

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-experts¹.
2. HC lesions correlate with impaired navigation².
3. HC activity patterns correlate with place strategy, distance coding^{3,4}.
4. HC gray matter volume correlates with some navigational tasks⁵.

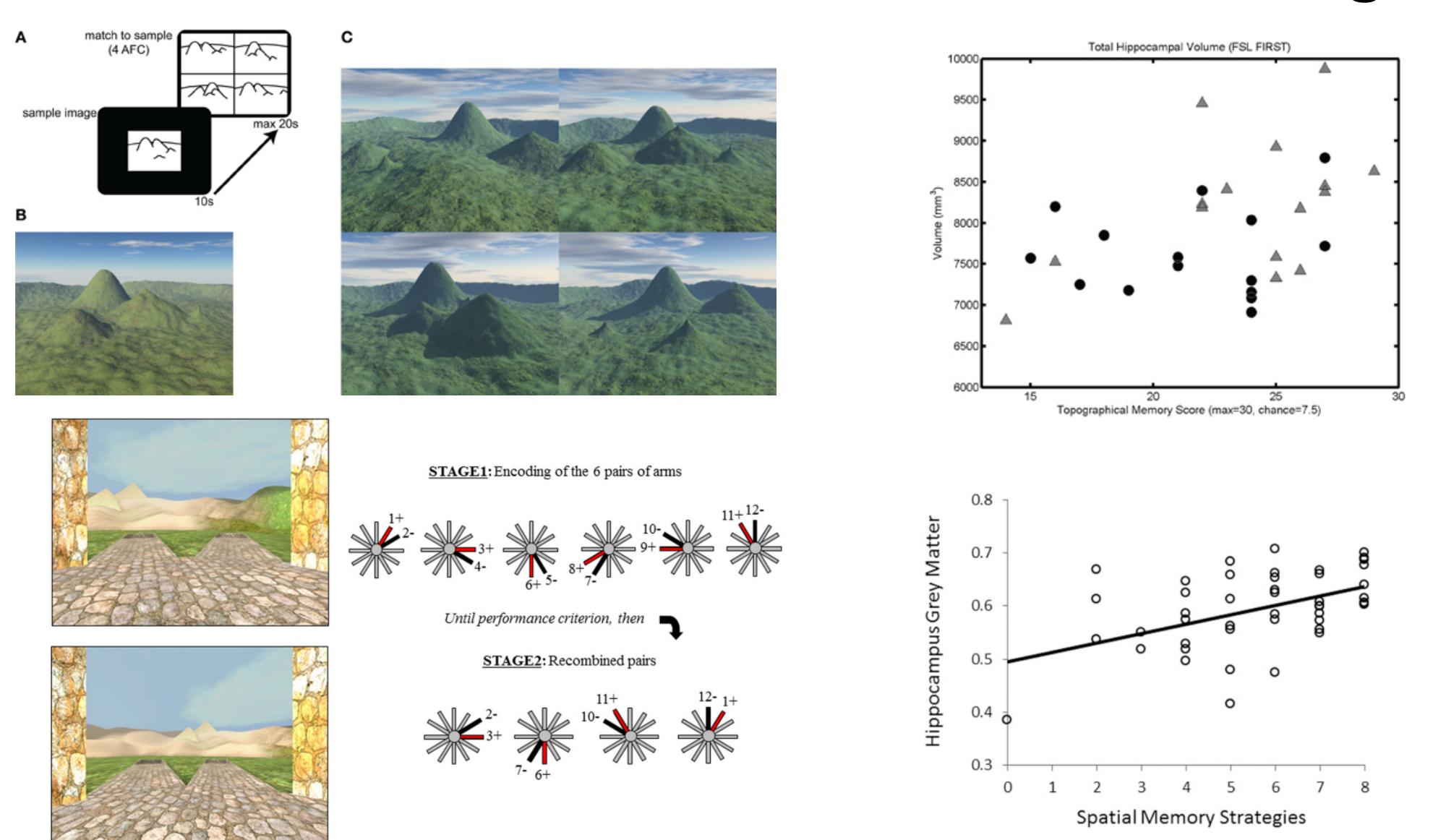
But does navigation ability correlate with hippocampal volume in a typical, healthy population?

Structure-Function Hypothesis:

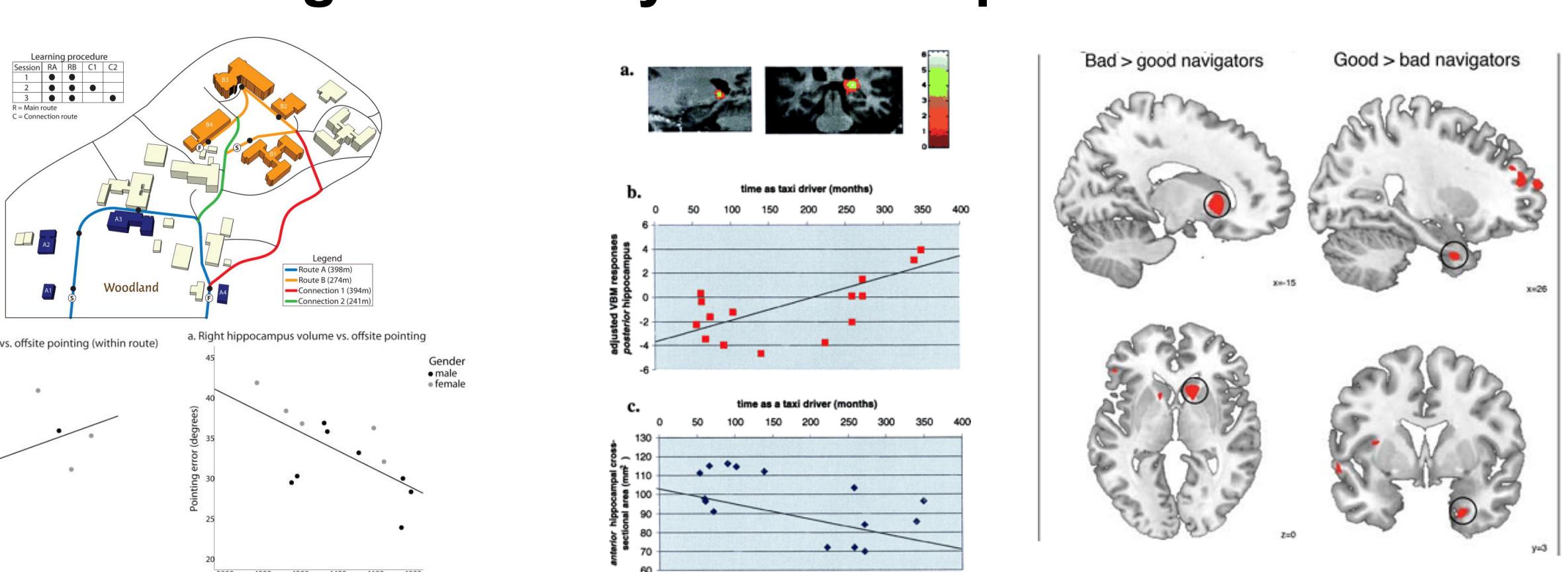
Better navigation = Larger HC, smaller caudate

Background

Spatial orientation correlates with HC volume + gray matter



General navigation ability and self-reported sense of direction



Method

N = 70 (+ additional 20, collecting now)

Behavioral Measures

WRAT-IV measure of verbal ability

Santa Barbara Sense of Direction⁶

Virtual Siltton^{7,8}

Mental Rotation Test (MRT)

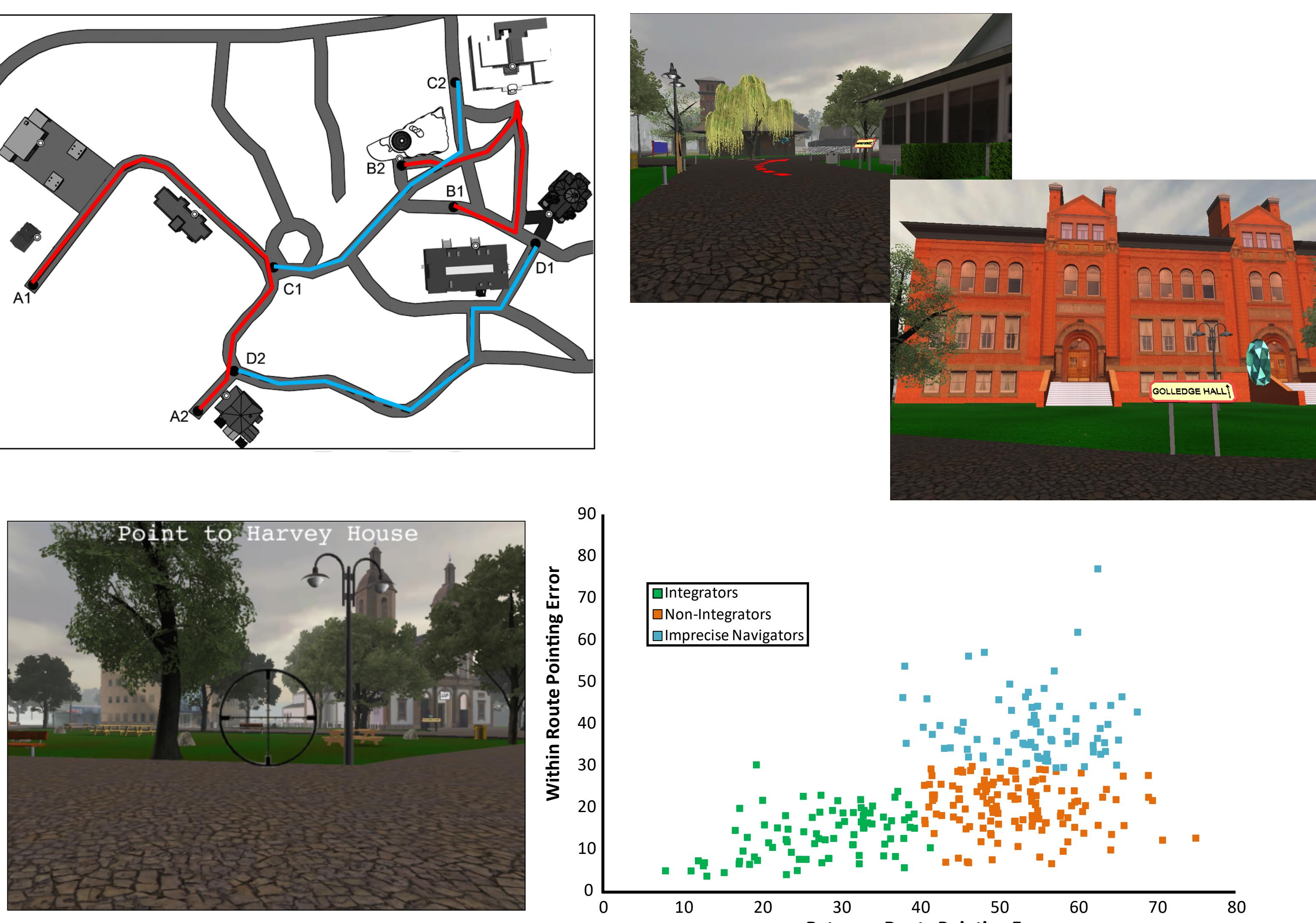
WRAT-IV measure of verbal ability

Brain Measures

Structural MRI, automated segmentation using freesurfer recon -all

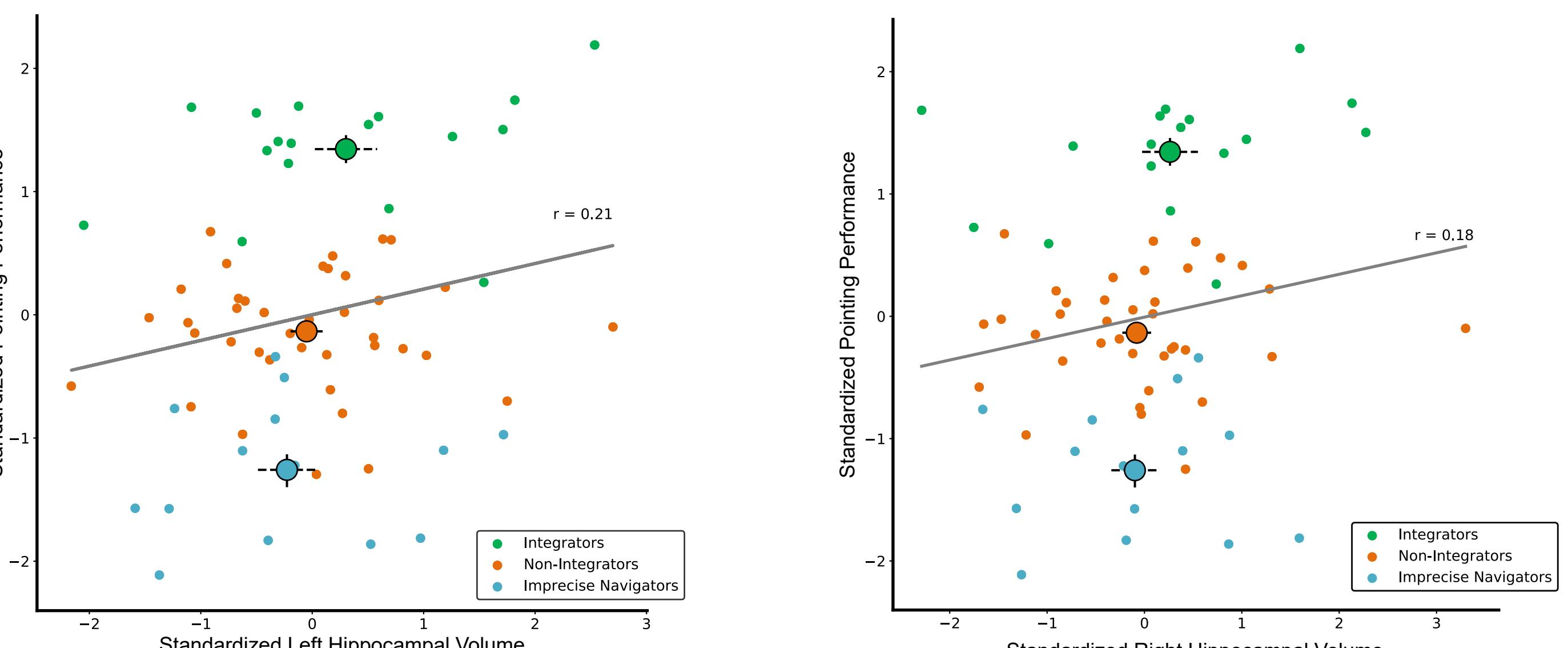
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Virtual Siltton

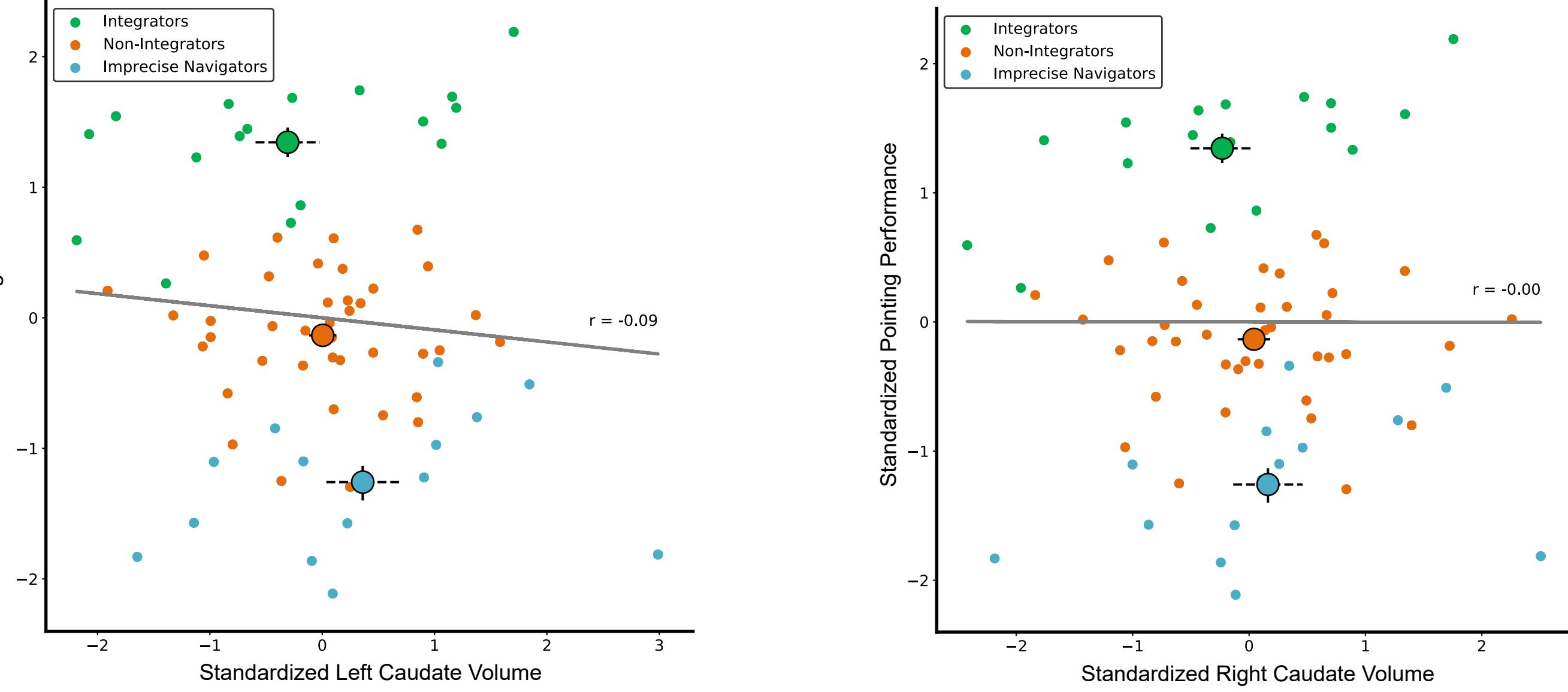


Nav. Ability, HC, Caudate

Hippocampal Volume

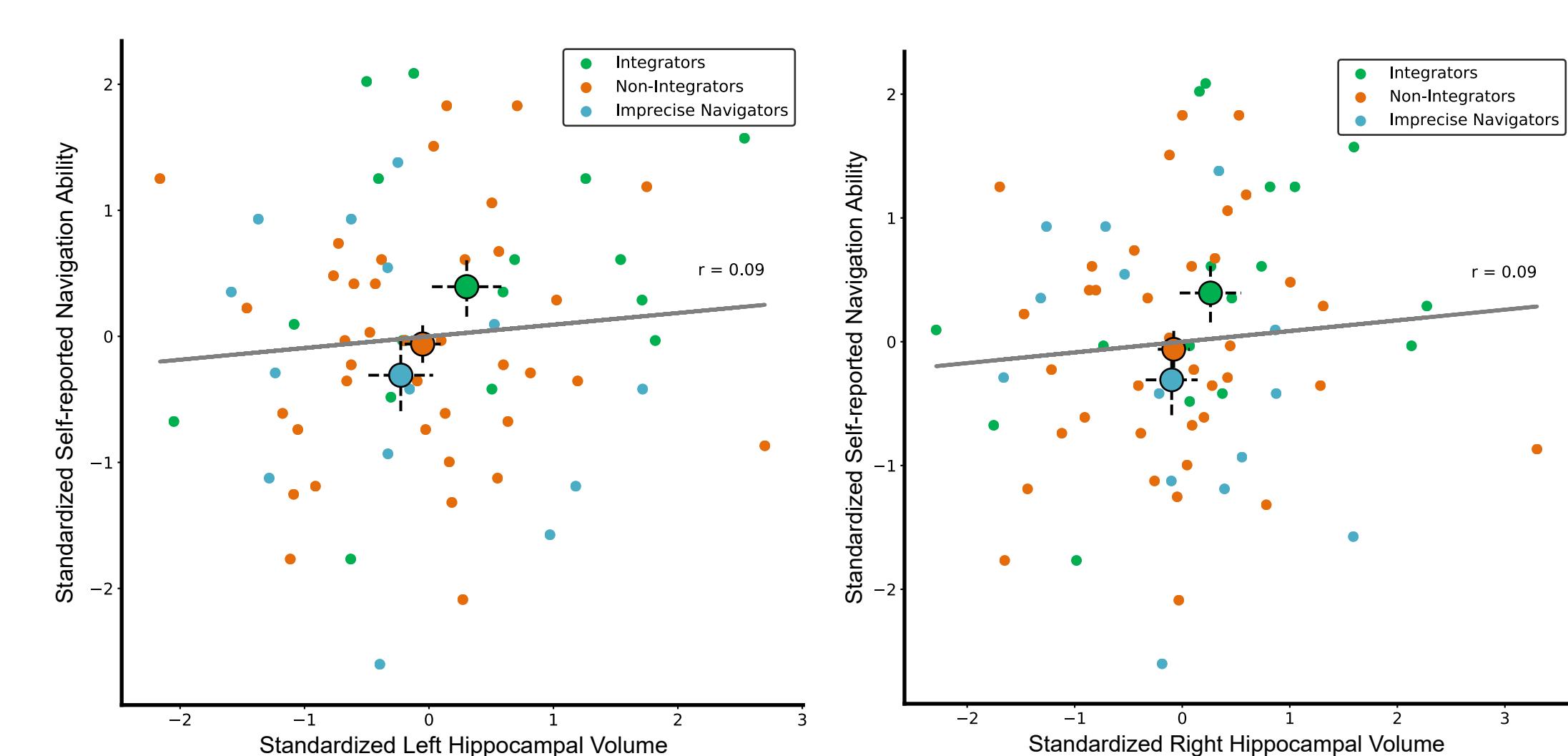


Caudate Volume

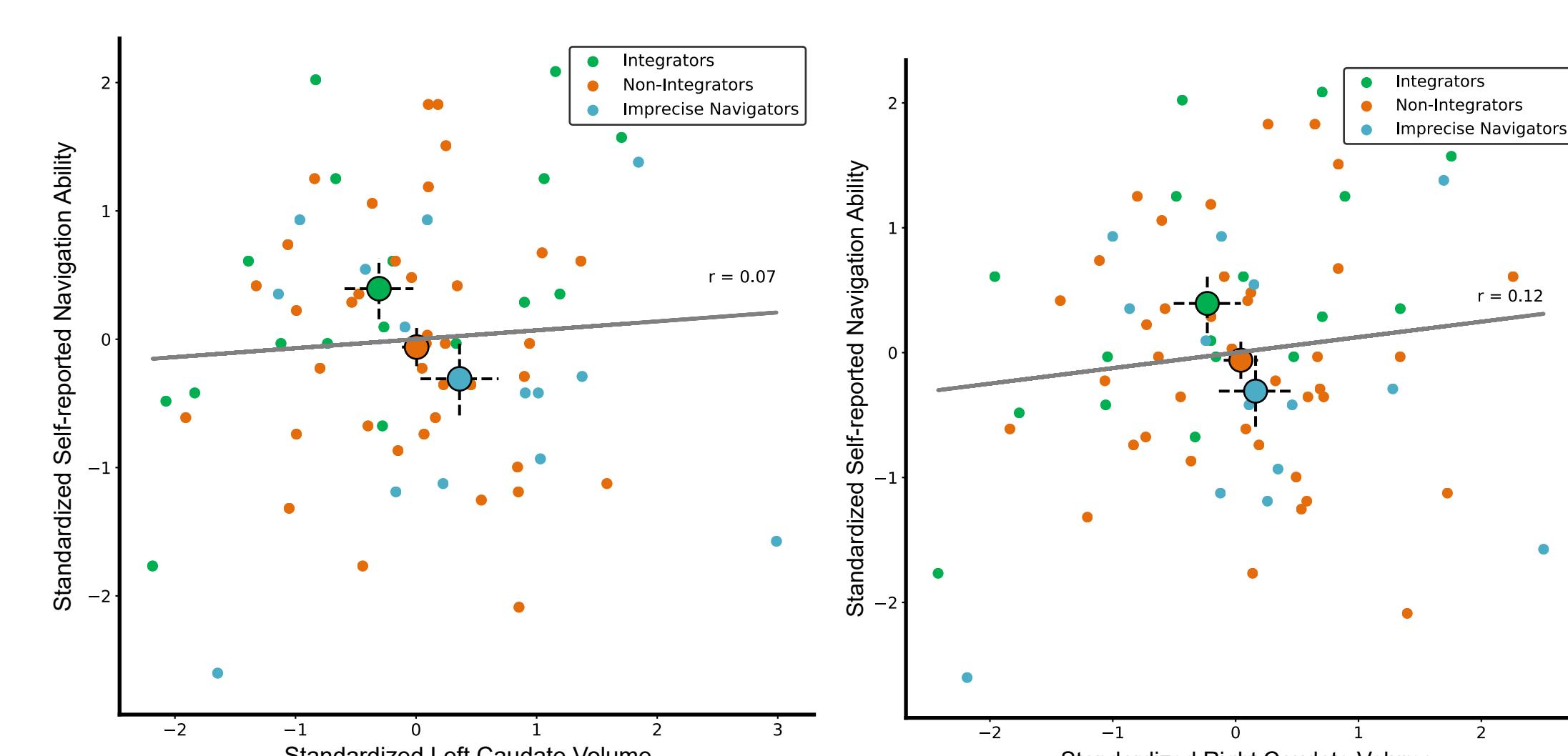


Self-report, HC, Caudate

Hippocampal Volume



Caudate Volume



Regression Analyses

Conclusions

- Evidence in favor of Navigational Flexibility Hypothesis
- Navigation ability not reducible to self-report nor to HP volume
- Though correlations with specific spatial tasks may be high, the brain-behavior relationship between more ecologically-relevant navigation behavior is less straightforward.

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