

# Everyday taxi drivers: Do gifted navigators have larger hippocampi?

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## Introduction

What is the relation between hippocampus (HC) and navigation?

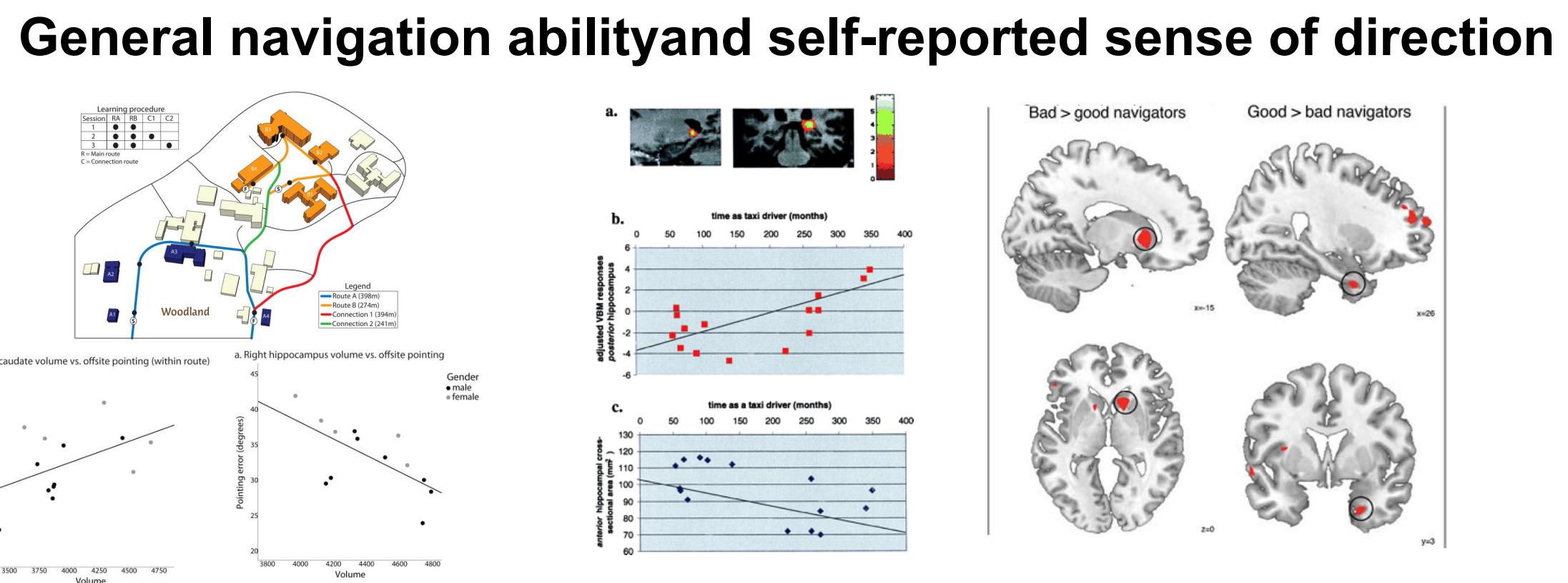
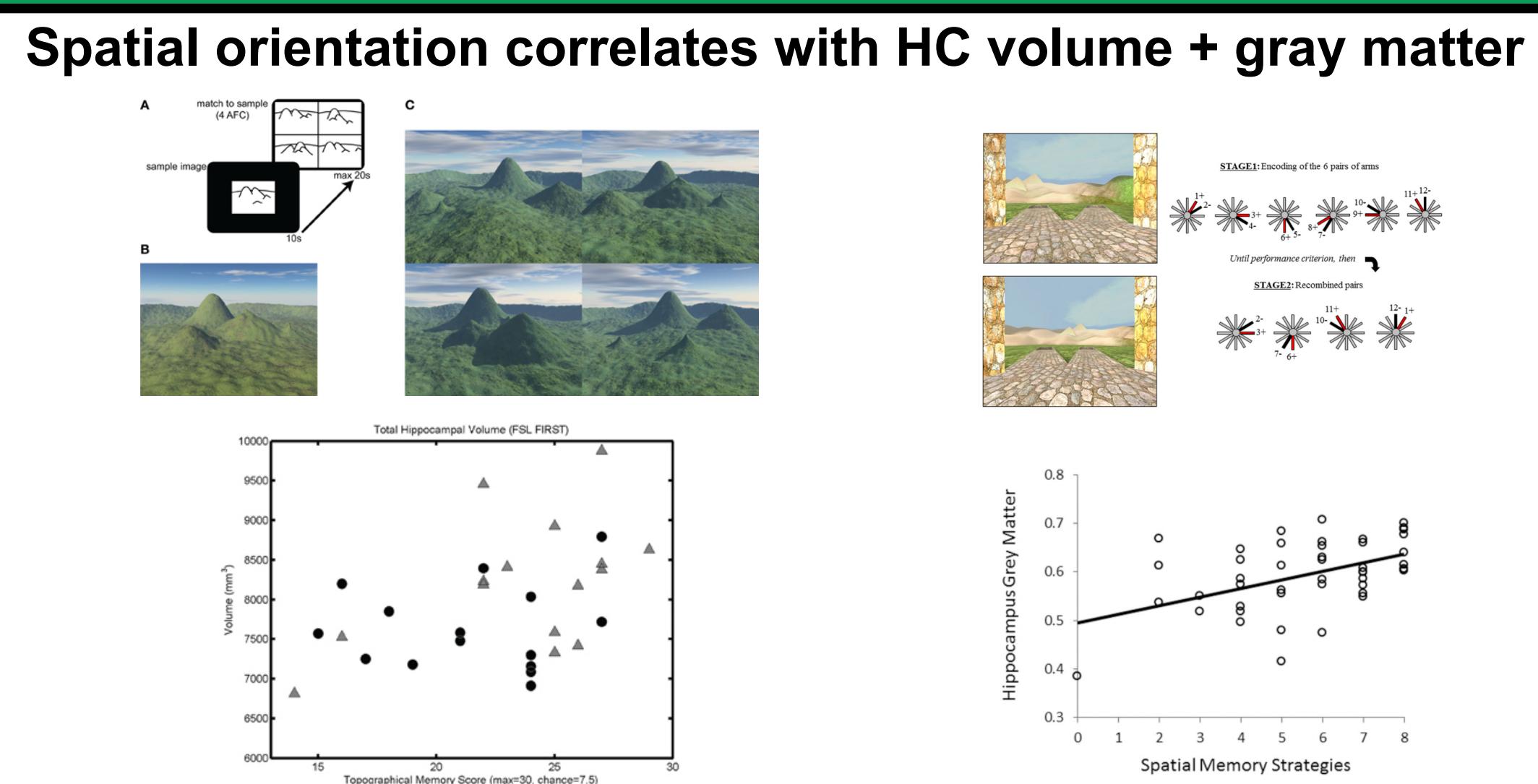
1. HC larger in experts than non-experts<sup>1</sup>.
2. HC lesions correlate with impaired navigation<sup>2</sup>.
3. HC activity patterns correlate with place strategy, distance coding<sup>3,4</sup>.
4. HC gray matter volume correlates with some navigational tasks<sup>5</sup>.

But does navigation ability correlate with hippocampal volume in a typical, healthy population?

Structure-Function Hypothesis:

Better navigation = Larger HC, smaller caudate

## Background



## Method

Pre-registered sequential design with optional stopping.

Pre-registered correlation: R-HC volume with pointing accuracy

N = 70 (41 women) (+ additional 20, collecting now)

### Behavioral Measures

WRAT-IV measure of verbal ability

Santa Barbara Sense of Direction<sup>6</sup>

Virtual Siltcon<sup>7,8</sup>

Mental Rotation Test (MRT)

### Brain Measures

Structural MRI, automated segmentation using freesurfer recon -all

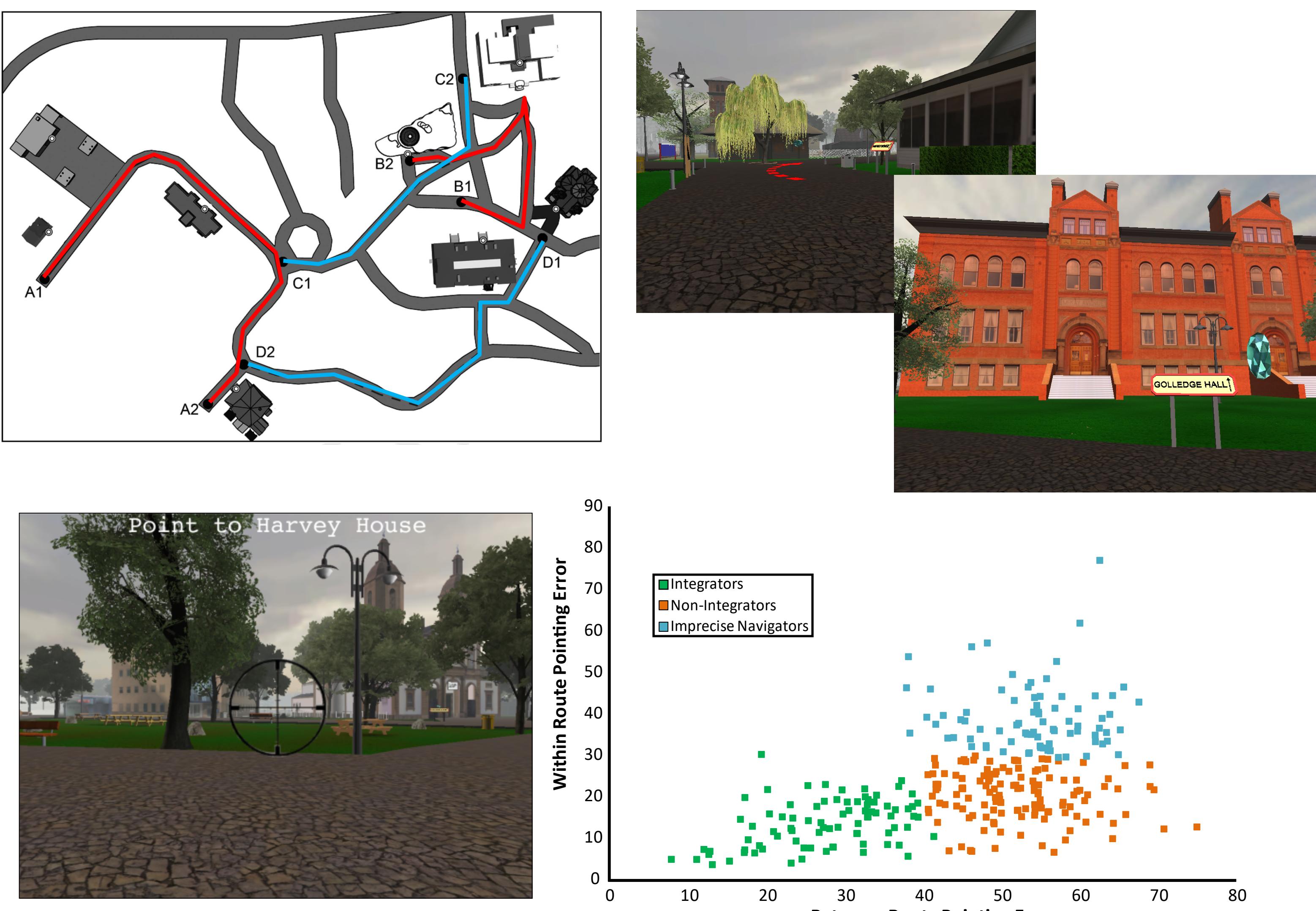
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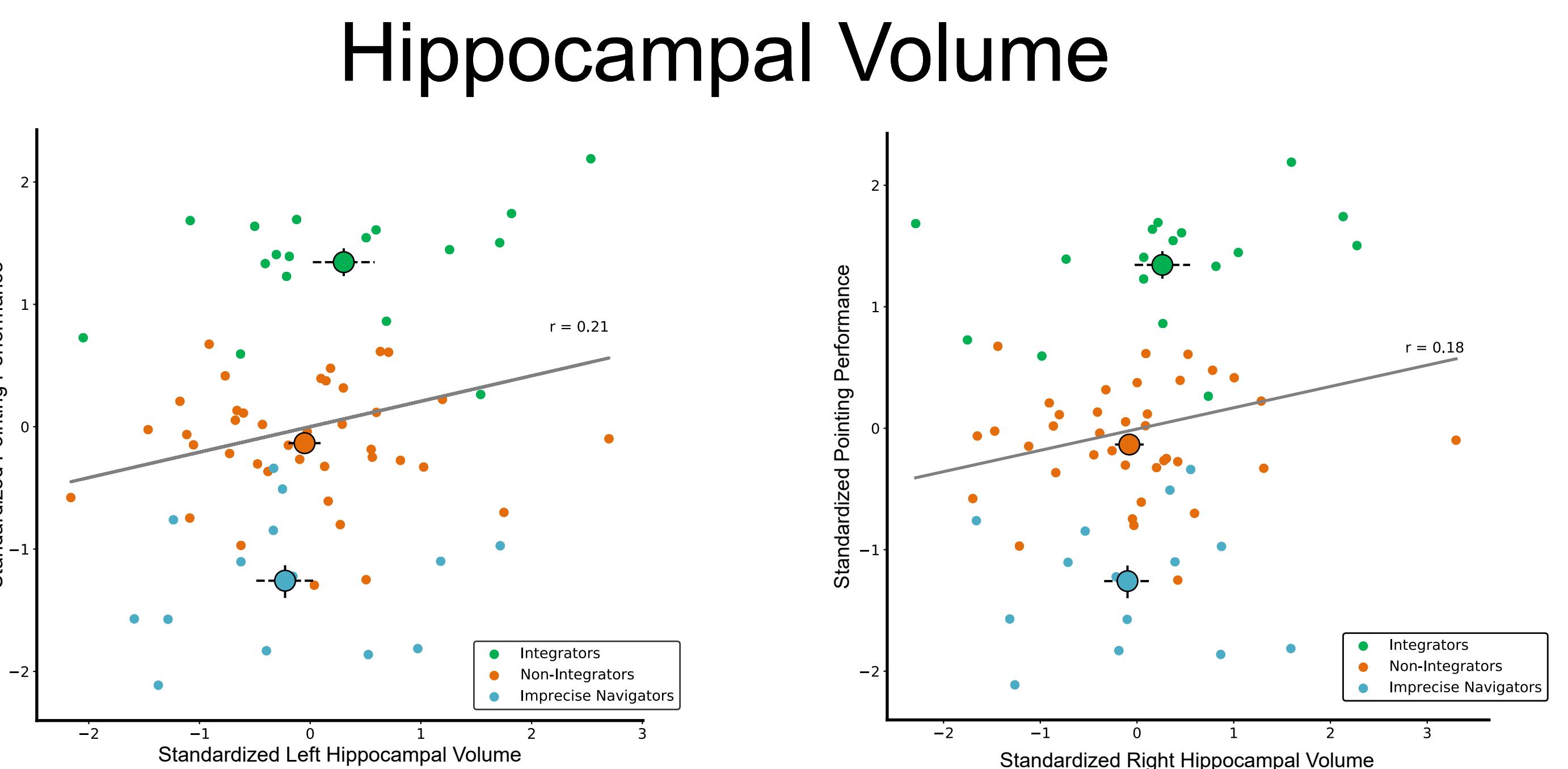
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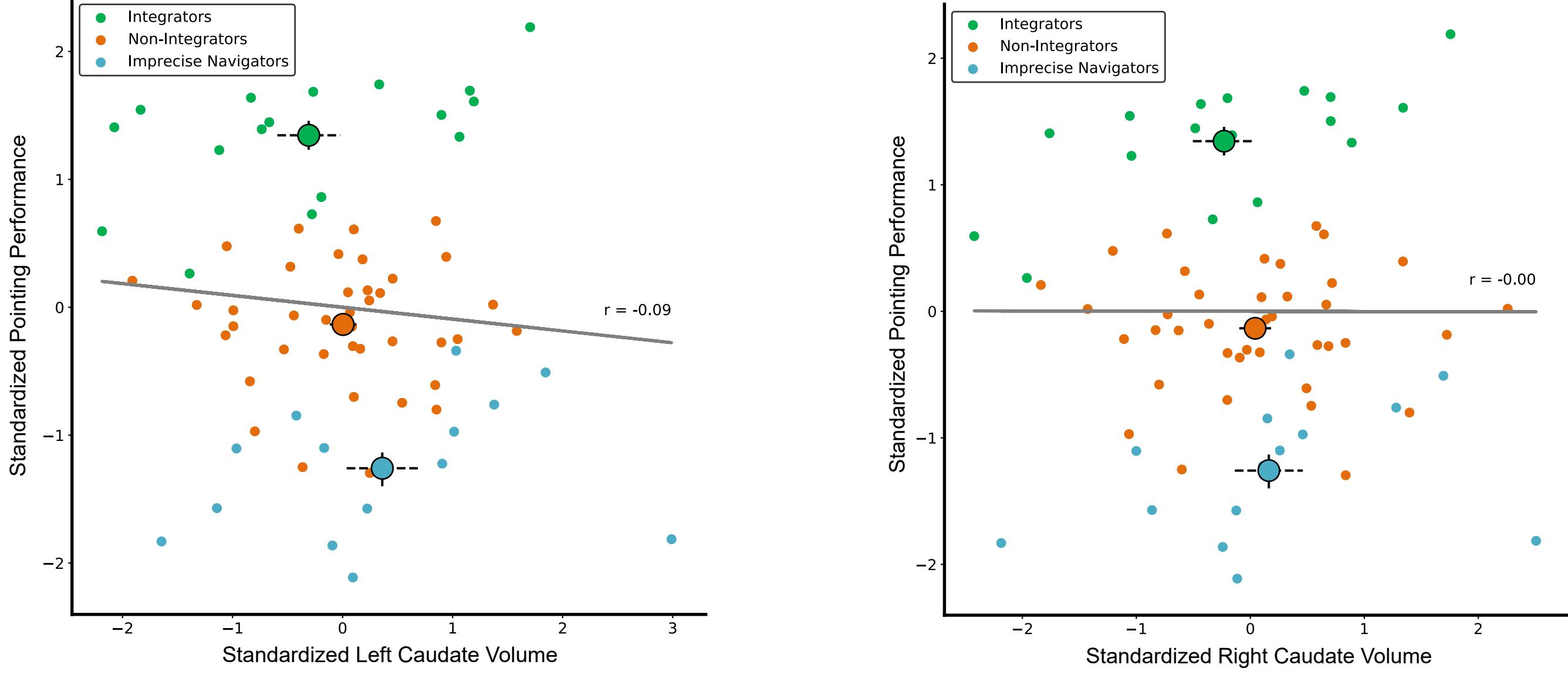
## Virtual Siltcon



## Navigation Ability

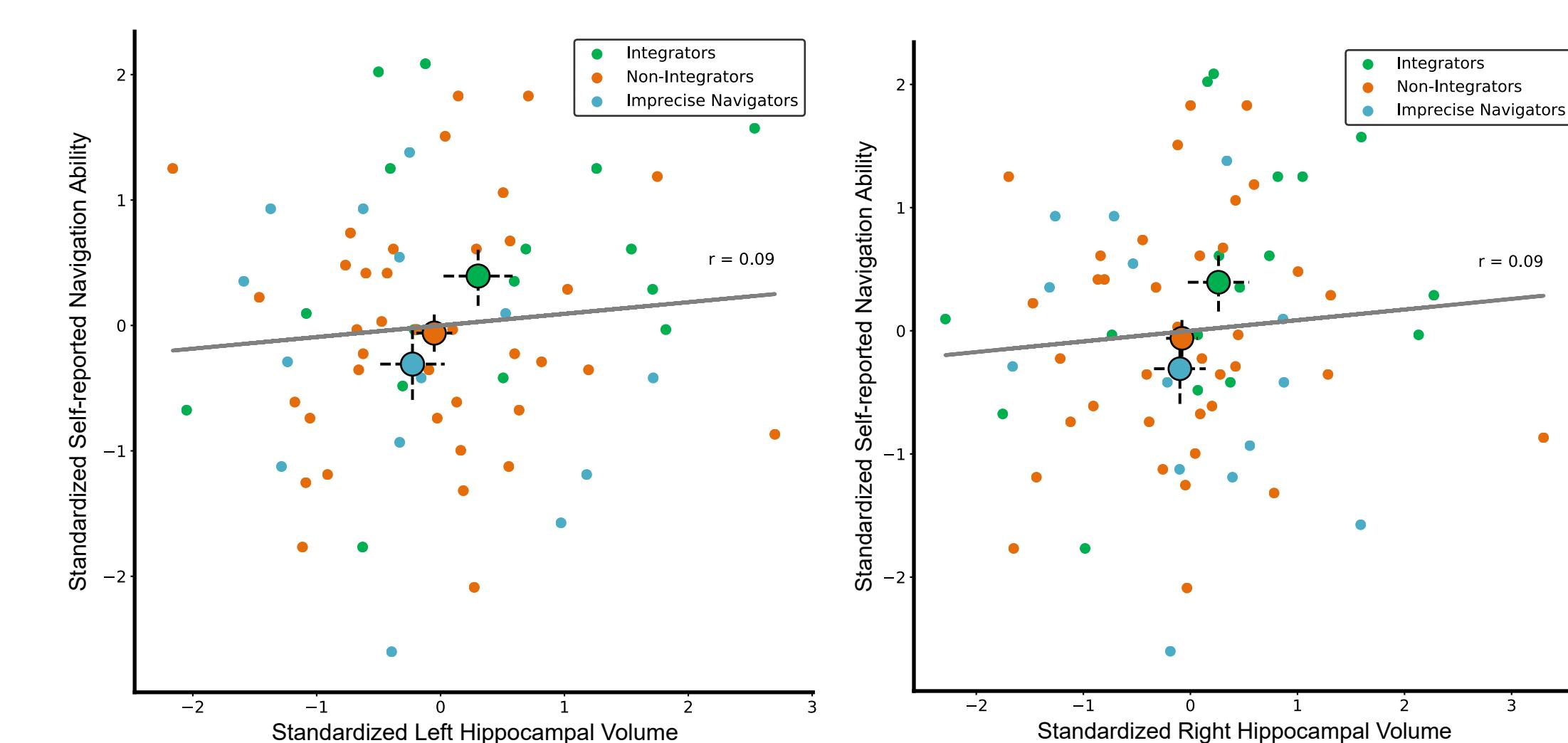


### Caudate Volume

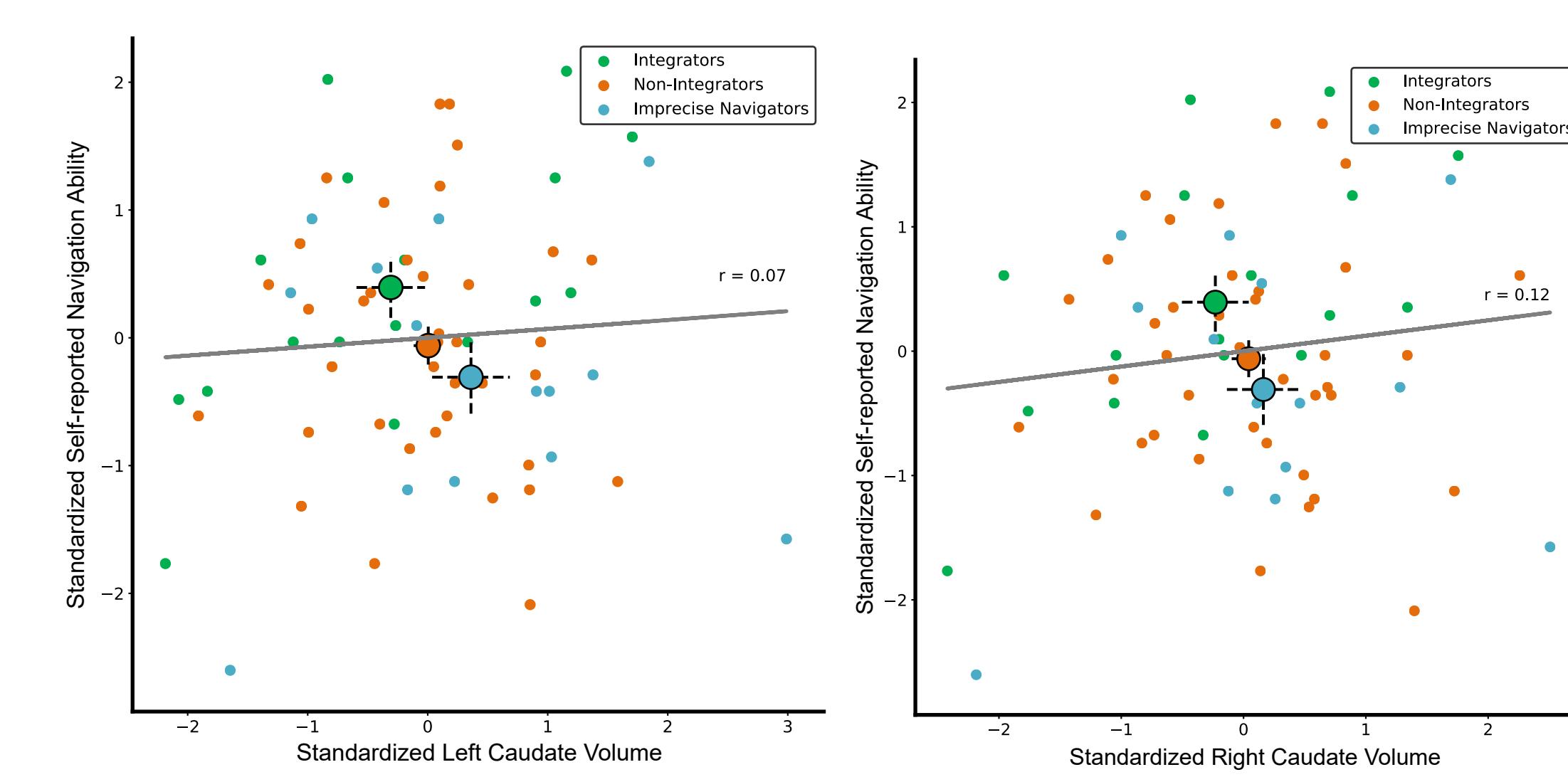


## Self-reported Nav. Ability

### Hippocampal Volume



### Caudate Volume



## Non-Pre-reg Analyses

The following analyses did not show significant differences:

Between versus Within-route pointing and HC/Caudate

Anterior versus Posterior hippocampus (hand-segmented)

Controlling for: WRAT, MRT, Cortical and Brain volume

L/R Amygdala with navigation ability

Gender:

Men had larger brains than women, but did not significantly outperform women on Virtual Siltcon. Nor did correlations with brain and behavior differ between genders.

## Conclusions

- Navigation ability is only weakly (if at all) related to HC volume in this sample of normally-functioning university students
- Past reports of an association in such samples may be attributable to small sample sizes or alternative measures (e.g., gray matter density). Past reports in other kinds of samples may reflect a true association in more extreme groups.

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