

Study explores individual differences in motion sickness with VR gaming

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The way our senses adjust while playing high-intensity virtual reality games plays a critical role in understanding why some people experience severe cybersickness and others don't.

Cybersickness is a form of motion sickness that occurs from exposure to immersive VR and augmented [reality](#) applications.

A new study, led by researchers at the University of Waterloo, found that the subjective visual vertical—a measure of how individuals perceive the orientation of vertical lines—shifted considerably after participants played a high-intensity VR game.

"Our findings suggest that the severity of a person's cybersickness is affected by how our senses adjust to the conflict between reality and [virtual reality](#)," said Michael Barnett-Cowan, a professor in the Department of Kinesiology and Health Sciences. "This knowledge could be invaluable for developers and designers of VR experiences, enabling them to create more comfortable and enjoyable environments for users."

The researchers collected data from 31 participants. They assessed their perceptions of the vertical before and after playing two VR games, one high-intensity and one low-intensity.

Those who experienced less sickness were more likely to have the largest change in the subjective visual vertical following exposure to VR, particularly at a high intensity. Conversely, those who had the highest levels of cybersickness were less likely to have changed how they perceived vertical lines. There were no significant differences between males and females, nor between participants with low and high gaming experience.

"While the subjective vertical visual task significantly predicted the severity of cybersickness symptoms, there is still much to be explained," said co-author William Chung, a former Waterloo doctoral student who is now a postdoctoral fellow at the Toronto Rehabilitation Institute.

"By understanding the relationship between sensory reweighting and

cybersickness susceptibility, we can potentially develop personalized cybersickness mitigation strategies and VR experiences that take into account [individual differences](#) in sensory processing and hopefully lower the occurrence of cybersickness."

As VR continues to revolutionize gaming, education and [social interaction](#), addressing the pervasive issue of cybersickness—marked by symptoms such as nausea, disorientation, eye strain and fatigue—is critical for ensuring a positive user experience.

The findings are published in the journal *Virtual Reality*.

More information: William Chung et al, Sensory reweighting: a common mechanism for subjective visual vertical and cybersickness susceptibility, *Virtual Reality* (2023). [DOI: 10.1007/s10055-023-00786-z](https://doi.org/10.1007/s10055-023-00786-z)

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