I have played first-person shooter games since the first Doom came out and am an avid video-game player. Although I do not get ill playing first-person video games on an ultra-wide monitor I do wonder how I would do with a VR headset. I am also curious as to what actually causes VR sickness to begin with.

But why should we even care about VR sickness? Isn’t this just a sickness that affects video gamers? No. VR use is growing and has applications in healthcare training, education, defense, etc. (from presentation) When we say VR sickness, what we are really saying is motion sickness due to VR exposure. The symptoms, though, go beyond normal motion sickness and can include headaches, eyestrain, and drowsiness. (<https://www.techtarget.com/iotagenda/definition/virtual-reality-sickness-VR-motion-sickness>) These effects are counterproductive to the immersive experience of VR and introduce design limitations on the VR developers.

There are many theories as to what causes VR sickness. It has been postulated that the number of eye movements, postural instability, and sensory conflict could all be contributing factors. Of course, like motion sickness, VR sickness does not affect everyone in the same way and not in the same intensity. To reduce these unwanted effects from VR exposure, Dr. Adhanom, is exploring technical countermeasures. It seems unintuitive, but as headsets were improved even more users experienced VR sickness symptoms. Simply put, VR became even more believable and increased the sensory conflict due to mismatched sensory cues.

The current focus is to reduce the sensory conflict that the user feels when moving about in VR. For example, requiring the user to walk in the VR environment before moving forward helps to avoid sensory conflict. Of course, the drawback is that the VR environment has infinite space while the VR user is confined by what is around them in the physical world. Teleportation in VR also helps but has downsides such as spatial disorientation and a low sense of presence. Therefore, the current best practice is to use field-of-view (FOV) restriction, a practice whereby the VR user’s field of vision gradually becomes narrower and narrower as they continue moving in the VR world. When the user stops moving in VR then the peripheral stimulation gradually returns to normal.

One issue with FOV restriction is when the user is not looking at the center of the restricted FOV. VR software does not adjust when a user is not looking straight ahead. This implies that the user’s restricted FOV is a tilted-axis concentric view. This lowers the user’s immersion and blocks optical flow. The presenter’s research has included a foveated FOV restrictor where the restricted portion of view moves with the VR user’s eyeball. The results of the study were positive as there was no significant difference with respect to gaze dispersion but the foveated FOV restrictor resulted in a bigger gaze dispersion (presenter’s slides). In addition, the participants experienced a low amount of VR sickness.

The last study was around trying to get the brain to adapt to abstract realistic environments. Where previous approaches to reducing VR sickness interfered with the VR experience and required environmental and/or hardware modification, this approach simply tried to figure a method whereby the brain could be trained to adapt to VR. In other words, simply train the user to tolerate VR. Previous findings suggested that adaptation works if the users are exposed to the same VR environment and that the adaptation only transfers to other VR environments if said environments are similar to the original trained environment. The training simulations were a mix of abstract and realistic environments with the VR training taking place from more abstract environments to more realistic environments.. In general there was a significant decrease in VR sickness levels between days 1 to 5 so the results were positive.

The current research revolves around an adaptable framework which monitors the user and adapts the VR environment based on real-time measures.