WORKING MEMORY VS SPATIAL NAVIGATION PERFORMANCE

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Abstract

Spatial navigation (SN) is a fundamental cognitive skill crucial for everyday activities, such as driving and shopping (Garden et al., 2002). Working memory (WM), the cognitive system responsible for temporarily storing and manipulating information, has been identified as a crucial component influencing SN performance (Solari and Hangya, 2018; Garden et al., 2002). WM itself is susceptible to age-related decline (Oberauer, 2005; Rhodes et al., 2022). Thus, understanding the relationship between WM and SN, particularly in the context of aging, holds substantial importance. This study aims to investigate the association between WM and SN performance, with a specific focus on age-related differences. Participants will be recruited through the FSU Psychology Department and Institute for Successful Longevity. The study will utilize standardized tests to assess both WM and SN abilities.

WM will be assessed using tasks that require the retention and manipulation of information over short periods. SN will be evaluated through tasks involving spatial orientation and route finding in simulated environments, including newly developed DORA test with the Cardinal Points (NSEW) and a Left/Right assessment.

Introduction

Working memory (WM) comprises distinct components, each dedicated to handling specific types of information, including visual, spatial, auditory, and verbal content, as well as functions like planning, problem-solving, reasoning, and decision-making (Garden et al., 2002). Many studies indicate that working memory capacity decreases over time (Oberauer, 2005; Rhodes et al., 2022). Younger participants also consistently outperform older adults in terms of accuracy in working memory tasks (i.e., Rhodes et al., 2022).

Working memory additionally influences navigational abilities through visuo-spatial landscaping and memory retrieval patterns (Solari and Hangya, 2018; Garden et al., 2002).

Methods

- This study includes a cohort of 45 undergraduate students aged between 18 to 22 years and 45 adults aged 65 years and above.
- Participants are being recruited through FSU's Psychology Department and Institute for Successful Longevity.
- Undergraduate students receive course credits as incentives, while adults are rewarded with a $30 Amazon gift card.
- The study utilizes an online Spatial Orientation Exam hosted on Qualtrics. This exam includes three distinct measures: a spatial orientation test, a cardinal points test, and a left/right orientation test.
- Participants complete the exam individually in a controlled environment of their choosing.
- Data analysis will be conducted using both a t-test and an ANOVA to compare results between the different cohorts and among the various measures.

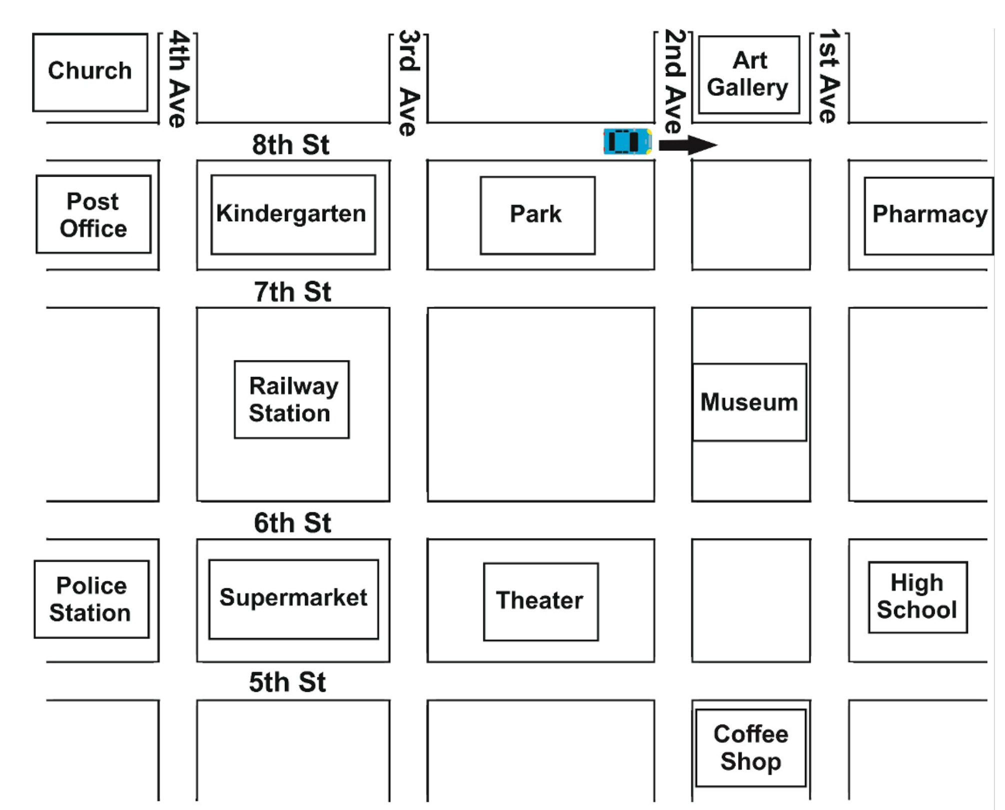

Figure 1. Example of NSEW or Left/Right Orientation Exam

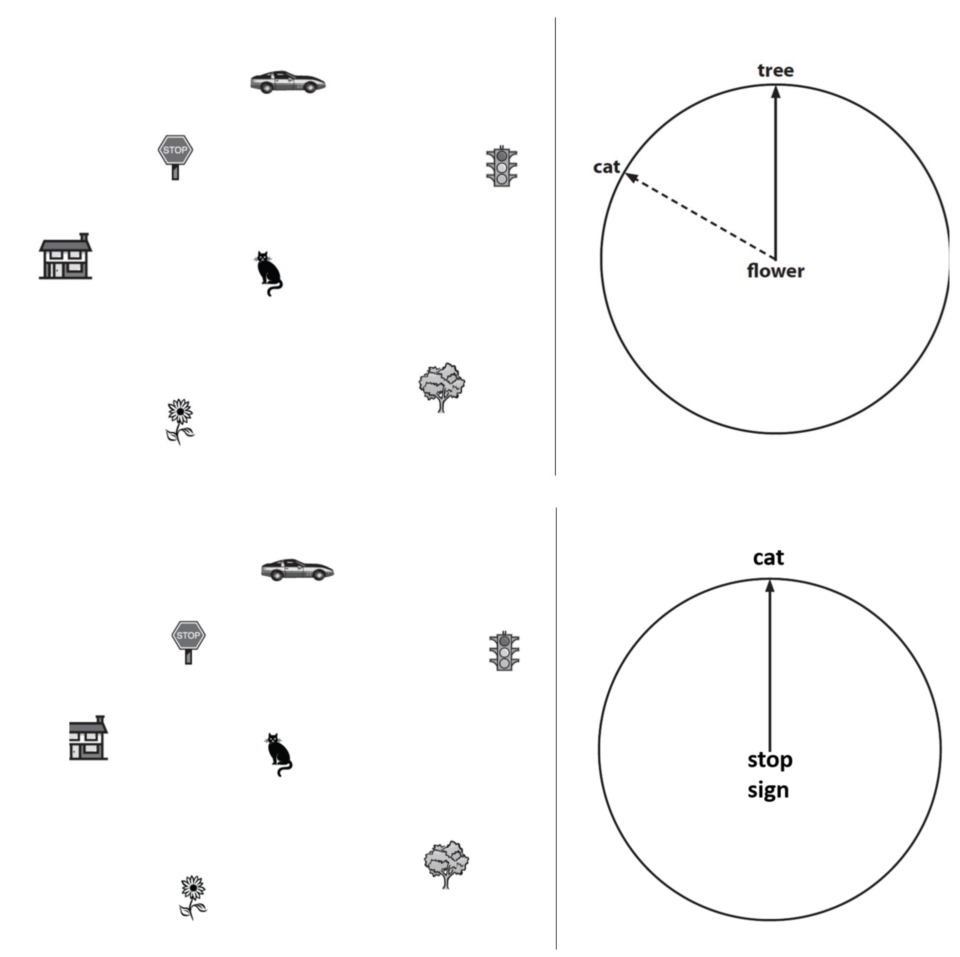

Figure 2. Example of Spatial Orientation Test

Results

- We expect to find that older adults demonstrate lower performance on the spatial navigation test compared to younger adults.
- Specifically, we expect older adults to exhibit slower response times and lower accuracy scores on tasks requiring spatial reasoning and orientation.
- We anticipate significant differences in performance between age groups, as indicated by the results of the t-test.
- The ANOVA is expected to reveal variations in performance across different measures within the Spatial Orientation Online Test, providing insights into specific aspects of spatial navigation abilities.
- Overall, we anticipate that our findings will support the notion that spatial navigation abilities decline with age and highlight the importance of considering these factors in cognitive assessments of older adults.

Discussion

The present study sought to unravel the intricate relationship between WM and SN performance, particularly emphasizing age-related disparities. Our investigation was motivated by the recognition of spatial navigation as a pivotal cognitive skill essential for everyday activities. Acknowledging the role of WM as a cognitive system responsible for the temporary storage and manipulation of information, our study aligned with existing literature emphasizing its impact on SN performance. By employing both self-reported and objective measures, the outcomes of our study could also further contribute to our comprehension of metacognition processes in both younger and older populations.

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