

The neural contributions of eye movement repetition effects in aging

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Introduction

- Repeated exposure to visual information leads to rapidly changing patterns of visual sampling behaviour [1] [2].
- For instance, a viewer makes fewer fixations on an image across repeated exposures, and this change in fixations is referred to as the *eye movement repetition effect*.
- Some studies have reported that eye movement repetition effects are hippocampal-dependent [3], others have shown that repetition effects are hippocampal-independent [1] [4].
- Older adults tend to exhibit diminished repetition effects as well as hippocampal volume loss. However, the influence of aging on the relationship between the eye movement repetition effect and hippocampal structure remains unclear.
- RESEARCH QUESTIONS:** (1) Is there a relationship between the eye movement repetition effect and hippocampal structure? (2) Does aging change the relationship between the eye movement repetition effect and hippocampal structure?

Method

- Participants** - 50 healthy younger adults (18-32 years) and 50 healthy older adults (60-83 years) participated in this study and were scanned at 3T MRI.
- Task** - Eye movements were monitored during scanning. Participants viewed faces that were repeated up to four times and made an age judgment for each face (Fig. 1A).

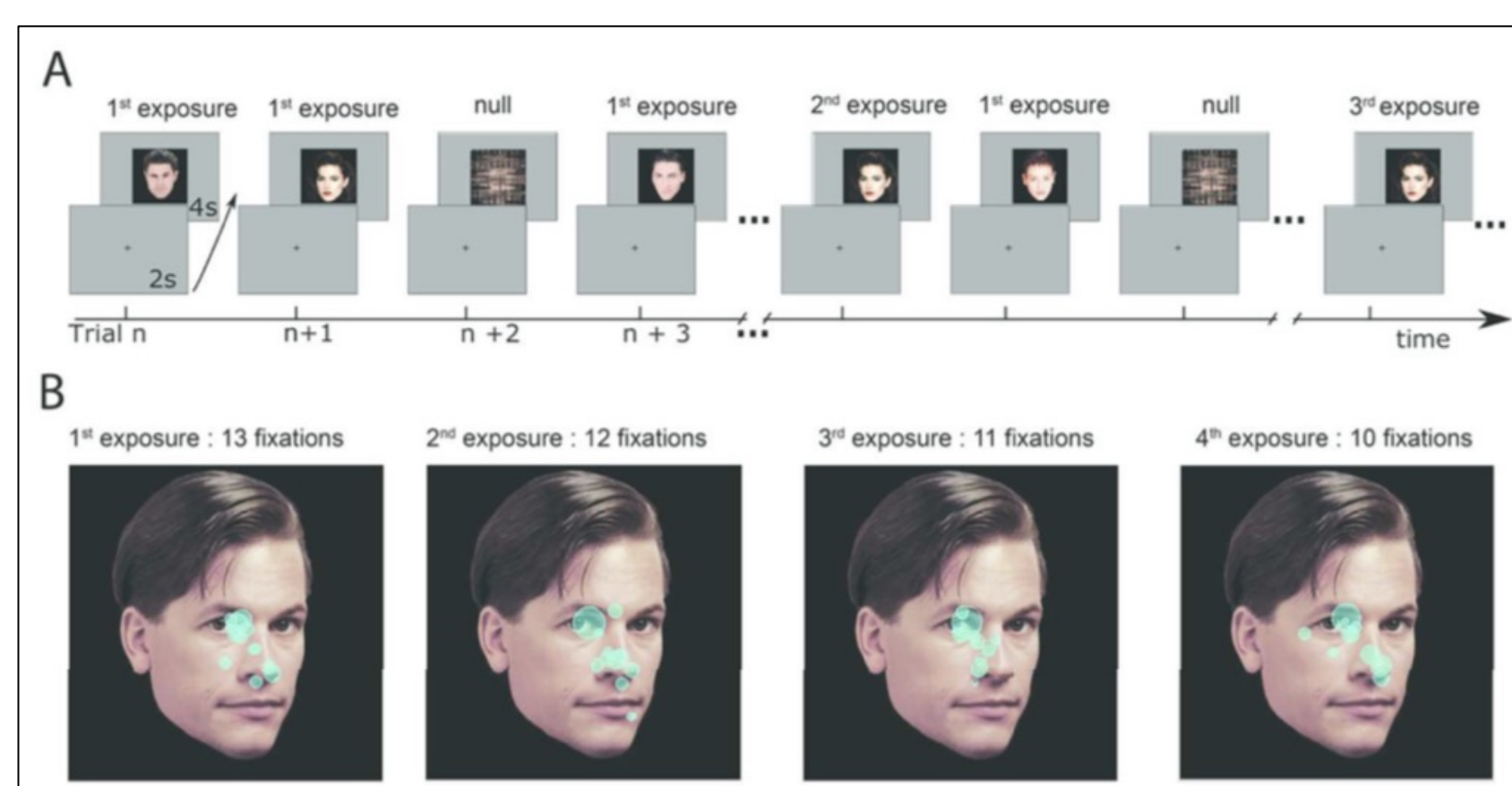


Fig. 1 – Schematic depiction of task (A). Example of change of fixations across repeated exposures of face stimuli (B).

- Eye movement analysis** - For each participant, the overall eye movement repetition effect was quantified by computing the mean number of fixations for the 1st, 2nd, 3rd, and 4th face exposures (Fig. 1B). The repetition effect (slope) was computed across the four repetitions using the *lm* function in R.
- Structural volume analysis** - An automated segmentation tool (ASHS [5]) was applied to the participants' T2-MRI scans to obtain hippocampal volumes.

Results

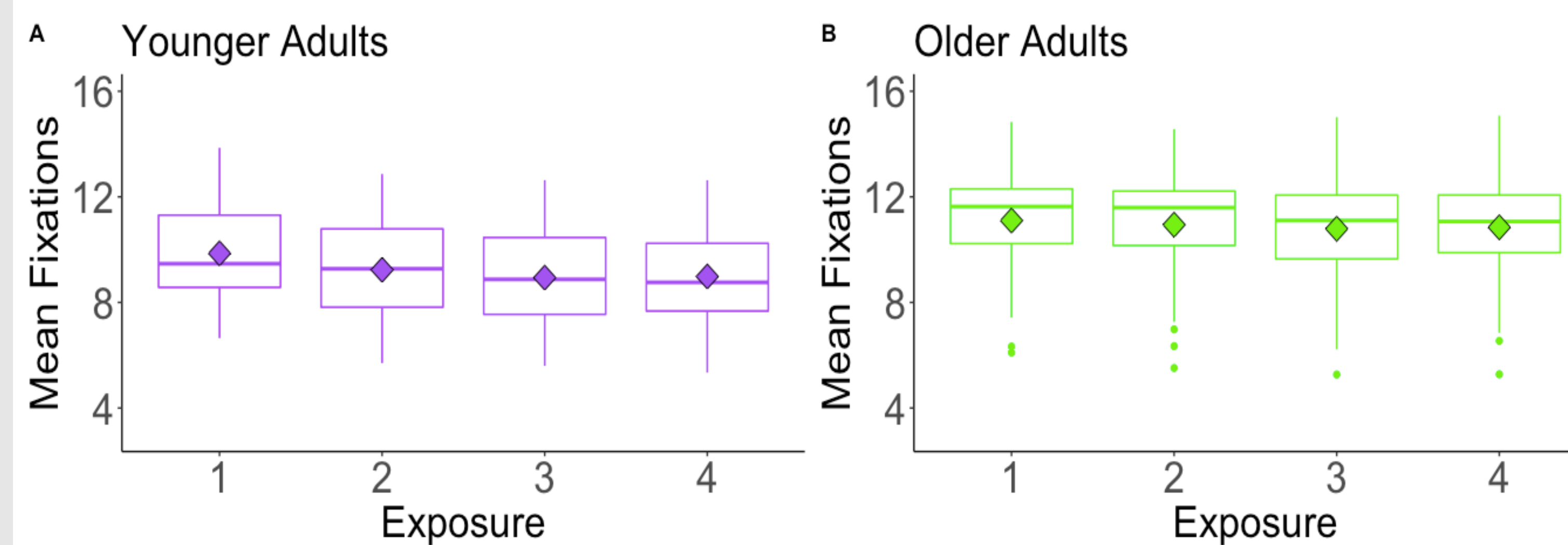


Fig. 2 - Compared to younger adults (A), the number of fixations made by older adults did not significantly vary as a function of repeated exposures (B).

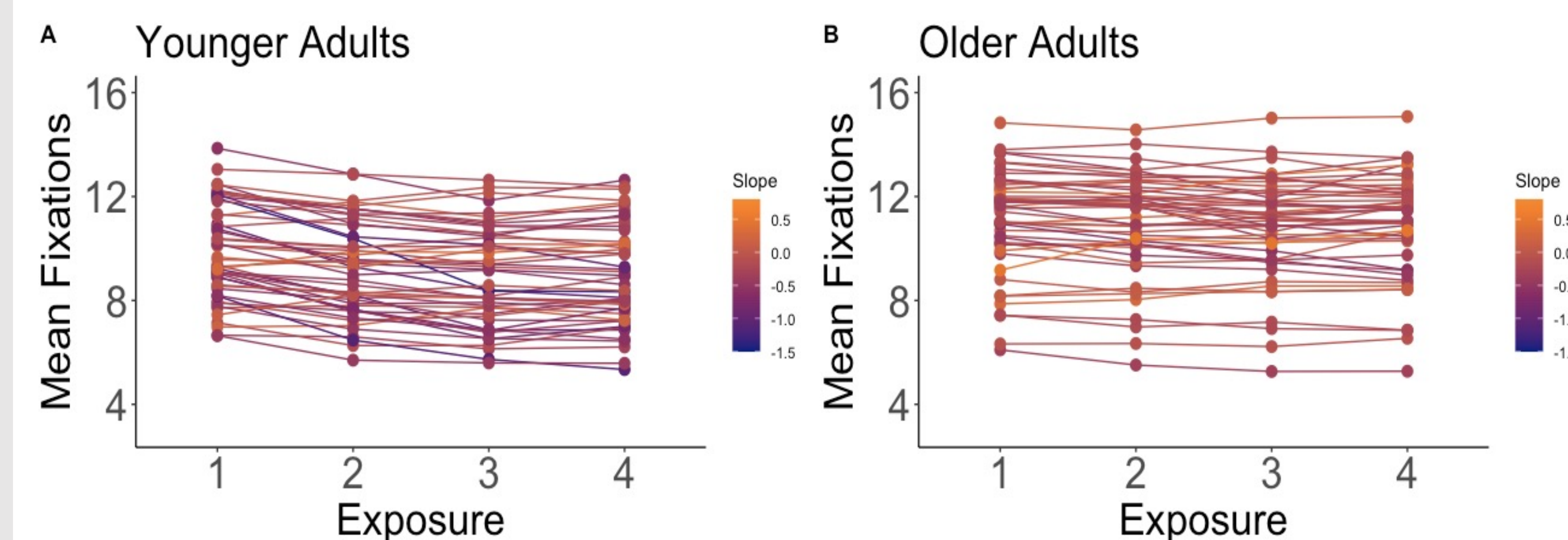


Fig. 3 - Compared to younger adults (A), the repetition effect (slope) was shallower in older adults (B).

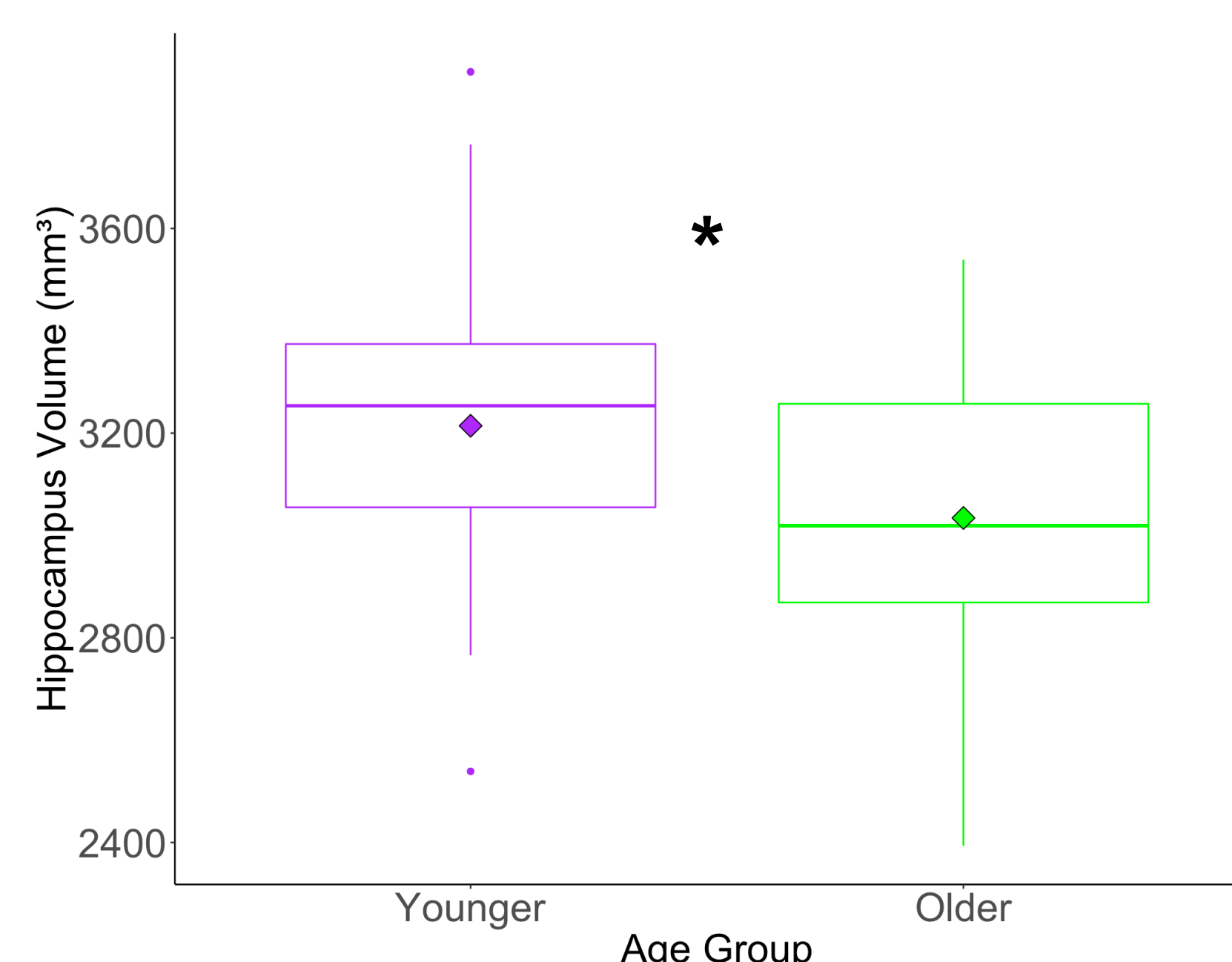


Fig. 4 - There was a significant difference in hippocampal volume between younger adults and older adults.

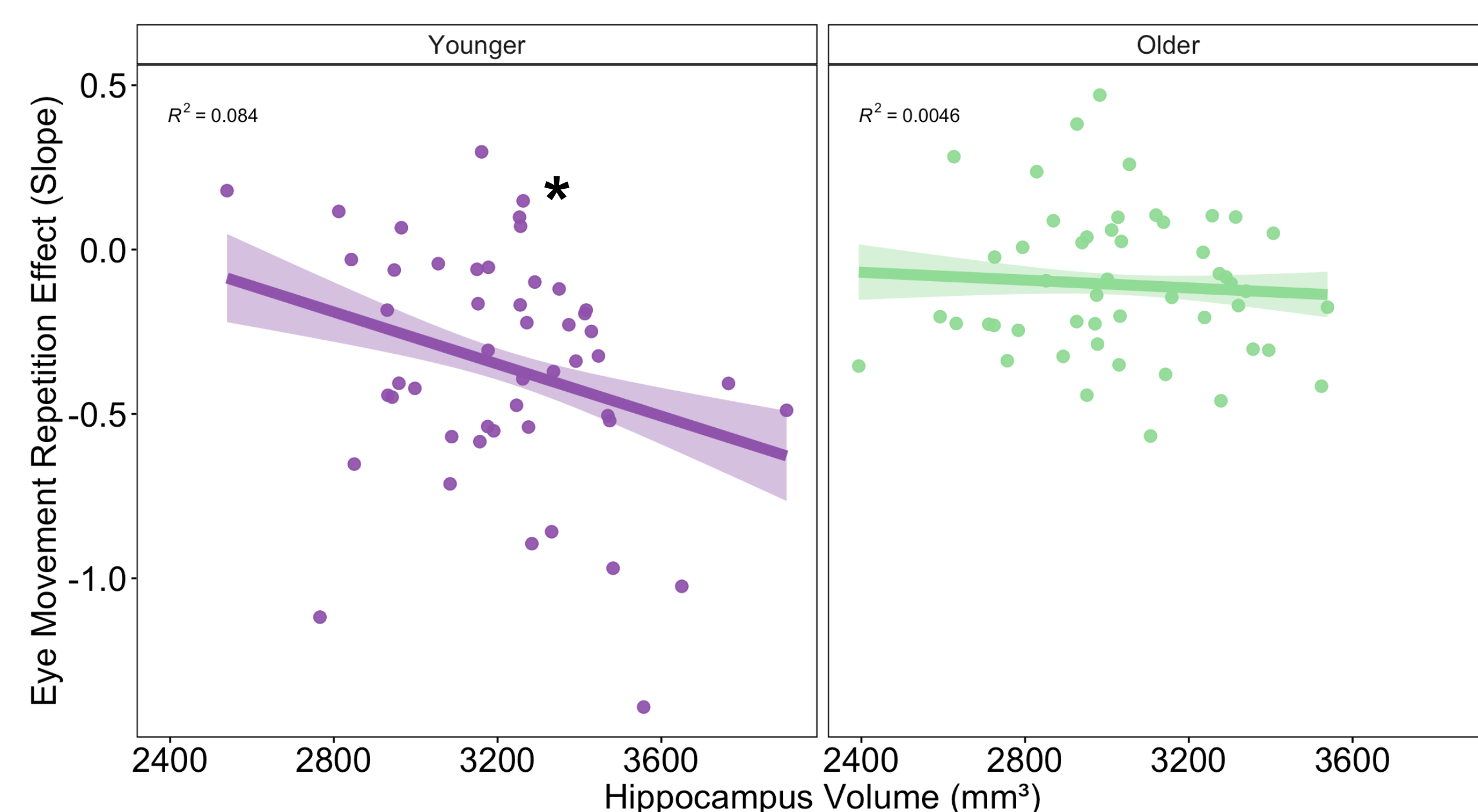


Fig. 5 - There was a significant negative relationship between hippocampal volume and the repetition effect (slope) in younger adults but not older adults. Greater hippocampal volume was associated with a stronger eye movement repetition effect in younger adults.

Discussion

- The fixations made by the older adults did not significantly vary as a function of exposure. Thus, compared to the younger adults, older adults exhibited a diminished eye movement repetition effect.
- Changes in viewing patterns across repetition were related to hippocampal volume in younger adults only.
- Therefore, in younger adults, the eye movement repetition effect was found to be related to the hippocampal system.
- In older adults, a decline in hippocampal integrity may be responsible for the lack of eye movement repetition effects.
- Future work will examine whether regions outside of the hippocampus also contribute to the eye movement repetition effect.

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