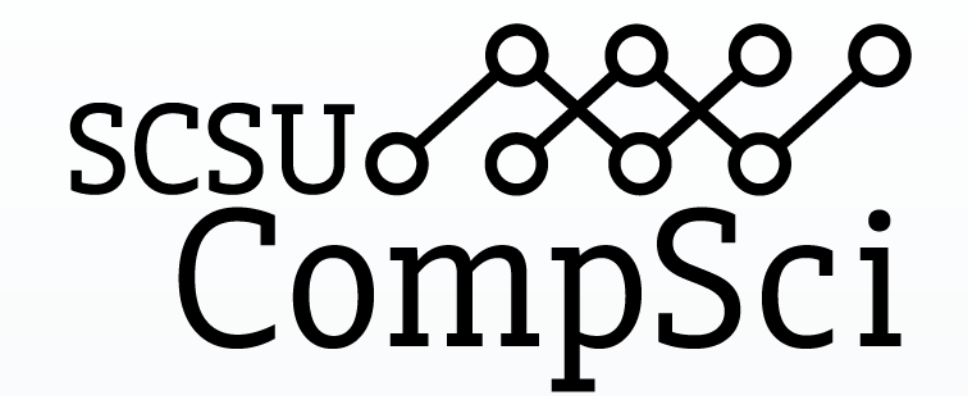




# Overview of Virtual Reality Simulation Sickness: Causes, Symptoms, and Prevention Strategies



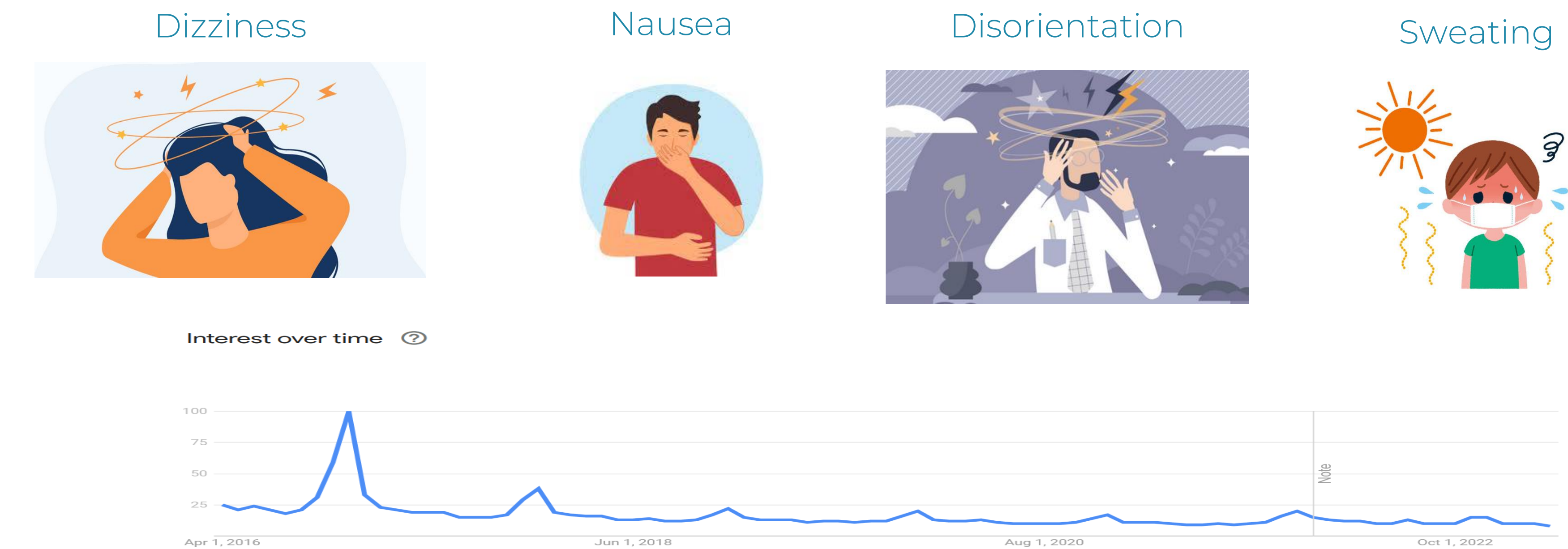
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## Abstract

This research poster highlights the potential of Virtual Reality (VR) in various industries such as research, medicine, and more. However, VR applications can lead to side effects such as disorientation, nausea, and oculomotor dysfunction, which limits the duration of usage. The poster aims to provide an understanding of the factors that can cause simulator sickness and explore emerging solutions to this issue. The research aims to reduce simulator sickness to increase immersion and expand the range of applications in VR. Understanding the factors that cause simulator sickness is crucial for the growth of VR in various industries.

## Simulation Sickness

Side effects of VR include, but not limited to:



## Ranking

Factors ranked by frequency:

1. Locomotion Techniques
2. Sensory Mismatch
3. Individual Differences
4. Field of View
5. Graphical Fidelity
6. Resolution

Papers covering Locomotion techniques and sensory mismatch were the most common in our survey. The majority of papers focused on factors that did not involve hardware or software specifications. There is an emphasis on vection (sickness provoked by visually perceived motion). This is caused by the user being exposed to movement in the VR environment while sitting or standing still. This leads to a sensory mismatch between the visual and vestibular systems. In our table, the factors locomotion methods and sensory mismatch are both directly linked to vection.

## Applications of VR

There are a wide variety of applications for VR, such as:

F1 Racing Training

Medical Training



Gaming

Flight Training



## Methodology



| Research paper  | Sensory Mismatch | Locomotion | Individual Differences | Field of View | Resolution | Graphical Fidelity |
|---|------------------|------------|------------------------|---------------|------------|--------------------|
| Correlating reaction time and nausea measures with traditional measures of cybersickness.                         | ✓                |            |                        |               |            |                    |
| Cybersickness provoked by head-mounted display affects cutaneous vascular tone, heart rate and reaction time.     | ✓                |            |                        |               |            |                    |
| Cybersickness in current-generation virtual reality head-mounted displays: systematic review and outlook.         | ✓                | ✓          |                        |               |            |                    |
| Teleportation in virtual reality: a mini-review.  |                  | ✓          |                        |               |            |                    |
| Handsfree omnidirectional VR navigation using head tilt.  |                  | ✓          |                        |               |            |                    |
| Player experience in a VR and non-VR multiplayer game.  | *                | ✓          | *                      |               |            |                    |
| Motion sickness: More than nausea and vomiting  | *                | *          | ✓                      |               |            |                    |
| Individual differences task attention in cybersickness: A call for a standardized approach to data sharing.       |                  | *          | ✓                      | *             |            |                    |
| Internal and external fields of view affect cybersickness.  |                  |            |                        | ✓             |            |                    |
| Combating VR sickness through subtle dynamic field-of-view modification.  | *                |            |                        | ✓             |            |                    |
| Effect of render resolution on gameplay experience, performance, and simulator sickness in virtual reality games. |                  | *          |                        | *             | ✓          | *                  |
| Effect of visual realism on cybersickness in virtual reality.   | *                |            |                        |               |            | ✓                  |

✓ = Main Contribution  
\* = Mentioned or observed

## New approaches to mitigating sickness

### Bone-Conducted Vibration -

The technique called Bone-conducted vibration (BCV) tries to match what the eyes see with what the inner ear feels during virtual reality experiences. This is because sometimes our eyes perceive motion, but our inner ear does not. There have been previous methods to solve this problem, but they were not comfortable for the user. BCV is a new technique that might be better because it could solve the problem without causing any discomfort.

Other Studies - Perpetual Camera Control, Dynamic Field of View Modification, Reverse Optical Flow.

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