

## Forgetting rate of topographical memory in a virtual environment

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### Background

It is well admitted that spatial knowledge of large-scale environments is organized into route or survey representations (Thorndyke & Hayes-Roth, 1982). The route representation consists in the memory trace of the sequence of landmarks encountered along a specific route and of the turns associated with each landmark. The survey representation is considered as being map-like, allowing direct access to the global layout of an environment. While extensive research has been devoted to the retention of verbal knowledge, very little is known about the retention of spatial knowledge. The available data show no systematic decline of performance in topographical memory for a long-term period. However, these data were gathered through a limited set of tasks (mainly tapping survey-type memory) performed in real-world environments, which were not entirely controlled from a methodological point of view. For these reasons, the forgetting rate of route and survey memory was investigated in a virtual environment.

### Method

The present study involved 16 male and 16 female young participants matched for level of education and age. The experiment comprised a learning phase followed by four

testing phases performed 5 minutes, 1 week, 1 month and 3 months later. During the learning phase the participants followed repeatedly a fixed well-learned route, from which they were required to build route then survey knowledge. Two route tasks (number of turns and travel time between two unseen landmarks along the route) and two survey tasks (pointing and Euclidean distance to unseen landmarks) were administered to the participants. The first testing phase evaluated the initial level of route and survey memory while the other three phases, which were performed without additional learning but with different series of items, evaluated the forgetting rate of route and survey knowledge.

### Results

For each kind of task, the amount of remembered knowledge was computed as a correlation index between the participants' estimates and the actual values. An ANOVA with gender as a between-participant factor, and task and session as within-participant factors, revealed a significant effect of task and of session. Although performance was worse for the survey than for the route tasks, it slightly declined with time for both kinds of knowledge.

### Conclusions

The analysis of remembered knowledge as a function of time revealed only a light decline of both route and survey memories. Current experiments are investigating to what extent these kinds of memories are differentially affected by time if the participants are not given the possibility to reactivate their knowledge along the testing phases (i.e., in the absence of repeated testing). When the participants are tested only after learning and after three months, there is no possibility of "reconsolidation" of topographical memory.

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