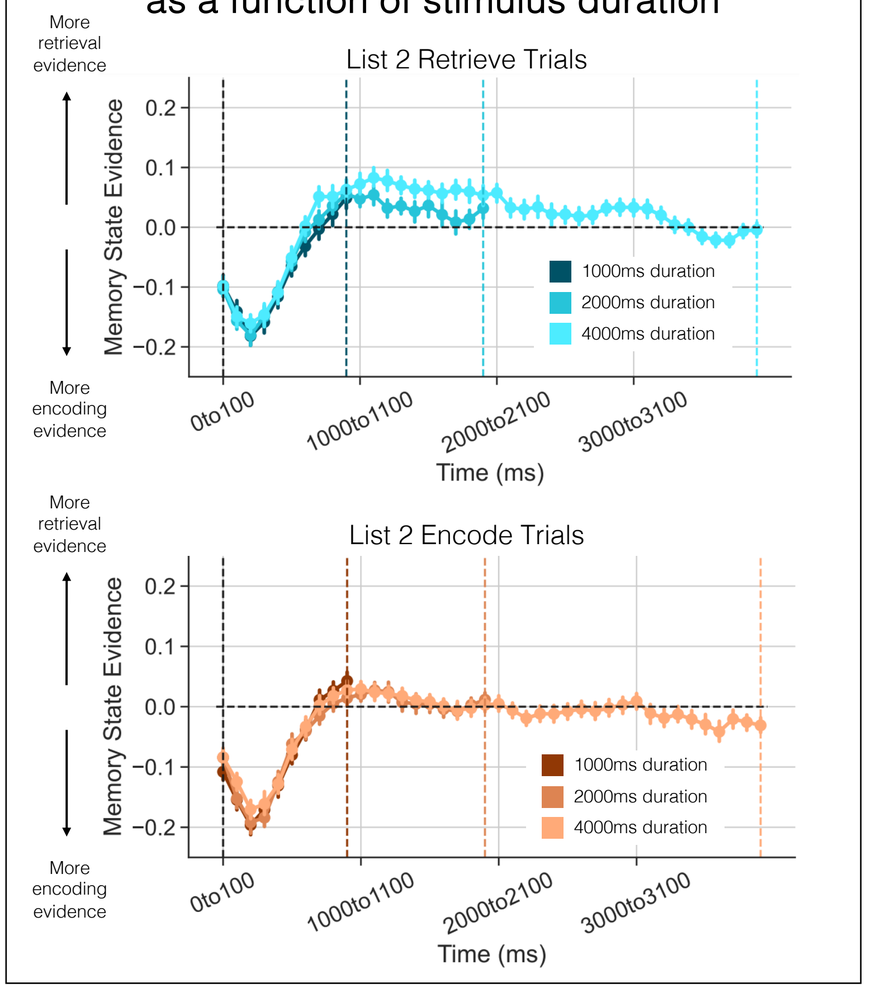
9 runs
18 trials/list
2000 ms/cue
1000, 2000, or 4000 ms/stimulus
Stimulus duration varied across runs
63 functional electrodes

Behavioral evidence of memory state shifts



†Data collection is ongoing

Older adult memory state engagement varies as a function of stimulus duration



Summary

- Both age groups shift between memory encoding and retrieval
- Older adults enter the retrieval state during both encode and retrieve trials, only transitioning to an encoding state after about 2000ms following stimulus onset
- When older adults do enter an encoding state, their engagement in the state remains shallow but consistent

Future directions

- Finish younger adult data collection
- Further investigate compensatory mechanisms that older adults may be using to close the gap in memory state engagement

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