



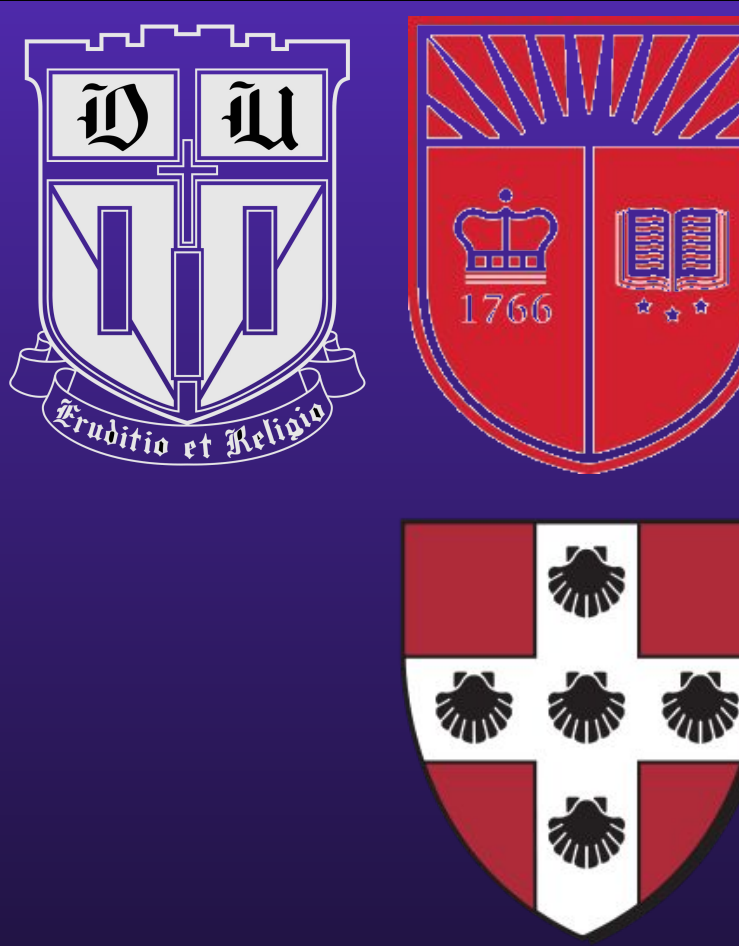
Cognitive Distraction to Improve Cybersickness in Virtual Reality Environments

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ABSTRACT

Immersion into a virtual reality environment (VRE) often results in cybersickness. Symptoms include nausea, dizziness, and disorientation. Previous research has demonstrated the effectiveness of habituation, field of view modification, and pleasant music in reducing cybersickness. Cybersickness and motion sickness have many symptoms in common, and cognitive distraction has shown promising results in reducing motion sickness. In this study, we hypothesized that administered cognitive distraction can accelerate the rate of habituation to a VRE, therefore lowering users' levels of cybersickness faster. We designed an experiment to test our hypothesis, where human subjects were instructed to immerse in a VRE on four separate sessions. The experimental group received cognitive distraction in the VRE while the control group did not. Participants completed the Simulator Sickness Questionnaire (SSQ) and the Presence Questionnaire (PQ) after each session. Results show that participants with cognitive distraction experienced a reduction in cybersickness symptoms to a greater extent than participants without cognitive distraction.

BACKGROUND

Cybersickness

- Occurs during use of VR [1]
- Sensory Conflict Theory [2]
- Nausea, dizziness, confusion, disorientation [2]

Habituation

- Decreased response to a reoccurring stimulus [3]
- Effective in reducing cybersickness [4]

Cognitive Distraction

- Removing one's attention from the processing of certain information [5]
- Used to mitigate motion sickness [6]

PROBLEM & OBJECTIVE

Research problem:

- Cybersickness is an obstacle hindering the effectiveness of VR applications [1]
- Women are much more likely to experience it than men [1]

Objective:

To determine if cognitive distraction speeds up a user's habituation to a VRE, hence reducing their cybersickness at a faster rate.

VIRTUAL ENVIRONMENT

We created a virtual suburban neighborhood comprised of 9 blocks containing houses, city buildings, storefronts, and a park.



Figure 1. Environment with Cognitive Distraction

Materials:

- Unity Gaming Engine
 - Asset store
 - C# scripts
- Oculus Rift
 - Headset and controllers

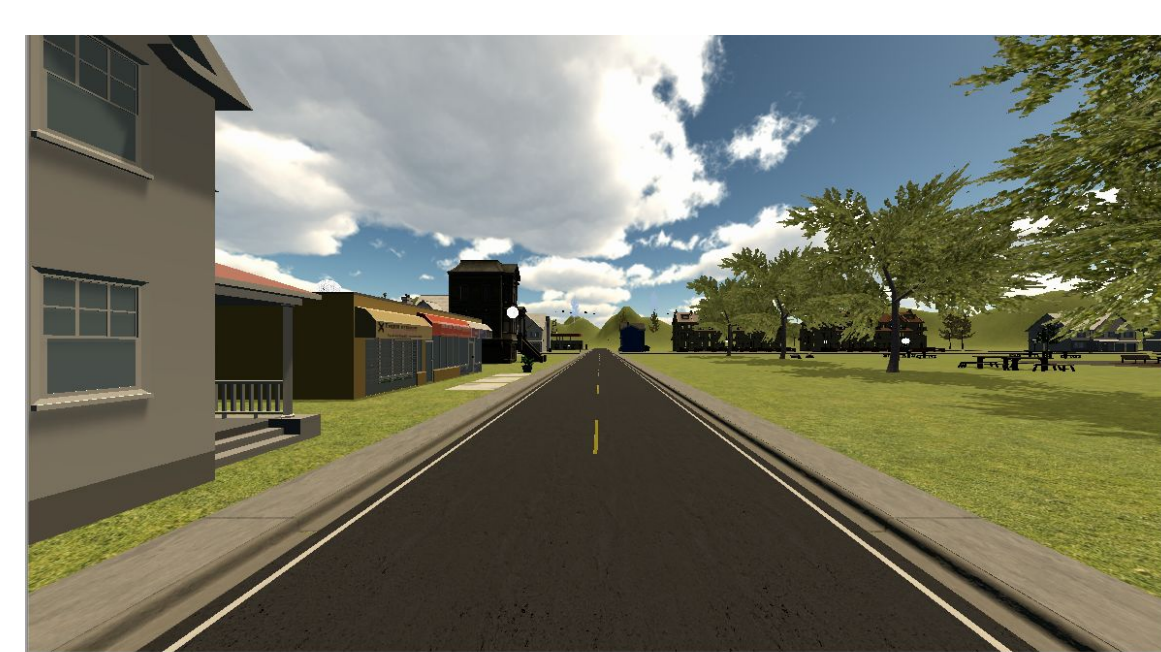


Figure 2. Environment without Cognitive Distraction

METHODOLOGY

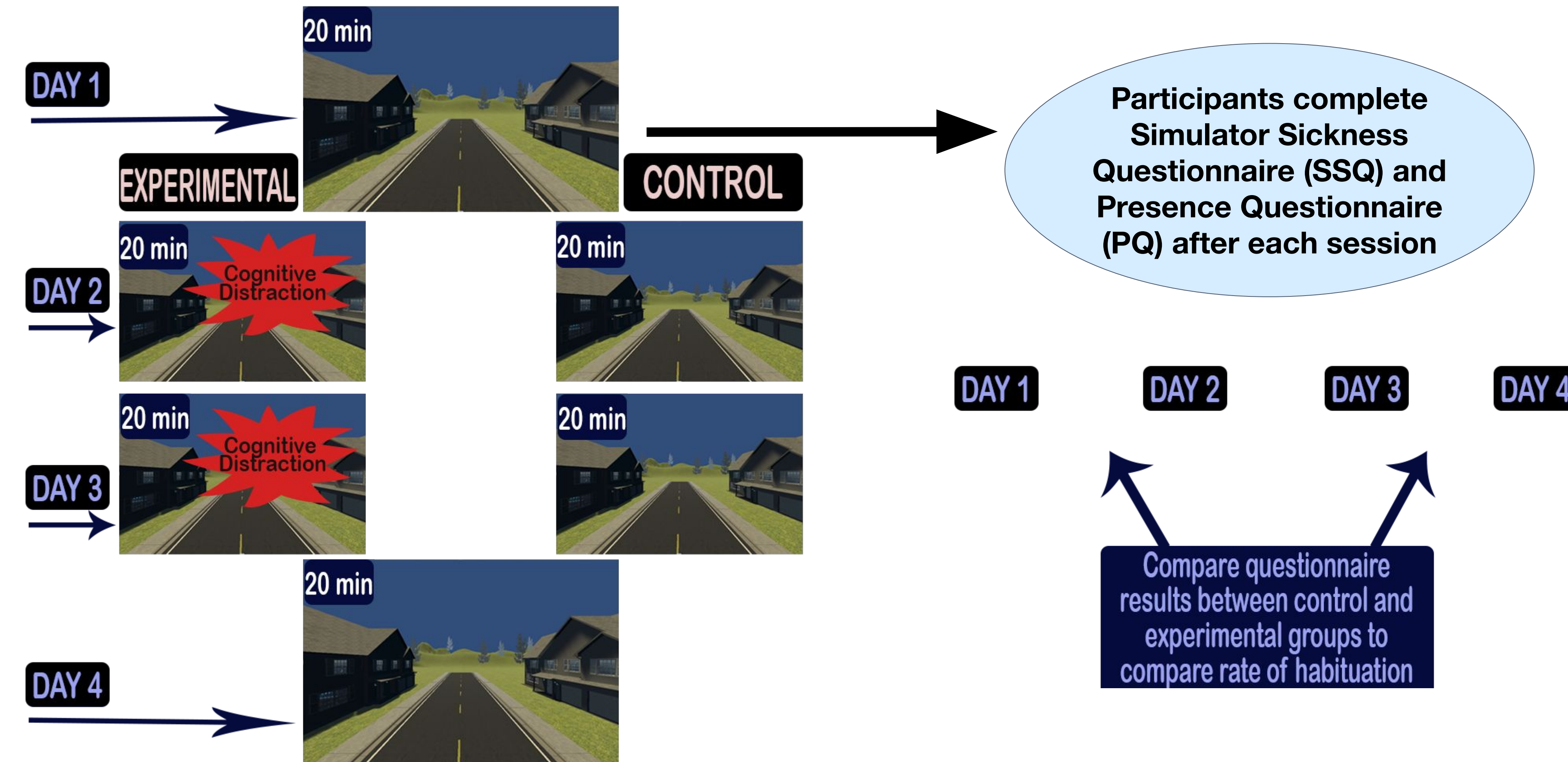


Figure 3. Experimental Protocol

Figure 4. Data Acquisition Protocol

PRELIMINARY RESULTS

The data below is from the first three immersions only.



Figure 5. Simulator Sickness Questionnaire (SSQ) scores of control group participants

Figure 6. Simulator Sickness Questionnaire (SSQ) scores of experimental group participants

DISCUSSION

While immersed in the VRE, certain external factors likely impacted our participants' SSQ scores.

- self-distraction (talking while immersed)
- sounds (weather, traffic, other conversations)
- personal (wearing glasses, amount of sleep, whether they ate)

Participants may also have been affected differently at different parts of the environment (i.e. inside vs. outside houses in the VRE)

FUTURE WORK

- Experiment with more subjects
- Administer questionnaires after the experiment in different time increments. Immediately after, a half hour after, an hour after, etc.
- Investigate effects of cognitive distraction in different VREs
- Explore effects of cognitive distraction with different types of movement (gradual vs. snap head rotation, controller-oriented vs. head mounted display movement)

CONCLUSIONS

In this study, we tested our hypothesis that cognitive distraction can increase the rate of habituation to a VRE, hence reducing cybersickness faster. Results show the SSQ scores of the 14 participants that were immersed in our VRE for 3 sessions each. We observed a trend in this preliminary data that the level of cybersickness of experimental group participants' decreased more than that of the control group, which supports our hypothesis. As future work, we expect to collect data from more subjects and more immersion sessions to further support our findings.

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