Eye Movements Reveal Age Differences in Pattern Completion

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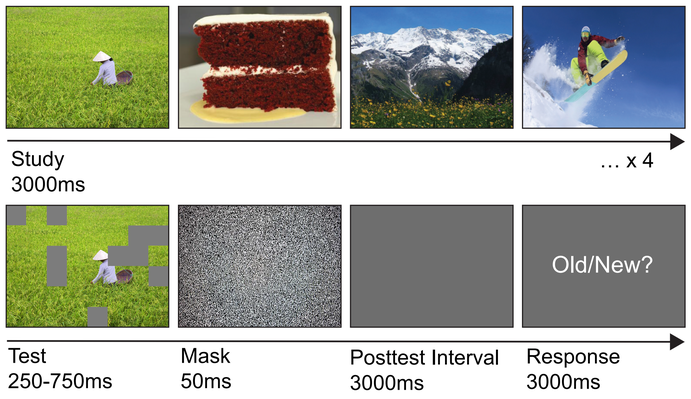
Introduction

- Older adults are more likely than younger adults to falsely endorse lure (similar) stimuli as 'old'[1,2].
- This response bias has been thought to reflect an age-related shift towards pattern completion – the retrieval of an encoded stimulus in response to partial or degraded input[3,4]. However there is a lack of evidence supporting this claim.
- We used eye movement monitoring to index the retrieval and reactivation of encoded stimuli (i.e., pattern completion) by younger and older adults. Specifically, we computed the similarity between encoding and retrieval gaze patterns, a measure that has been previously linked to memory retrieval[5,6], neural reinstatement[7], and hippocampal activity[8].

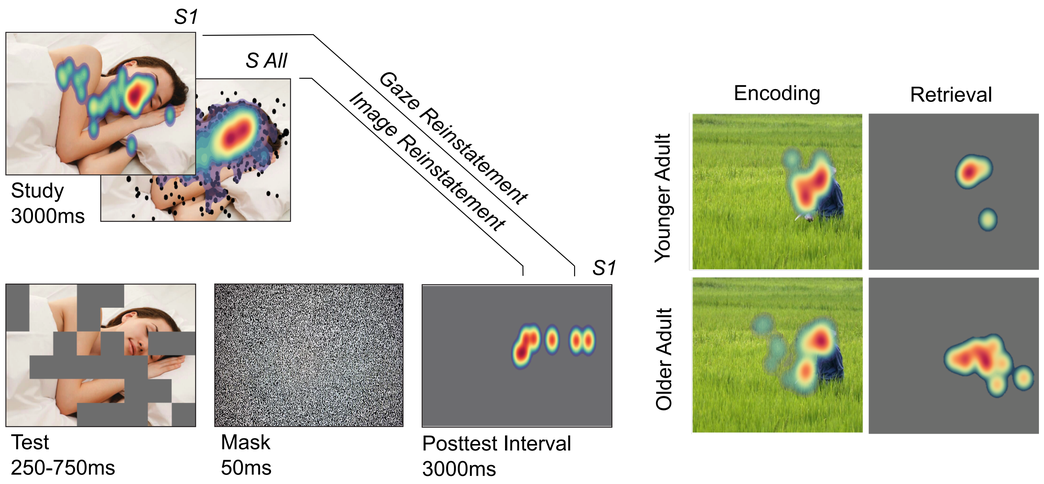
Methods

- 64 younger adults (Mean age = 23.66 years) and 42 older adults (Mean age = 73.56 years) completed a partial-cue recognition memory task with degraded old and lure images[6].

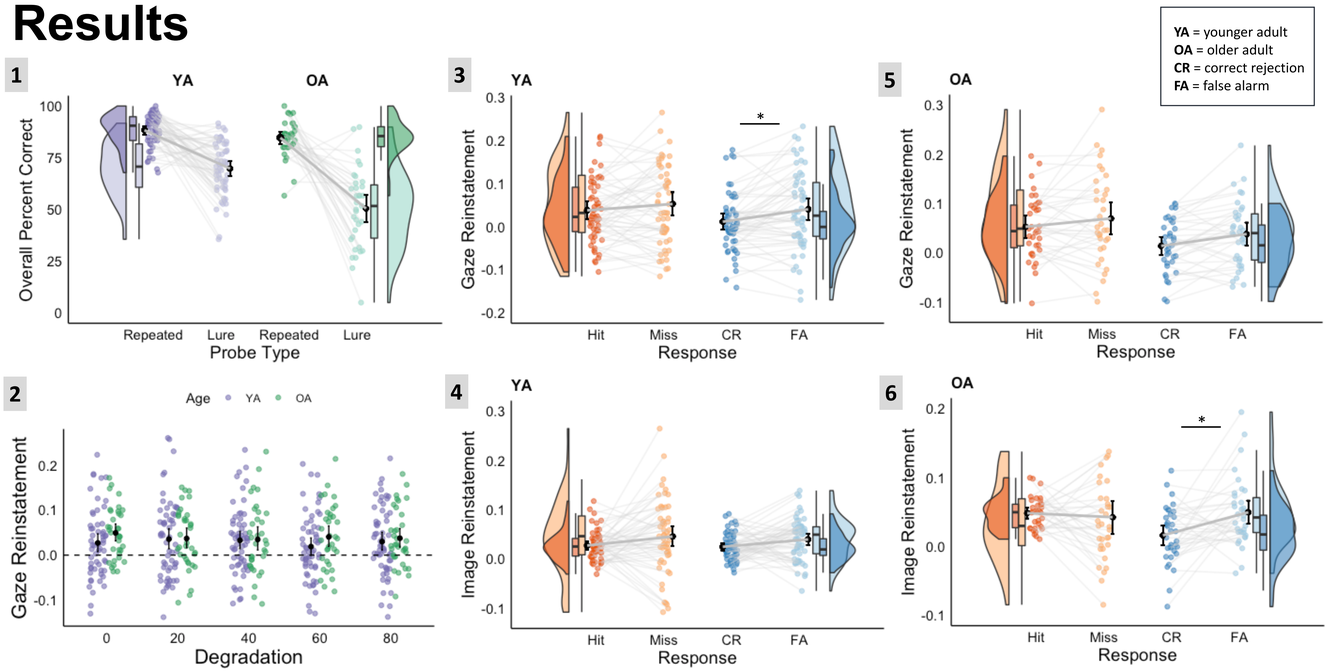


- Images were viewed 4x at study across 4 blocks.
- Test images were presented briefly and degraded by removing 0-80% of visual content.
- Subjects were instructed to visualize the briefly presented test image while "looking at nothing" before making an old/new recognition response.

- Similarity between encoding and retrieval gaze patterns reflects reactivation of encoded image features (image reinstatement), and the corresponding operations (i.e., eye movements) by which they were encoded (gaze reinstatement).



Results



- Older adults' behavioral performance is consistent with a bias towards pattern completion (more false alarms to lures) (1).
- Both younger and older adults' eye movements show evidence of retrieval-related reinstatement at all levels of test probe degradation (2).
- Older adults show equivalent gaze reinstatement (3,5) and greater image reinstatement (4,6) relative to younger adults.
- Lure false alarms are associated with gaze reinstatement in younger adults (3) and with image reinstatement in older adults (6).

Conclusions

- Eye movements during a stimulus free retrieval interval provide direct evidence for reinstatement of specific, previously encoded image representations from partial input cues (i.e., pattern completion).
- Age-equivalent image and gaze reinstatement indicate that older adults retain access to both salient features of encoded images and the eye movements made to them, respectively.
- Age differences in the correlations between reinstatement and performance suggest that whereas older adults may have access to both the content and experience of a previously encoded event, the latter is either not available, or not used to support behavioral pattern completion.
- Eye movement reinstatement is a promising tool for assessing pattern completion and dissociating content from process.

References

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