



# Spatial Navigation and Mental Rotation Skills in Older and Younger Individuals



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## Abstract

Background: Spatial navigation skills, including mental rotation abilities, play a vital role in everyday life. These skills can be influenced by various factors, with age being one of the key determinants of individual variations in mental rotation proficiency.

Methods: This study investigates differences in mental rotation skills between younger and older adults. The participants will undergo two one-hour test sessions on the Qualtrics and PsyToolKit platforms, comprising a set of cognitive tests such as the Cardinal Points Task, Left-Right Task, and Mental Rotation test. The tests will measure participants' accuracy and the time taken to complete each section.

Results: We are in the process of recruiting participants. We predict that individuals in the younger group will display higher accuracy scores across the series of tests, with faster average times of completion when compared to the older group. It will be useful to utilize the information gathered from this study for further research into the mechanisms that drive any differences in mental rotation skills between age groups.

## Introduction

The concept of mental rotation pertains to the ability of an individual to hypothetically rotate a given stimuli, either in two or three dimensions, relative to its initial orientation (Mast & Gurtner, 2023). Research has revealed that the accuracy and reaction times of individuals in spatial performance tests, including mental rotation tasks, is correlated with their age (Techentin et. al., 2014). When presented with mental rotation tasks, in which participants had to determine the original orientation of a presented object after being rotated, the data displayed that younger individuals had both higher accuracy and faster mean reaction times in trials when compared to individuals of older age groups (De Beni et. al., 2006; Zhao et. al., 2019).

Previous research has demonstrated age differences between older and younger individuals in a specific task but has not compiled multiple mental rotation, spatial orientation tasks and subjective measures (self-description) into a single study. This project seeks to examine mental rotation and spatial orientation through the administration of multiple tasks of varying types in two sessions.

## Methods and Materials

### Recruitment and Participants

- 45 older individuals will be recruited through emails and phone called via the Institute for Successful Longevity registry.
- 45 younger individuals will be recruited through emails from the Florida State University Department of Psychology's undergraduate subject pool.

### Session Description

- Participants will be subjected to two different sessions of approximately one hour each that consist of various tasks that measure both accuracy and overall test completion time as well as informational questionnaires.

### Tests Administered

#### Spatial Orientation Task

-Participants are tasked with orienting themselves given a random field of objects, two objects to establish a starting position, and the third object to place on the given circle for their answer.

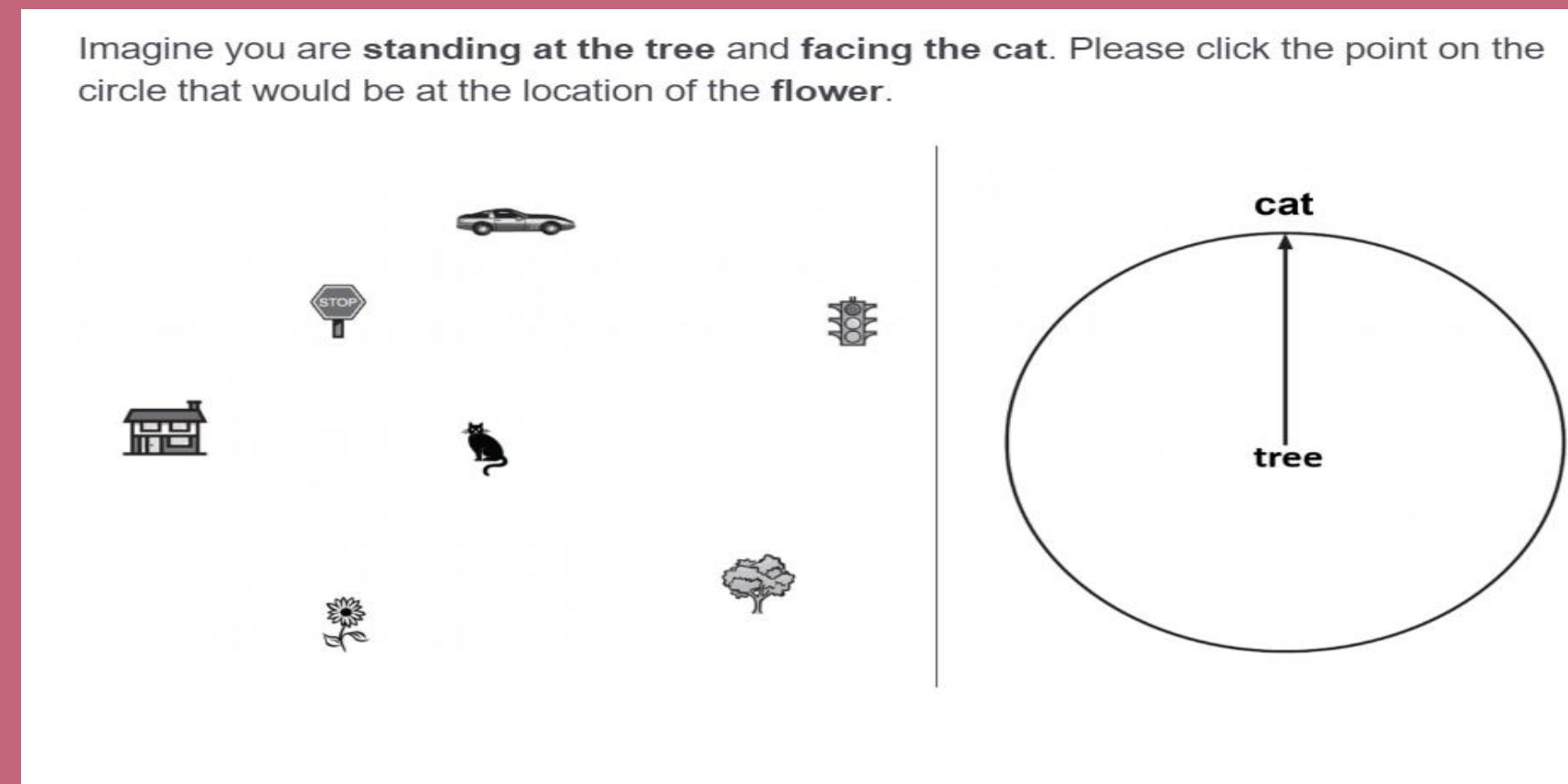
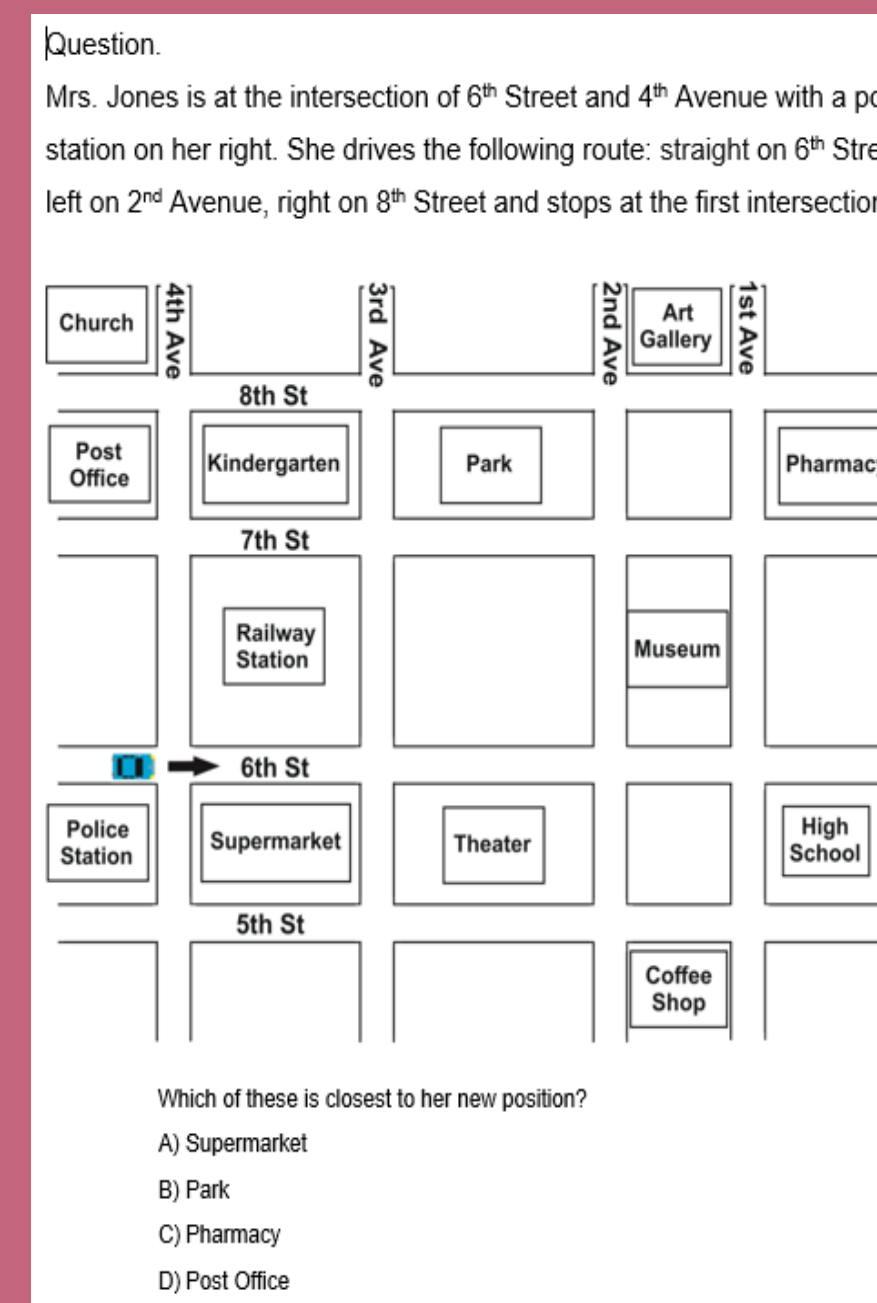
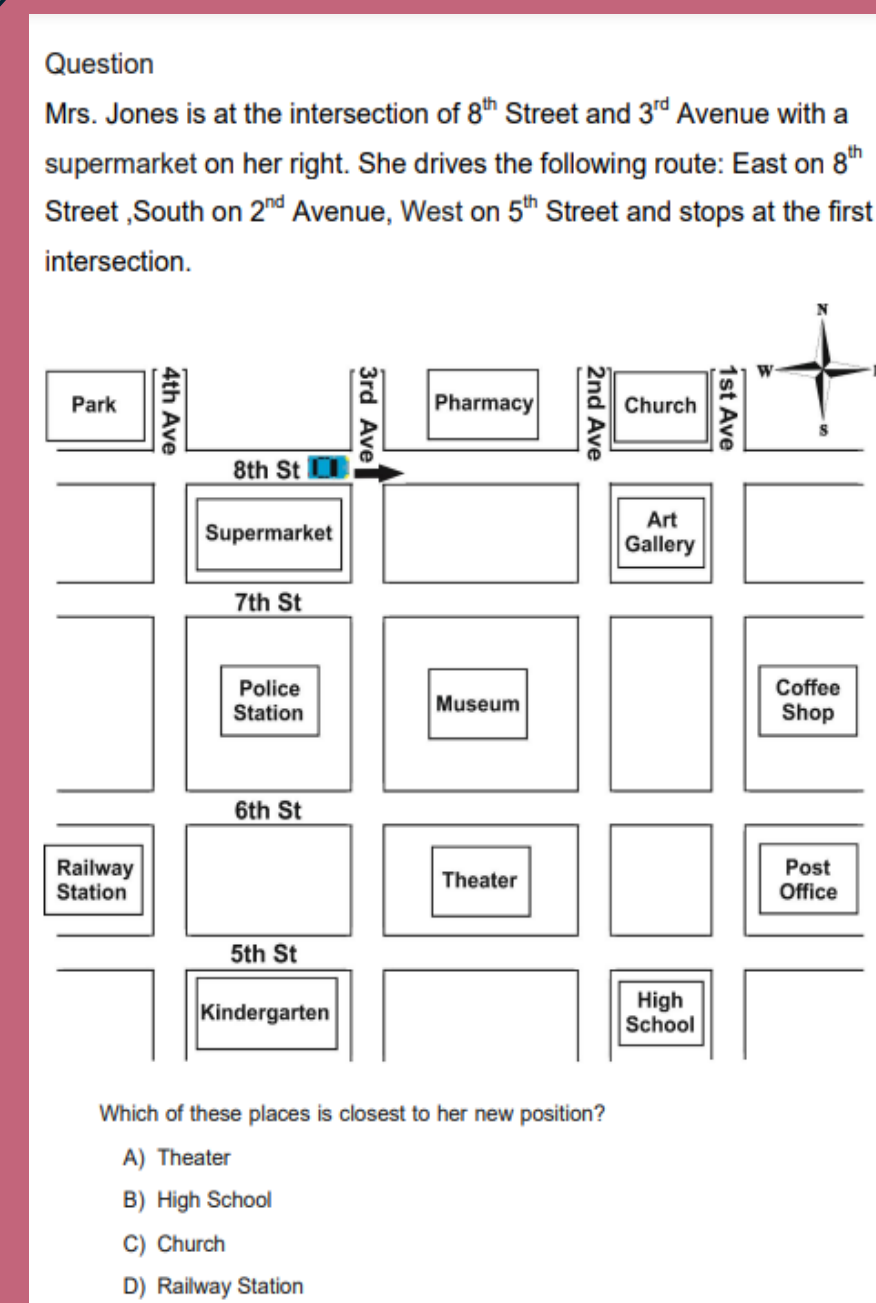


Figure 1: Sample Question from the Spatial Orientation Task demonstrating the field of random objects, the assigned position, and the object to orient towards.



Figures 2 and 3: Sample Questions from the Cardinal Points (left) and Left Right (right) tests that require participants to follow a given set of directions and determine the nearest landmark at the final position.

#### Left, Right and Cardinal Points Tests

-Participants are given an overhead street view consisting of various locations and a starting position for the car. Directions are given, either in left or right or in cardinal points, for three movements and asked, after these movements, the landmark closest to the final position of the car.

## Results

Currently, recruitment and administration are in progress for both participant age groups.

## Discussion

With data collection and analysis still being conducted, we expect to find that participants in the younger age group will demonstrate higher accuracy scores across all tests as well as faster times of completion on average.

The data collected from this study will help to establish data for both age groups for further application, including the use of mental rotation and spatial orientation skills as a cognitive markers for mental disorders.

## References

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