Wayfinding Directions in U.S. and German cities: A Comparison of Qualitative Aspects in Sketch Maps for Supporting Spatial Orientation

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Introduction

To date, very little research has been conducted regarding the impact of different forms of urban structures on spatial thinking and how people from different cultures like inhabitants of the US and Europe perceive and describe the environment they are familiar with (Noordzij & Postma, 2005).

Studies have shown that in geometric, grid pattern environments, people predominantly depend on the underlying structure of the environment when providing route directions and judging orientations (Freundschuh, 1992; Lynch, 1960; Stea & Downs, 1977). Studies addressing the influence of culture on providing directions revealed that participants from the US use route descriptors only describing the route itself more often than a survey-like description, which would include the overall layout of the surrounding area (Taylor & Tversky, 1996).

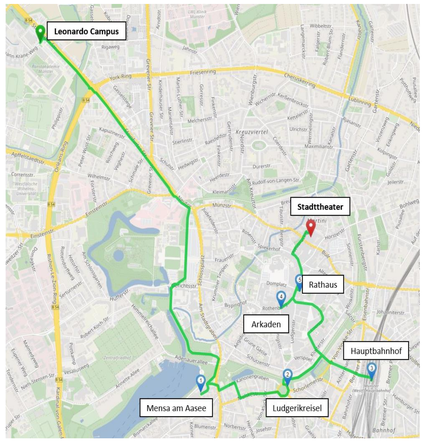
Thus, it is suggested that people have different spatial representations in their mind and also perceive space differently, depending on the environment and the culture, in which they have been grown up (Suzuki, 2013). This can be either due to different ways of how they learned the environment, or the structure of the environment itself.

Methods

We designed an experiment for investigating how residents of either an American city or a German city mentally structure their surroundings, as well as how they plan and visually communicate routes between various familiar locations.

Using a between-subjects design, each participant is exposed to only one of the conditions. The conditions are: A (long route, leading into the city), A' (long route, leading away from the city), B (medium length route, leading into the city), B' (medium length route, leading away from the city), C (short route, leading into the city), C' (short route, leading away from the city). In Albany, for condition A/A', the optimal path is about 26.6 km (16.5 miles) long, for condition B/B' 20.1 km (12.5 miles), and for condition C/C' 13.7 km (8.5 miles). In Muenster, the optimal path for condition A/A' is 6.6 km (4.1 miles) long, for condition B/B' 4.7 km (2.9 miles), and for condition C/C' 2.3 km (1.4 miles).

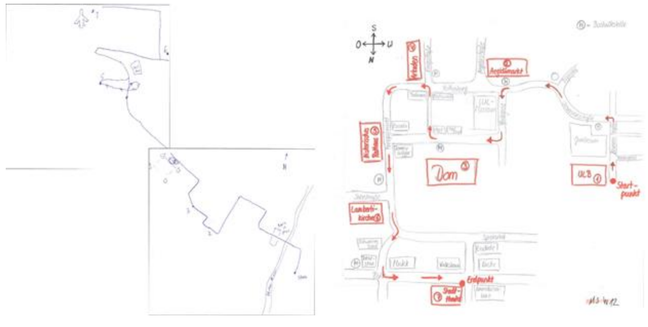
Our sample includes data from 45 participants (27 male and 18 female) in Albany (U.S.) and 46 participants (27 male and 19 female) in Muenster (Germany).



Results

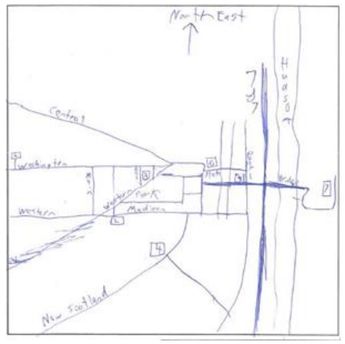
We used a prototype of the Sketch Map Analyzer tool that analyzes sketch maps regarding different qualitative aspects. In particular, the tool analyzes the accuracy and completeness of spatial information drawn in a sketch map with respect to a geo-referenced base map, addressing the following qualitative measures: 1) Completeness of road segments, 2) completeness of landmarks, 3) overall completeness, 4) linear ordering relations between landmarks along a route, 5) left-right relations between landmarks and streets, 6) topological relations between roads and landmarks, 7) connectivity of spatial objects, and 8) relative orientation relations between roads.

The resulting sketch maps can be roughly classified into two different types of maps: 1) Route – focused maps, and 2) Network – focused maps. The illustrations below show the two types of maps for both cities.



Albany Muenster

Route-focused



Albany Muenster

Network-focused

Acknowledging the differences between participants within a city, the authors employ univariate ANOVA to compare participant's performance in sketch map measures. Each qualitative aspect of sketch map measures is the dependent variable. Independent variables include city, sex, and route length as fixed factors and self-rated measures including personality, masculinity, femininity, egocentric, survey, and cardinal strategies as covariates.

City is a significant factor that contributes to the differences between the two cities, which is found the only significant factor in the following qualitative aspects of sketch maps: 1) completeness of street segments; 2) overall completeness of both street segments and landmarks; 3) the correctness of placing landmarks on the correct side of street segment; 4) the topological relationship between street segments and landmarks.

In the qualitative aspect of landmark and street segment ordering, the interaction of city and the route length is found significant. This indicates that not only the city but the route within a city can lead to different performance. The figure X shows the participant's performance in each combined category of city and route length.

In the qualitative aspect connectivity established in sketch maps, city also contributes to differences between the two cities. In addition, the interaction of sex and city is also significant. Besides the fixed factors, the covariate of cardinal directions in self-rated wayfinding strategies also contribute significantly to the differences.

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