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Identifying which Street Characteristics Promote Walking for Transport - A Virtual Reality Think-Aloud Study

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This work addresses the following topic(s) from the Call for Contributions:
(Please check at least one box)

- Placemaking to integrate urban spaces and mobility
- Promoting sustainable mobility choices in metropolitan regions
- Governing responsible mobility innovations
- Shaping the transition towards mobility justice
- System analysis, design, and evaluation
- other: _____

Extended Abstract

Problem statement

Walking is widely recognized as an accessible and eco-friendly mode of transportation with numerous health benefits. Research has shown that the environments in which a person travels shapes that individual's preferred mode of transport. While macro-environmental factors like neighborhood walkability, play a role in active transport, micro-environmental factors such as the presence of a sidewalk, evenness of the surface, greenery and trees, traffic speed, etc., offer more adaptable solutions. These micro-environmental factors are mostly regulated by local governments, which makes it less complex when having to change one off those factors because less stakeholders are involved. Additionally, the nature of these factors is often less complex, e.g. creating an even surface is easier than creating a well-connected neighborhood. Previous studies, like walk-along interviews or experimental photograph studies, face methodological limitations. Experimental studies using manipulated photographs lack interaction with the environment, as they cannot capture the movement of traffic or the accompanying sounds. Walking in real-life conditions during walk-along interviews poses challenges in replicating environmental conditions for participants as it is not feasible to control the actual (traffic) situation. This uncontrollable situation can also pose safety issues. VR emerges as a promising alternative, providing controlled scenarios and potential for inclusivity as already been shown for cycling. By being fully emerged in the environment it offers a more realistic impression compared to photographs, while still being safe and standardized for every participant, which is not always the case for studies under real-life conditions. Additionally, VR has the potential to involve specific groups of the population that may be difficult to engage or include through real-life methods.

Research objectives

The objective of this study is twofold. First we want to use VR to discover which street characteristics are important in creating safe and attractive environments for different sub-groups of pedestrians. Second, we aim to

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determine whether this method indeed adds value compared to other more traditional methods, such as walk-along interviews or photo experiments.

Methodological approach

To ensure a diverse, inclusive sample, convenience sampling will be utilized. Recruitment will take place via social media, schools and (sport)clubs for younger participants, community health centers and associations for those with a low socio-economic position, and organizations catering to older adults, like local recreation centers. For the experiments participants will walk through a virtual street based upon an existing street in Ghent, Belgium. A VR set-up will be used, consisting out of an immersive VR headset, and an omnidirectional treadmill (Virtualizer Elite 2, Cyberith GmbH, Austria) that allows them to move freely within the environment. Data will be collected using the think-aloud method while participant are walking through the street. This method involves participants vocalizing their thoughts. The goal is for participants to provide unfiltered information about the environment, enabling the researcher to gain broad insights into the topic. Additionally, some socio-demographic characteristics of the participants will be collected. This will allow us to differentiate between the opinions of different target groups within the population. Furthermore, some questions will be asked regarding the use of the VR setup (e.g., about the sense of being present in the VR environment (Igroup Presence Questionnaire), how realistic the environment was perceived, any feelings of VR sickness (Virtual Reality Sickness Questionnaire), how the walking is compared to normal walking, etc.). The number of participants will depend on data saturation within the qualitative part of the study. To detect which street characteristics influence walking for transport, a content analysis will be performed to analyze the think aloud data. Socio-demographic characteristics will be used to determine differences between sub-groups in the sample. Analysis of variance will be performed to identify the user experience of the VR set-up.

This study is approved by an independent Medical Ethics committee affiliated to Ghent University and the Ghent University Hospital (reference number BC-07548 E05). Data collection will take place in November and December 2023, and the results of this study will be presented at the conference.

(Expected) results

It is expected that several street characteristics which influence the environment regarding safety and attractiveness for walking for transport will arise from the qualitative content analysis, e.g. an aesthetically pleasing environment (cleanliness, well maintained buildings, ...), an even surface, sufficiently wide sidewalks, the presence of greenery in the street, a separation from cars etc. Furthermore, we expect to find differences in the importance of street characteristics promoting walking for transport among different age-groups within the study sample. Concerning the VR-experience we expect a better user experience for younger participants compared to older participants, meaning better scores on the sense of being present, how realistic the VR environment is, VR sickness, and the walking experience on the VR set-up compared to normal walking. Nonetheless we still hypothesize that VR will be a viable tool to conduct research about the physical environment for all age groups.