



Cyclists' perception on cycling infrastructure – the relation of safety, comfort, and comprehensibility

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Introduction

Although cycling has many benefits on both individual and societal level, the mode share in most countries remains relatively low. One of the most discussed reasons why people don't use the bicycle for transport is the lack of perceived safety (Mahne-Bieder et al., 2019; Friel et al., 2023). In contrast to objective safety based on accident rates, perceived safety relates to the feeling of being free of danger. The two of them do not always correspond and sometimes even contradict strongly (Flade, 2013; Guski & Blöbaum, 2008). However, several studies show that apart from perceived safety there are other factors like mental comfort, ease of use or continuity that have an influence on route choice or mode choice behavior (e.g. Berghöfer & Vollrath, 2022; Hull & O'Holleran, 2014). However, it still remains unclear how these various factors interact and why their perception differs between cyclists.

Methods

Using an iterative and qualitative approach, our findings may contribute to this question. In a bicycle simulator, participants rode virtually through several intersection designs (see Figure 1). The first part of the study was conducted in 2021 with n=46 participants and four intersection designs that correspond to German infrastructure design guidelines. In the second study, n=31 participants rode through three intersection designs which were designed in response to the findings of the first study.

In both studies, we conducted focused guideline-based interviews after each ride to identify strengths, weaknesses, and possible improvements for each junction design. We analyzed interview data using a deductive code scheme which we expanded with inductive codes.



Figure 1: Intersection designs as used in the study (designs displayed in the first row were used in the first study part, designs in the second row were used in the second study part)



Results

Although the research was focused on cyclists' safety perception, participants gave a variety of statements not concerning safety. Data analysis from the first study revealed three main criteria participants used to describe their perception on cycling infrastructure: safety, comfort, and comprehensibility (Friel et al., 2023, Wachholz et al., 2024).

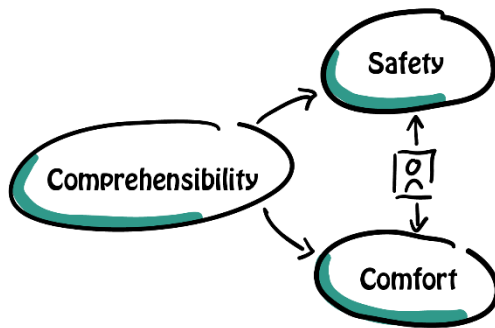


Figure 2: schematic relation between comprehensibility, safety, and comfort

Analyzing data from the second evaluation, we found a connection between these criteria: Depending on an individual trade-off, comprehensibility apparently influences either safety or comfort (see Figure 2). For example, many participants were unsure if cyclists or car drivers had right of way in a roundabout design. Consequently, some participants stated that the confusion about priority rules made them feel

unsafe. Other participants reported to feel safe yet uncomfortable as they had to reduce speed and raise attention.

Discussion

These results extend the understanding of perceived safety, as safety may be partly due to a lack of comprehensibility but varies due to individual traits or behavior. As the presented study used a qualitative and explorative approach, further research needs to investigate if this theory can be validated quantitatively. Furthermore, research is needed to identify how to design cycling infrastructure that is comprehensible, comfortable, and safe.

Literature

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