

# User virtual reality sickness effects from different locomotion methods

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### 1.Introduction

Virtual reality is a technology that offers immersive experiences for users. Yet, common occurrence when dealing with virtual reality is virtual reality sickness.

Virtual reality sickness is the common symptoms of motion sickness that occurs due to several effects within the virtual environment. The project aimed to investigate these effects on users.

### 2.Aims & Objectives

The aims of the project is to investigate the effects user may gain through virtual reality and measure the severity of the symptoms.

To reach this an experiment hypotheses was formed to achieve this goal. These hypotheses was:-

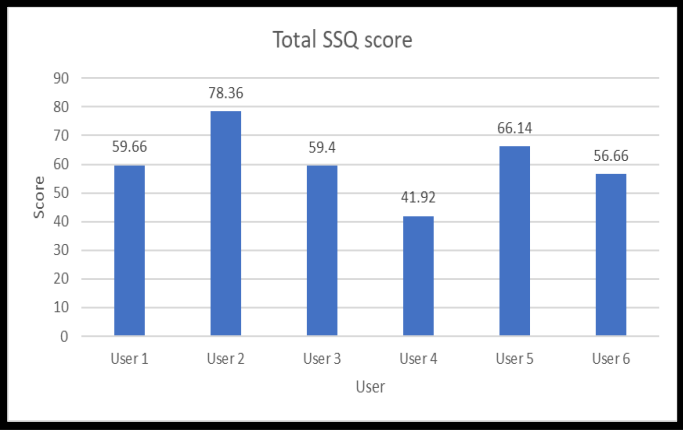
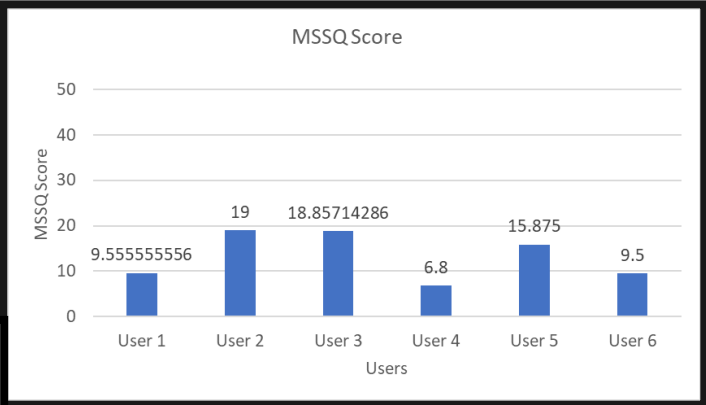
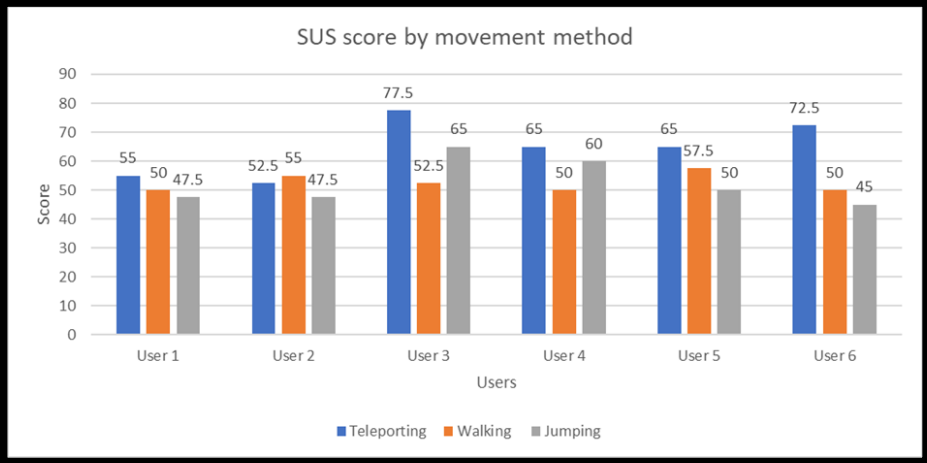
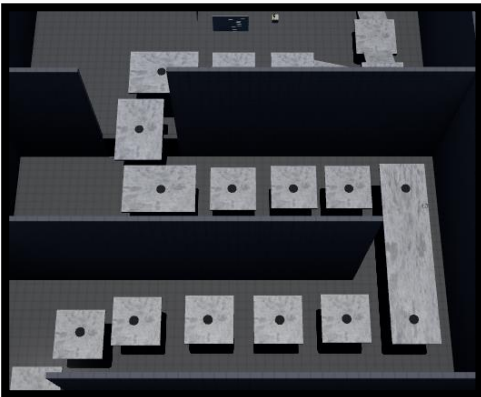
- What is the impact of virtual reality sickness on users
- Does having experience with VR headsets affect the severity of sickness symptoms
- Do the VR movement methods within a VR environment (Teleportation, walking and jumping), affect the severity of VR sickness symptoms more so than others.
- Is there a correlation between VRSQ score and a MSSQ scores

### 3. Methodology, Design & Implementation

Through research, **Unreal Engine 5** was chosen to design and create a virtual environment where these movement methods could be tested in a untextured and textured environment, while using a Meta quest 2 head display.

To measure a user's susceptibility with VR sickness, a motion sickness susceptibility questionnaire form(MSSQ was found suitable. To measure VR sickness symptoms, a virtual reality sickness questionnaire or simulator sickness questionnaire(SSQ) was found suitable for measurement[1][2].

Additionally, to measure a users experience with the virtual environment, a virtual reality locomotion questionnaire(VRLEQ) was used to measure experience and usability. MSSQ, VRLEQ and SSQ have all different calculations and measurements.



### 4.Evaluation

Evaluation of the results were performed through Excel, where the results could be shown diagrammatically.

Graphs and tables were also made to evaluate the results of the questionnaires.

Further evaluation of the results shown they linked back to the literature review.

### 5.Conclusion

In conclusion, the aims and objectives of the project has been met, with Unreal Engine being an effective tool to create environments that can be used to measure the impact of sickness severity.

Possible correlations are shown between MSSQ and SSQ questionnaires, with a 50/50 split on what movement method is most sickness inducing(Walking and Jumping).

Further potential correlations include the relationship between the usability scores of the movement methods to the participants SSQ scores

### 6.Recommendation and further research

Recommendations for further research would include :-

- Higher participants number
- More movement methods considered (such as driving or climbing)
- More variables of the virtual environment considered
- Severity of symptoms based on headset used (such as HTC Vive or Valve index)

### 7. References

[1] R. K. Wasim Merchant, "An Overview of Cybersickness Self-Report," June 2022. [Online]. Available: [https://cradpdf.drdc-rddc.gc.ca/PDFS/unc392/p814963\\_A1b.pdf](https://cradpdf.drdc-rddc.gc.ca/PDFS/unc392/p814963_A1b.pdf). [Accessed 18 4 2023].

[2] C. Boletsis, "A User Experience Questionnaire for VR Locomotion: Formulation and Preliminary Evaluation," in International Conference on Augmented Reality, Virtual Reality and Computer Graphics, Lecce, 2020.