

Strategies in Spatial Navigation

Olessia Blajenkova
Maria Kozhevnikov
Rutgers University

The goal of this research was to investigate the relation between individual differences in strategies used in navigation and mental representations of the environment reflected in sketch-map drawings.

Method

Sixty-six participants were taken through a specific route on two floors inside a building and they were subsequently asked to draw sketch-maps of the route. All sketch-map drawings were classified on various parameters such as accuracy in representation of spatial relations and landmark placement, different types of environmental landmarks, and use of verbal and pictorial features. After taking the route for the one time, participants were asked to point to different places that they met on the route. In addition they were asked to find a shortcut to the starting point, to retrace the route from the beginning as well as to recognize and the landmarks encountered on the route. Also, Shephard & Metzler computer-based mental rotation test was administered to participants to control for their spatial ability.

Results

Three types of sketch map drawings were identified and named correspondingly as one dimensional - 1D, two dimensional - 2D and three dimensional - 3D. 1-D maps represented linear sequence of landmarks and fail to represent spatial relations. Another type of map, 2-D, reflected spatial relations and directions, however it represented relations among locations only within one plane. 3-D maps represented directions and spatial interrelations with vertical alignment with respect to both floors of the

building. 1-D maps are commonly known as route maps, while 2-D and 3-D can be identified as survey maps. Results showed that 3-D maps were the most detailed in both schematic and pictorial aspects and accurate representations of an environment. Those maps were shown to correlate with the highest performance on landmark recognition, way finding and pointing tasks. Furthermore, those who drew 3-D maps had advantage on Shephard & Metzler mental rotation test. Those who drew 1-D and 2-D maps were worse in navigational tasks performance as compared to the 3-D group. 1-D maps had more verbal coding and pictorial details as compared to 2-D maps. The pictorial details in 1-D maps tended to be unproportionally enlarged. 2-D maps were found to be more schematic and have fewer details, especially pictorial ones, however they preserve spatial relations among locations.

Conclusions

In summary, the results show that differences in mental representations reflected in sketch-map drawings are internally consistent and correspond to different strategies of spatial navigation. The most successful strategy corresponded to the 3-D map, reflecting spatial relations in three-dimensional space. The other types of maps tended to represent only specific aspects of the environment: essential landmarks and verbal coding in 1-D maps or outline of spatial directions in 2-D. 1-D and 2-D strategies may reflect different strategies, which are possibly initiated by deficits in visual/spatial working memory resources.