

Construction of a spatial mental model from a verbal description or from navigation in a virtual environment

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Background

The construction of a spatial representation from a verbal description has been extensively studied, and the characteristics of the representation as well as the processes involved in this construction have been clarified. Many studies have shown that these representations preserve the spatial relationships between the elements of the described environment (e.g. Schneider & Taylor, 1999). These spatial representations are usually called spatial mental models, in reference to the Johnson-Laird theory of mental models (1983). Over the last few years, a number of studies have also investigated the processes involved in the construction of these mental models. One question of recent interest has been to investigate the involvement of working memory (WM) in the construction of a mental model derived from a verbal description, using a dual-task paradigm. A specific involvement of the visuo-spatial WM (VSWM) has been evidenced, as well for survey as for route descriptions, even if to a different extent (e.g. Pazzaglia et al., 2005). Virtual environments are also a mean to investigate the properties of the spatial representations constructed by individuals. Our objective is to question the role of the visuo-spatial and verbal components of working memory in the construction of a spatial model when subjects are immersed in a virtual spatial environment. The aim of the first experiment, which is currently running, is to verify whether the spatial model

constructed from a virtual environment is similar to the one constructed from a verbal description. A second experiment will follow and will use a dual-task procedure to examine the involvement of VSWM and the verbal WM in the construction of the spatial model.

Method

The virtual environment used is a town constructed on the basis of photos of Paris, France. The computer-generated virtual environment is projected onto a screen with a video projector. Subjects are driven in the town and they see the interior of the car as if they were sitting in the front place. An itinerary has been constructed, that follows a road with turns and crosses. All the classical elements of a town are shown (buildings, shops, traffic lights, garbage containers, trees, other cars, etc.) and ten specific areas or landmarks can easily be distinguished (such as a train station, the town hall, a parking, etc.). Usual motor noise and town noise are also heard. Subjects are told that they are driven by a friend to the station, and they are instructed to remember how to get there in order to be able to find their way in the town. The corresponding verbal description of this route was constructed on the basis of the navigation in the environment. Subjects are first presented either the visual projection of the route or the verbal description. To assess for the construction of a spatial model, they then have to verify some statements about the itinerary. Sentences describe the spatial relationships between the landmarks and refer either to relationships explicitly stated in the corresponding text or not. In addition, subjects have to draw a map of the route.

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