


# Speed and space perception in virtual reality for bicycle research

**Other Conference Item****Author(s):**

Nazemi, Mohsen; van Eggermond, Michael A.B.; Erath, Alexander; Schaffner, Dorothea; Joos, Michael; [Axhausen, Kay W.](#) 

**Publication date:**

2018-10

**Permanent link:**

<https://doi.org/10.3929/ethz-b-000296581>

**Rights / license:**

[In Copyright - Non-Commercial Use Permitted](#)

## Speed and space perception in virtual reality for bicycle research

**M. Nazemi<sup>1</sup>, M. van Eggermond<sup>1</sup>, A. Erath<sup>1</sup>, D. Schaffner<sup>2</sup>, M. Joos<sup>1</sup>, Kay W. Axhausen<sup>1</sup>**

<sup>1</sup> Future Cities Laboratory, ETH Zurich University, Singapore, nazemi@ivt.baug.ethz.ch

<sup>1</sup> Future Cities Laboratory, ETH Zurich University, Singapore, eggermond@ivt.baug.ethz.ch

<sup>1</sup> Future Cities Laboratory, ETH Zurich University, Singapore, Erath@ivt.baug.ethz.ch

<sup>2</sup> University of Applied Sciences and Arts Northwestern Switzerland, Switzerland,  
dorothea.schaffner@fhnw.ch

<sup>1</sup> Future Cities Laboratory, ETH Zurich University, Singapore, joos@arch.ethz.ch

<sup>1</sup> Department of Civil, Environmental and Geomatic Engineering, ETH Zurich University, Switzerland,  
axhausen@ivt.baug.ethz.ch

### ABSTRACT

Survey methods for bicycle research have been evolved in time, ranging from conventional telephone surveys, paper-based and web-based surveys, to in-depth Virtual Reality (VR) ones, all aiming to provide insights about diversity among behaviours (McNeil et al., 2015; Tilahun et al., 2007; Xu et al., 2017). The underlying criteria in all of the aforementioned methods is that respondents need to understand what they are valuing or they will make potentially wrong assumptions based on different experiences and frames of reference. VR allows for highly-detailed observations, accurate behaviour measurements, and systematic environmental manipulations under controlled laboratory circumstances. It therefore has the potential to be a valuable research tool to carry out behavioural experiments to study cyclists' perception of safety and comfort. In order to fully understand VR as a valid environmental representation, it is essential to examine to what extent not only user cognition and behaviour, but also if users' experiences are analogous in real and virtual environments (Kuliga et al., 2015). The aim of this research is to find out how accurately participants perceive speed and distance of the passing vehicles and find out solutions to calibrate virtual environments, particularly for bicycle research. To this end, a VR experiment was devised that allows respondents to cycle through a variety of streets, and in which the passing speed and distance of passing vehicles - two are crucial variables influencing cyclists' perception of environment - is varied.

**Keywords:** cycling perceived safety, virtual reality survey, bicycle infrastructure.

### REFERENCES

- [1] Kuliga, S.F., Thrash, T., Dalton, R.C., Hoelscher, C., 2015. Virtual reality as an empirical research tool—Exploring user experience in a real building and a corresponding virtual model. *Comput. Environ. Urban Syst.* 54, 363–375.
- [2] McNeil, N., Monsere, C.M., Dill, J., 2015. Influence of Bike Lane Buffer Types on Perceived Comfort and Safety of Bicyclists and Potential Bicyclists. *Transp. Res. Rec. J. Transp. Res. Board* 2520, 132–142. <https://doi.org/10.3141/2520-15>
- [3] Tilahun, N.Y., Levinson, D.M., Krizek, K.J., 2007. Trails, lanes, or traffic: Valuing bicycle facilities with an adaptive stated preference survey. *Transp. Res. Part Policy Pract.* 41, 287–301. <https://doi.org/10.1016/j.tra.2006.09.007>
- [4] Xu, J., Lin, Y., Schmidt, D., 2017. Exploring the Influence of Simulated Road Environments on Cyclist Behavior. *Int. J. Virtual Real.* 17.