Real versus Simulated Environments in Survey and Route Perspective Learning

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Introduction

This experiment is primarily based upon two neuroimaging papers, which explore the neural correlates of mental exploration and encoding in route and survey perspectives.[1,2] Shelton et. al found that survey encoding recruited a subset of the areas that were recruited during route encoding but with a greater activation in the inferior temporal cortex and superior parietal cortex. Route encoding was found to involve the medial temporal lobe structures, anterior superior parietal cortex, and postcentral gyrus, which survey encoding did not. In this experiment the participants encoded both the route and survey environments through a computer simulation. Mellet et. al examined the same cognitive functions during mental exploration of an area learned through different perspectives. In this case the survey perspective was learned through a computer simulation but the route perspective involved a participant actually being led through a real area. Mellet et. al hypothesize that the right hippocampal area supports a "dual-perspective" representation, and that bi-lateral hippocampal involvement is related to the simultaneous incorporation of route information and object landmarks. Additionally, activation in the parietofrontal network was thought to reflect the spatial mental imagery aspects of the task. While each of these studies examined different aspects of survey and route perspective—one examined encoding and the other mental exploration—neither study clearly explored the differences between the encoding or mental exploration of real versus simulated environments. Many participants reported the lack of a "feeling of immersion" in their environment when learning in a simulated environment. How does this and the lack of detailed visual cues effect encoding and recall of such environments. My study is designed to examine the accuracy and response times of participants making distance judgments between objects in each of these situations. On the one hand it is possible that the lack of this feeling of immersion may interfere with the participants spatial abilities and result in lower accuracy and longer response times, however it also seems plausible that the lack of finer detail in simulated environments may allow for quicker more accurate distance judgments.

Procedure and Design

Participants. Forty healthy right-handed volunteers (twenty females, twenty males; mean age, 25 years) were given monetary compensation and gave written consent.

Experimental Task. This experiment involved four groups: survey-real, survey-simulated, route-real, and route-simulated. In each group the participant was familiarized with an area he or she had never before seen. The participant was led through the environment by an experimenter who walked with the participant in the real conditions or controlled the motion of the simulation in the simulated conditions. In several key locations of this area, objects were located and pointed out by the experimenter. The participant was led through this environment twice and the next day was led through once more, after which he or she was immediately tested on the accuracy of distance judgments between the objects that were in the environment.

The distance judgments were tested by a computer program which presented the names of two objects, one at a time for an interval of one second each, followed by a string of numbers (1-9) from which the participant was required to choose the number closest to the number of feet separating the two objects. These comparisons were ordered randomly and both accuracy and response times were measured.

[1]Mellet E, Bricogne S, Tzourio-Mazoyer N, Ghaëm O, Petit L, Zago L, Etard O, Berthoz A, Mazoyer B, Denis M. (2000) Neural Correlates of Topographic Mental Exploration: The Impact of Route versus Survey Perspective Learning. NeuroImage 12:588-600.

[2]Shelton A, Gabrieli JDE. (2002) Neural Correlates of Encoding Space from Route and Survey Perspectives. J Neurosci 22(7):2711-17.