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SYMPOSIUM SCHERER

Wayfinding tasks in visually impaired people: the role of tactile maps

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Abstract Wayfinding is one aspect of cognitive mapping that includes the features of encoding, processing and retrieving information about the environment (Golledge 1999; Kitchin and Blades 2001; Blades et al. 2002). Such ability refers to the cognitive patterns of learning a route and retracing it from memory. Orienting oneself in a new environment and moving efficiently and independently are difficult tasks which depend upon a series of processes of high cognitive complexity (Espinosa et al. 1998). These tasks are even more complicated in the case of blind and visually impaired people, thus the abilities of both travelling independently and interacting with the outer world are the greatest challenges for this specific population (Golledge 1993).

Several studies (e.g. Klatzky et al. 1995; Passini and Proulx 1998; Klazky 2000) found that there is no significant difference between sighted and blind people in spatial competence and spatial tasks. Other studies (e.g. Ochaita and Huertas 1993; Jacobson et al. 1998; Golledge et al. 2000) confirmed that people who are visually impaired can learn routes successfully.

In order to gain, store, and recover spatial information, visually impaired people make use of tactile cues as well as auditory or olfactory cues. Furthermore, the kind of cognitive strategy employed to interact successfully with the environment could depend also on which assistive device is used for moving into the surroundings.

Some researches (Jacobson 1992; Espinosa et al. 1998) verified the importance of tactile maps for helping blind and visually impaired people to form impressions of their surrounding space.

Blades et al. (2002) found that the performance of visually impaired people can be enhanced by the strategies used for learning a new route, e.g. by modelling a map of the route itself.

The main aim of the present study is to assess the usefulness of tactile maps to learn and retrace an unfamiliar route for blind and visually impaired people. In other words, it is expected that individuals who have the possibility of employing a tactile map of a novel route show a greater learning outcome than individuals who have not.

A further aim of this study is to verify the aid of route modelling to improve wayfinding competence. Study participants were 30 visually impaired adults (17 totally blind and 13 partially blind) from 20 to 55 years of age, balanced for gender and blindness level (i.e., total or partial). They were recruited in two national associations of blind people who live in the Region of Sardinia. The experimental route was 526 m long and passed through a University complex in the centre of the city of Cagliari. At the beginning of the route, just before approaching the entrance of the campus, participants had to cross the traffic lights (which included acoustic signals for visually impaired). The remaining part of the route was inside the campus, crossed by cars and motorbikes, too. The route ended in front of the Campus Student House.

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The following experimental procedure was implemented.

Before the trials, participants answered a questionnaire including questions on residual visual abilities, and cause(s) of the impairment. Participants were split in two groups of equal number and randomly assigned at one of two experimental conditions.

In the *Verbal Description Condition*, people carried out the learning trial by walking through the entire route guided by the experimenter. In this condition the experimenter pointed out sequentially all the 11 decision points with a verbal description.

In the *Tactile Map Condition* people handled a tactile map along the learning trial. The map contained the entire route and was reproduced in a special sheet realized through the Minolta technology. Before the learning trial, the experimenter placed the participant's finger in the start point of the tactile map and gave information about the symbols reported. During the learning trial participants of this condition did not receive any further information.

In both conditions the participants performed a total of three tasks (i.e.: the learning trial and two experimental trial), which consisted in walking and orienting in a new route. There was a break of approximately 20 min between the trials. At the end of each break, participants were guided to the route starting point throughout a route, which differed from the experimental one.

From the second trial (i.e. the first one after the learning trial) all participants carried out the route without any guide or suggestion by others.

In the second and third trials two independent judges reported in a graph paper (overprinting the map of the route in a 1:1,000 ratio) any mistaken deviation from the route and indicated the total time necessary to complete the trials for each participant. If the participants deviated more than 5 m from the route, the researchers stopped and re-conducted them back to the point where they had begun to deviate. All experimental trials were videotaped.

At the end of the second trial all participants were asked to make a map of the route. They were given a squared padding pillow with a rope cotton and some needles to reproduce the route. The process was videotaped and the reproducing models were photographed.

On the whole, research findings confirm the importance of tactile maps for visually impaired people's successful interaction with the environment.

The participants who learned the route by using tactile maps showed a more accurate level of confidence in retrieving the spatial information necessary to complete the trials. They walked quicker and completed the trial with more accuracy than people who learned the route by direct experience with verbal descriptions.

Keywords Cognitive mapping · Wayfinding · Blindness

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