Effect of aging on spatial representation

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Introduction

The ability to represent a new environment is complex and many factors may contribute to its decline with normal aging (Klencklen et al., 2012). The objective of this study is to examine some of the components of this decline, considering unfamiliar and realistic routes in a novel environment with a variety of tasks to assess for the spatial model built by young and older participants.

Method

Participants

30 young adults between 19 and 30 (14 men and 16 women, m = 25.27 years old) and 30 healthy older adults between 65 and 87 (8 men and 22 women, m = 69.87 years old) participated to this experiment.

Procedure

Two presentations of the video of an unfamiliar and long route through the streets of a town close to Paris followed by spatial ant verbal tasks:

- Visual recognition task
- Direction recognition task
- Order recognition task (participants had to choose between two pictures - the one that represents the place encountered first)
- Verbal statements verification task (participants had to decide whether the statement is true or false)

Complementary tests:
Family scenes (episodic memory), Corsi blocks (visuo-spatial working memory), digit span task (verbal working memory), binding span task, inhibition flexibility test, mental rotation test, Mill Hill vocabulary test, Mini Mental Scale examination, spatial representation questionnaire of Pazzaglia (self estimation of the sense of direction and spatial representation preferences).

Examples of tasks

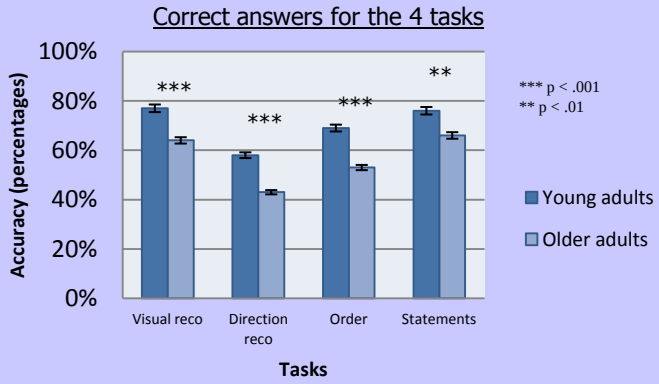
(visual recognition task above and direction recognition task below)

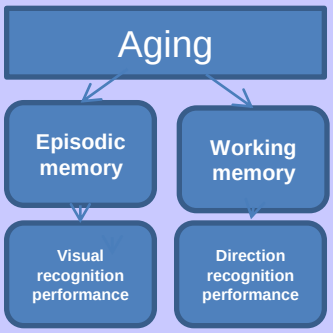
Does this picture represents a place of the route ?

Which direction should you take at this intersection?

Results

The ANOVA shows that older adults have poorer performances than younger adults in the 4 tasks. Moreover, they have lower scores in all tests, except for the vocabulary test and the spatial preference questionnaire.





Analyses of mediation indicate that the effect of aging on the visual recognition task would be partly explained by an impairment of episodic memory. Moreover, the effect of aging on the direction task would be partly explained by impairment of working memory.

Discussion

These results suggest a reduced quality of spatial representation in the elderly compared to young people for visual recognition of places, judgment of order of appearance and memorization of the directions.
These results are coherent, whether the test is visual or verbal, even if older participants consider themselves as having the same sense of direction than younger adults in the questionnaire.

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