Change detection and recollection in younger and older adults: An eye tracking study

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Background:

Recognition Memory:
Change Detection: ability to notice changes made between presentations of pairs of stimuli
Change Recollection: ability, at a later time, to recall that change occurred between pairs of stimuli from an earlier presentation
- Change detection and recollection depend on associative binding
- OAs have more difficulty than young adults (YAs) with identifying changes and later recalling changes that were made to pairs of stimuli

Semantic Stimuli Verses Non-Semantic Stimuli:
- OAs with MCI have subtle semantic memory deficit; leads to greater impairment in change *detection* when task uses semantic stimuli

Eye Tracking:
- Adults with Alzheimer's Disease show less interest, or a lack of novelty preference, in altered or new stimuli; unstudied in MCI/pre-MCI
- Eye tracker used during VPC change detection task to measure fixation times of participants; allows us to compare differences in attention, measured in fixation points, given to altered stimuli

Healthy Novelty Preference   **Impaired Novelty Preference**
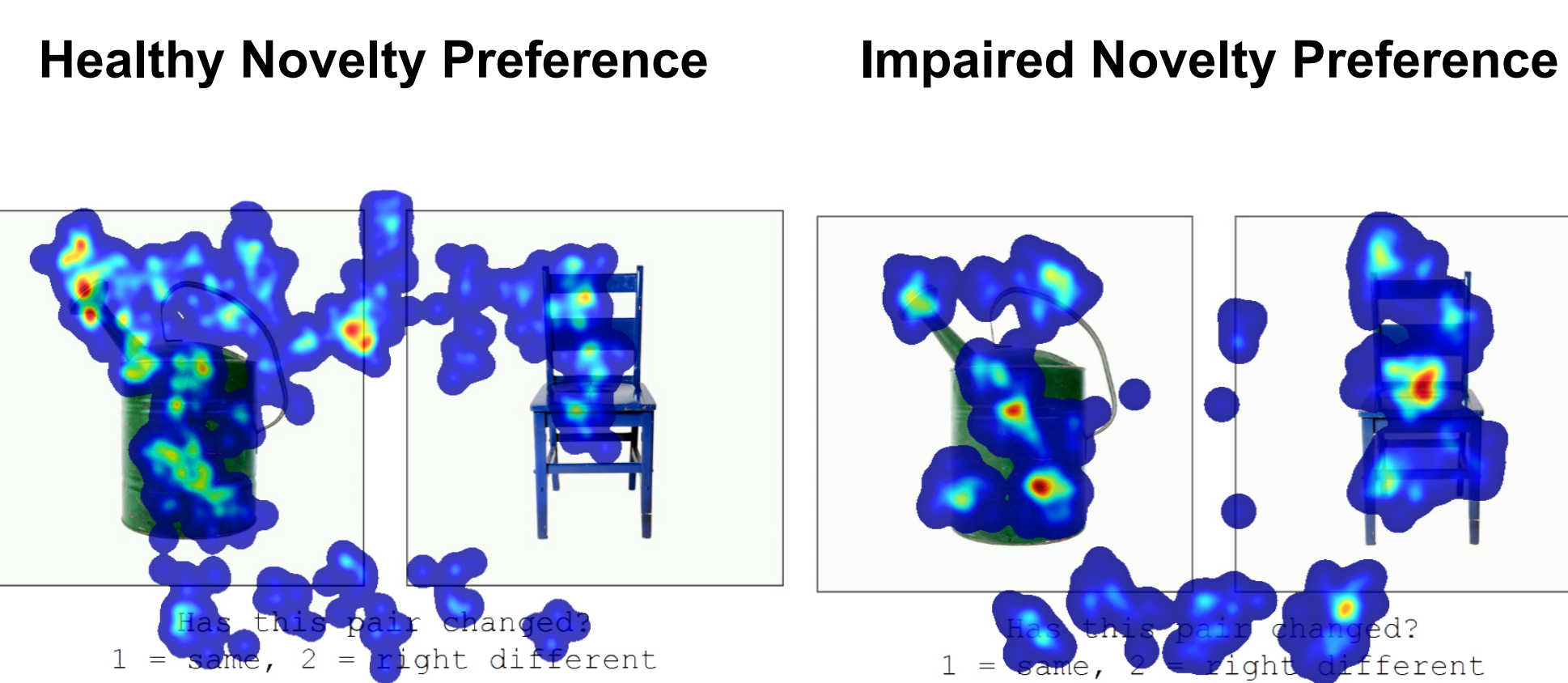
Methods:

Participants:
- 31 older adults (17 women, 14 men; M_{age} = 72.65 years, range 66-96 years) were recruited through a community mailing and an existing database of older adults over the age of 65 in Alamance and surrounding counties.
- 33 younger adults (21 women, 12 men; M_{age} = 19.09 years, range 18-21 years) were recruited from Elon University using the Sona Psychology Department participant pool

Materials:
- Computerized task was programmed through E-Prime 2.0 software and the eye tracking data was recorded using the Gazepoint GP3 eye tracker
- Assessment of older adults was completed using the Mini-Mental Exam (MMSE) and a modified version of the Clinical Dementia Rating (CDR)

Experimental Design:

Reasoning Behind Design:
- Adults with MCI exhibit change *detection* deficit; unknown what happens with change *recollection*; we hypothesize that both change detection and change recollection will be similarly impaired in pre-MCI individuals within the healthy OA group
Change Recollection tasks: OAs perform poorer compared to YAs, but unknown what happens in MCI/pre-MCI; lack of memory for change due to proactive interference from new information
Visual Paired Comparison (VPC): change detection task; requires identification of differences between pairs of stimuli
- Shared memory demands of VPC and change recollection tasks imply that VPC can be modified for use as a change recollection task, not just measure of change detection
- Used E-Prime Software to design and program a fused VPC and change recollection paradigm that we used to compare healthy YAs and perceived healthy OAs to identify early patterns of aging and signs of pre-MCI within the perceived healthy OA group
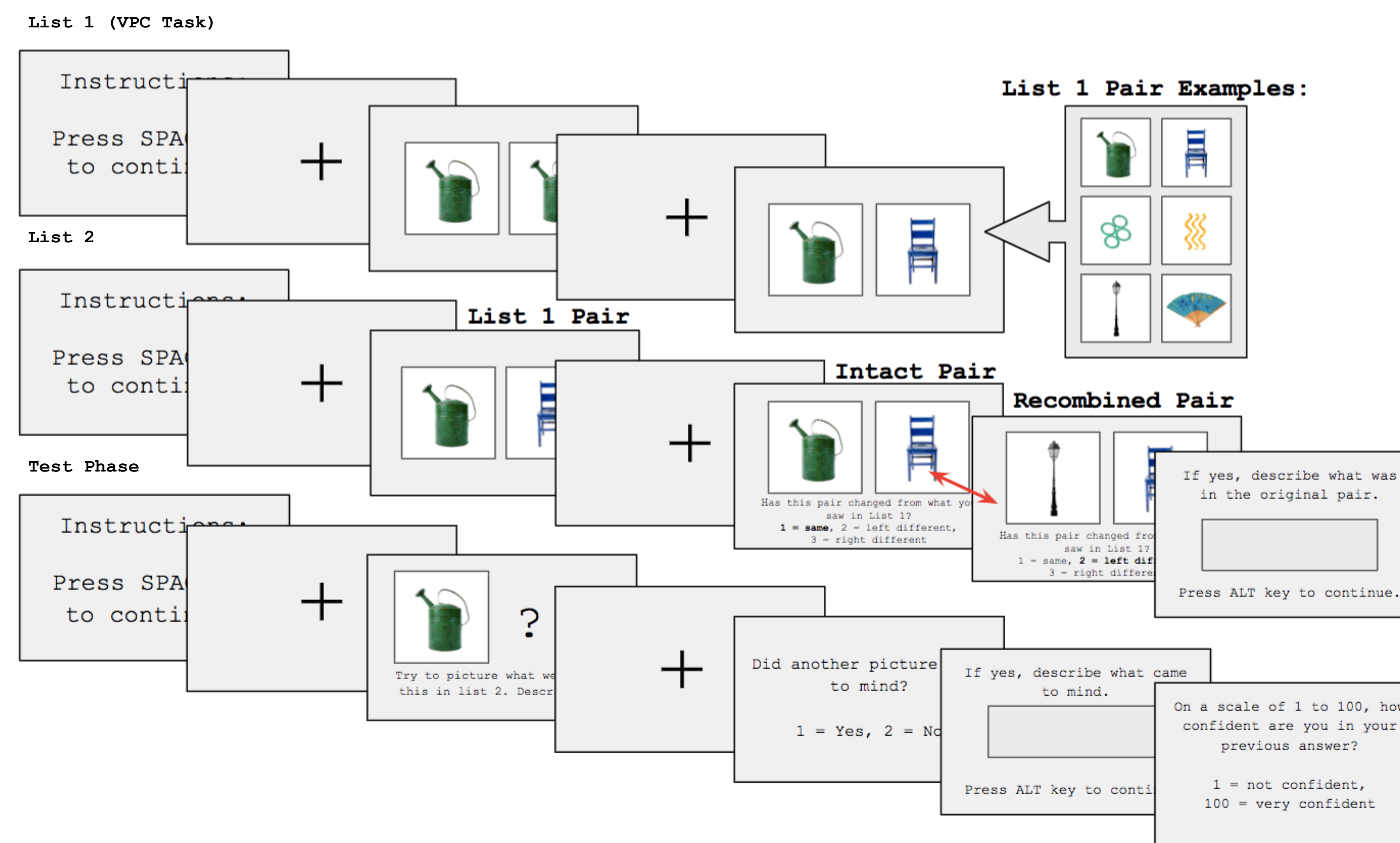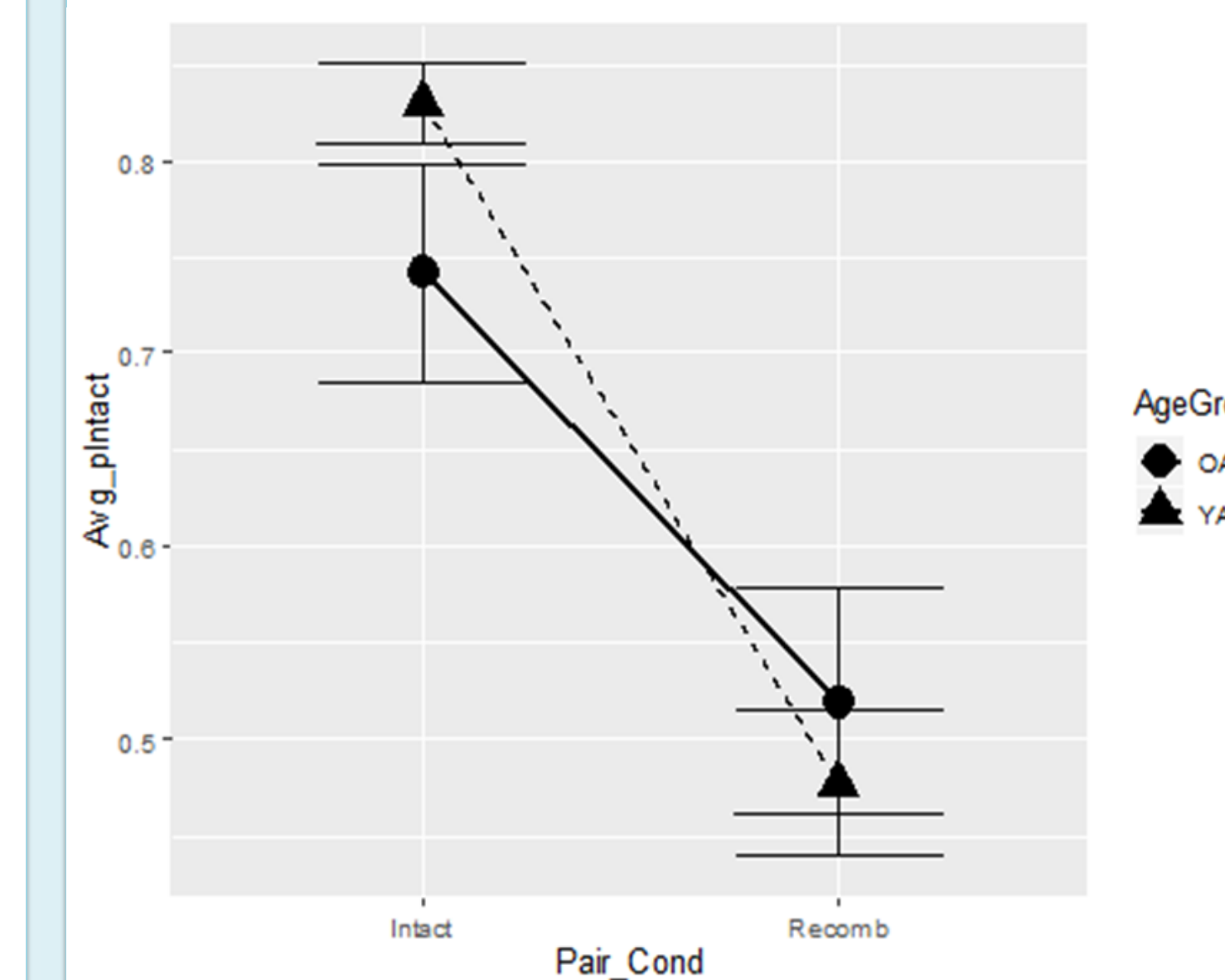

Results:
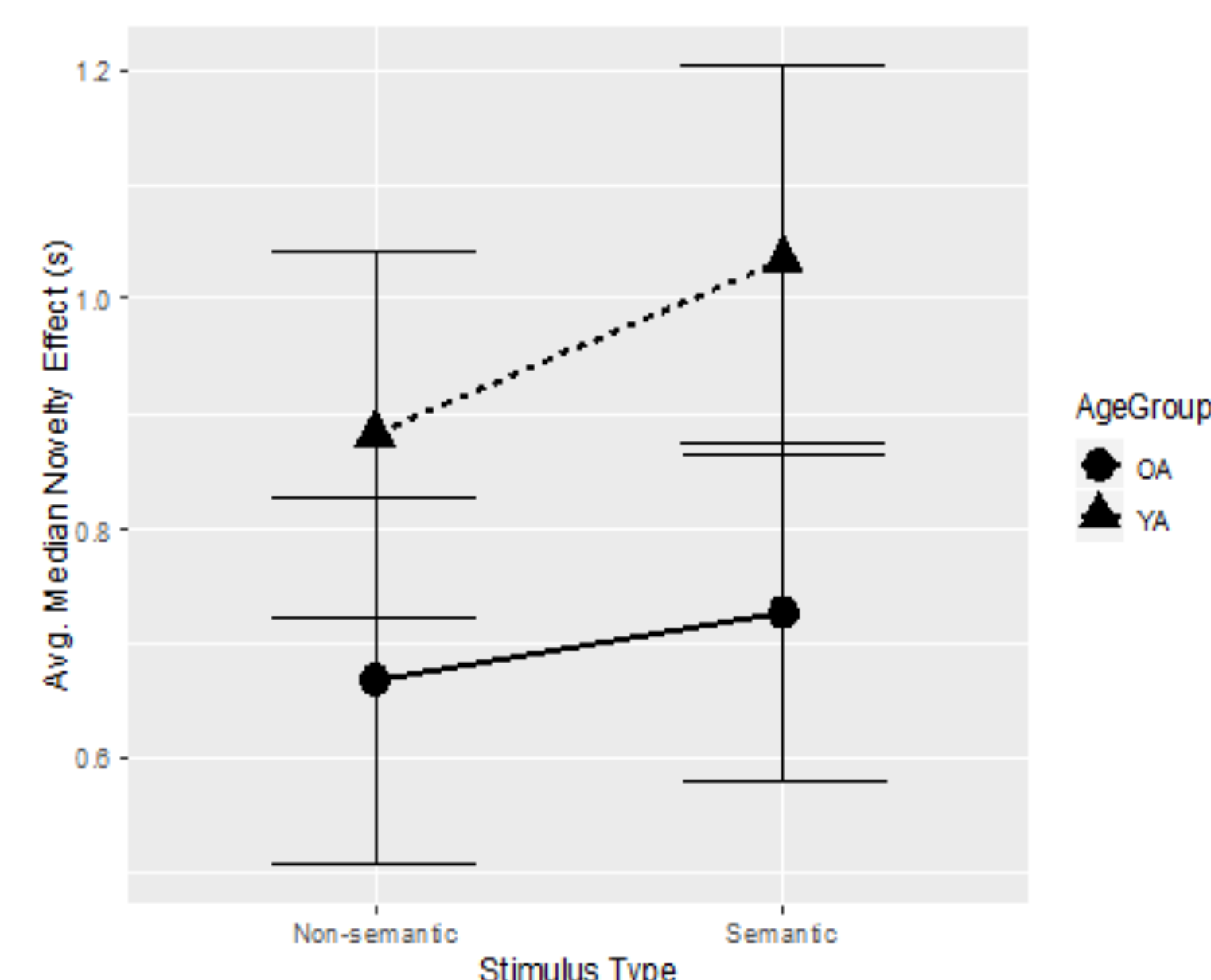
- In VPC, both young and older adults exhibited a novelty preference: more fixation time looking at the unfamiliar than the familiar image

- Novel image was fixated more than 0.6 second longer than the familiar image, on average

- Novelty preference in the VPC task did not significantly differ across age groups or stimulus types

Results (cont.):

- Older adults slightly less likely to recognize intact pairs as being the same, and slightly more likely to falsely recognize recombined pairs as being the same, relative to young adults.
- Both groups performed similarly in change detection; young adults performed significantly better in cued recall portion of change recollection
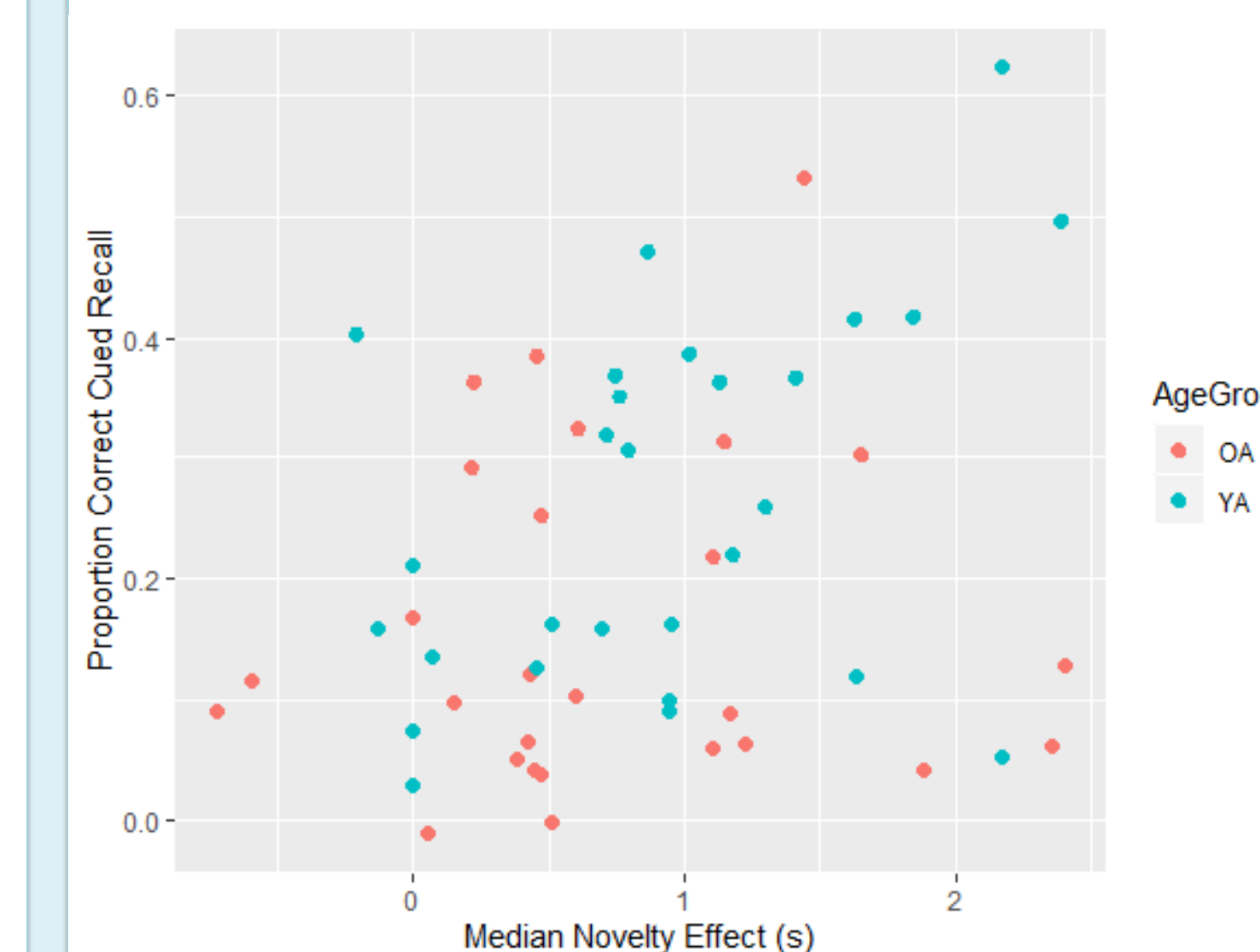
- Correlation between median novelty effect and cued recall performance was significant in younger adults (All p's<.01) ; correlation was not significant for older adults
- Novel findings suggest that eye-tracking measures may predict associative memory more reliably in younger adults than in older adults; consistent with the Associative Deficit Hypothesis.

Discussion:

- Eye tracking predicted performance of younger adults because the hippocampus is still intact in younger adults; difficulty in predicting older adults performance was likely due to variety of different stages of hippocampal decline within the older adults participant group
- If sample of older adults was larger, there would be increased likelihood of identifying a pre-MCI sub-group with the CDR scores; could effectively measure performance differences between pre-MCI, MCI, and healthy older adults
- Future study could add a new category of entirely new stimulus pairs; compare change detection and recollection between intact, recombined, and new pairs to better understand potential interference effects in older adults

References:

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*Full list of references available upon request