I Don't Want to Live in this Reality Anymore, an HTC Vive Study

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1. ABSTRACT

This paper recounts and elaborates upon the tests done to prove the hypothesis "The HTC Vive's hardware and UI are not fluid or intuitive to use." I examine various reasons to understand why users feel whether the HTC Vive is accessible to people who have not used a virtual reality (VR) headset before. Various questions were asked users, ranging from the responsiveness of the system, to the preferred methods of movement. After analysis on the data recorded, I elaborate on the changes that warrant the most necessity and give suggestions to improvements on the system.

2. INTRODUCTION

VR provides us with a new territory of interacting with digital media, creating an experience that is difficult for us to say is 'typical'. This means that previous extensive testing on usual design choices for media can't be utilized quite as efficiently. Using any form of virtual reality is disorienting at first, but with the decreasing number of people who tend to peruse the instruction manual, the HTC Vive should be more intuitive to use for newcomers [1]. The HTC Vive poses a new challenge for users, weaving an entirely unique interface that people must learn, with a level of physicality that no other current tech uses. This mixture creates new levels of interaction that gaming or technological literacy typically does not cover, resulting in an unintuitive UI [2]. Previous literature shows that operating within this 3D space removes almost all conventional UI design choices. Scrolling down along menus creates a jittery and difficult experience due to the cameras' sensitive tracking. The system itself poses no significant problems to address, but the smaller hardware and UI issues congregate to make the initial experience a jarring one. The questions posed included how comfortable the different methods of movement were. The motivation for this is to use the results to improve the design of another game that my lab is currently developing, so we know the biggest functionality quirks to avoid applying too often. The tests have shown an overwhelmingly consistent response in terms of general responses.

3. Methodology

The process to test my hypothesis consisted of 2 parts: think-aloud walkthroughs, and a survey questionnaire afterwards. All users were given a task for the think-aloud walkthrough. They had to turn on SteamVR from steam, move around physically and using the teleportation function for 1 minute, and then click *Google Tilt Brush VR* in the HTC Vive homeroom in VR. For each person, I gave instructions as they finished a part of the task, so if they turned on SteamVR, I would ask them to start moving around. I expected people to take around 3 minutes for this task, give or take 15 seconds. As an example, my own time for this task as someone who's experienced with VR was 1 minute and 28 seconds. The survey consisted of multiple questions, from "*The HTC Vive's UI was intuitive and fluid to use"*, to "*I preferred teleporting to move around in virtual reality"*. Most of the questions had short answer follow-ups, such as "*Of the two methods of movement mentioned above, which did you prefer more and why?*"

5 users were recruited for the walkthrough and the questionnaire. 3 of those users identified as male, and 2 of them identified as female. Almost all of them were of ages 23-24 except for one male outlier who was age 34. All of them belonged to fields that commonly used technology and computer science, with a split of 2 computer science majors, 1 computational media major, and 2 bioinformatics majors. Wearing glasses was physical quality that I believe affected their experience of the HTC Vive was noted but not asked about. Each participant had no other conditions that would affect their walkthrough of the VR headset, such as prone to dizziness or motion-sickness. Also, all the users were completely unfamiliar with any VR headsets, including the Oculus Rift, Playstation VR, etc., and the walkthrough would have been the first time that they had operated with this form of media at all.

4. Quantitative Analysis

Simple questions were asked to get a quick overview of opinions of locomotion in VR.

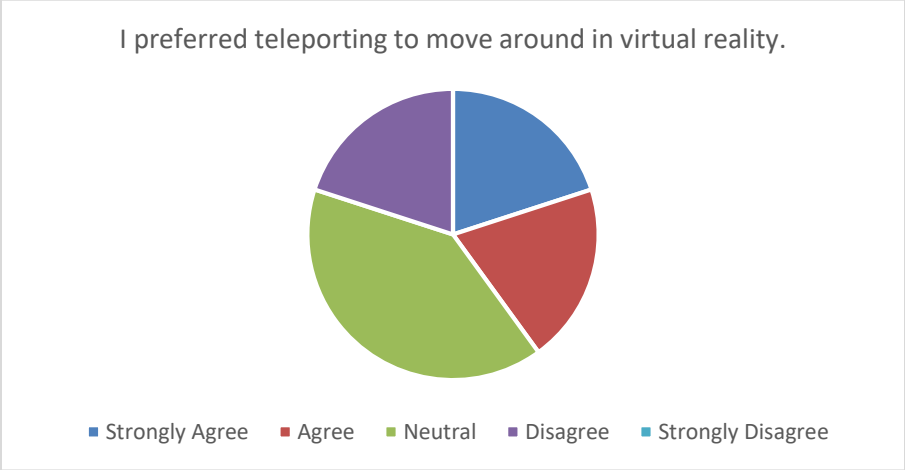


Figure 1: Feelings towards teleportation as movement in VR

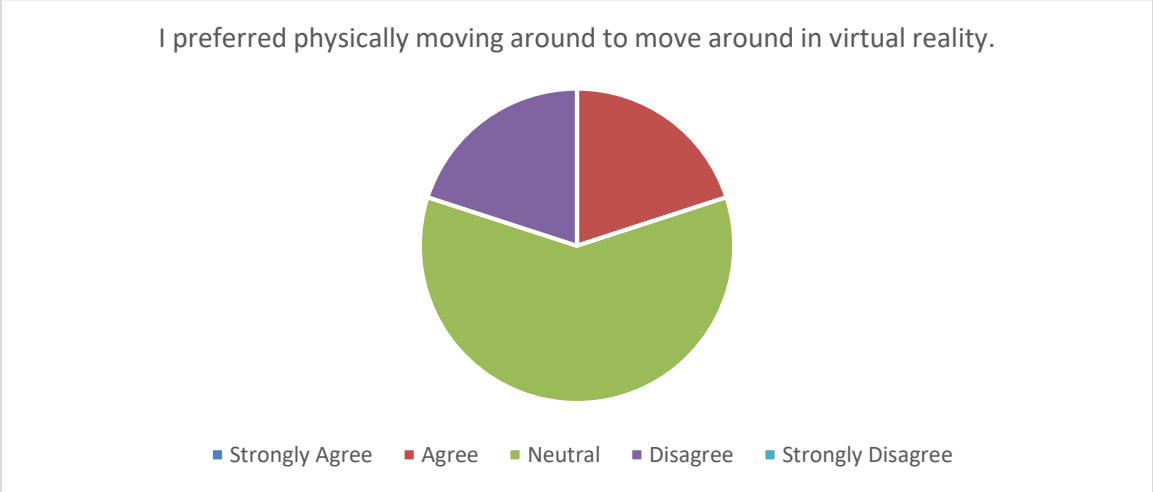


Figure 2: Feelings towards physical movement as movement in VR

Due to previous literature review, it was expected that teleportation was the favored movement. Studies showed that this form of locomotion within the virtual space was had less jarring transitions [3]. The users overall had stronger positive opinions towards teleportation, while they were more neutral towards physically moving around. To address the hypothesis, we look at table 1 for the total times.

Table 1: Time it took to complete the task

Players	*Times*
Player 1	339 s
Player 2	464 s
Player 3	354 s
Player 4	215 s
Player 5	196 s

This averages out to be around 313.6 seconds, with a standard deviation of 110 seconds. Due to the lower number of participants (n = 5), I used a one sample *t*-test to discover a 95% confidence interval of 176.95 seconds to 450.25 seconds, with the true population mean residing somewhere in that interval. I am unable to safely reject my hypothesis as it still falls between that range. However, the hypothesized amount of time resides close enough to the extremes of this interval, that if I recruit 54 users total to shorten this 95% confidence interval to 60 seconds, I would most likely discover that I can safely reject this hypothesis.

5. Qualitative Analysis

All participants were asked the question, "What piece of hardware (controller, headset, etc.) would you change the most, and how?" Table 1 shows the responses most recorded, with the no other type of answers besides the controllers and headset.

Table 2: Which hardware most needs to be changed?

Responses	*Sample sentence*	*# of responses*
Controller	"controller, button use is not intuitive based on button location"	4
Headset	"the headset needs to be more adjustable (I have a fat head) and it needs to be more fluid"	3

5.1.1 Hardware that needs change

Almost all participants mentioned the controllers as being the most clunky part of the setup. There was only one answer that abstained from mentioning the controllers. The most interesting part of all this was that I had only asked for one piece of hardware that needed to be changed, but 2 participants felt the need to address that either the controllers or the headset also needed to be adjusted. All participants who mentioned that the headset needed to be changed wore glasses, though 1 of them did not mention that the headset should be more glasses friendly.

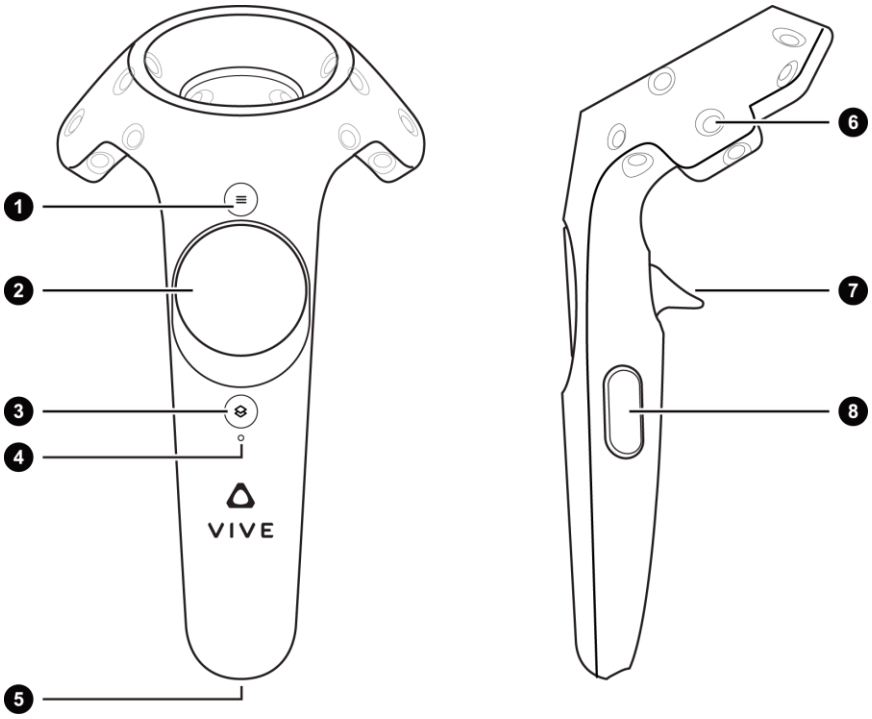
Table 2: What part of the controller needed to be changed?

Responses	*# of responses*
Buttons	3
Precision	1

Table 2 shows that almost all participants who mentioned the controllers had issues with the buttons, mostly because of how unintuitive it all was. A sample sentence being, "The buttons and controls on the controller confused me, because I couldn't work out what the conventions were for interacting with things." I compared the buttons on the HTC Vive to typical buttons across multiple generations of game controllers to see if the icons shown in figure 1 resembled anything done previously. However, there were no matches, indicating that no amount of gaming literacy could have informed a user which button was the button to turn the controllers on. Every time a participant turned on the Vive, the headset would automatically turn on, and there was good feedback of that event, as you would be able to see through the headset into VR. However, it was apparent that Steam did not give sufficient feedback that the controllers were on, because although players could not see the controllers in VR, they assumed it was part of how the UI was intended to be. A content analysis of all the videos gave me the information I needed to confidently say that the portions that gave players took the longest time on was realizing that their controllers were on. One player even abandoned a second controller because one of them was already turned on and they assumed that was enough.

The think-aloud walkthroughs also brought to light one more glaring issue that the HTC Vive had that players did not mention: the wire attached to the headset. Players were stepping on it, or nudging it accidentally and adjusting how they moved because of that quite often. This was a small enough event that players did not notice, and the headset's/controller's problems overshadowed this.

Figure 1: HTC Vive controller



5.1.2 Suggestions for improved design

The easiest fixes to the controller would be the buttons. A simple icon image adjustment would allow people who are used to playing games understand the controller faster. At this point, relocating the buttons would be confusing to the audience that is already accustomed to the Vive. Adding letters or symbols to buttons that do not have any icons on them lets games or the system itself inform players with more clarity that they have to press a certain button to do a certain action. For the controller's precision, that would most likely have to be adjusted in player settings to adapt to the player's personal fidgeting.

As the for headset, the only fix I could possibly recommend would just be to make the straps along the helmet more noticeable to adjust its size. Many of the players' complaints could have been solved if they noticed and found the current strap more functional. The wire issue could be solved by simply including a wall-mount for that with the HTC Vive.

6. DISCUSSION and CONCLUSION

Using both quantitative and qualitative methods, I have identified that people find the HTC Vive experience overall to be rough. Overall, my hypothesis that completing the series of tasks would take participants around 3 minutes could not be rejected due to low number of users causing a wide confidence interval. However, I have managed to identify several aspects of the HTC Vive that should be adjusted or changed in some way to improve overall user experience.

The think-aloud walkthroughs and surveys revealed a plethora of small issues that arose unconsciously. At first glance, it seems as if the system was intricately designed enough to provide users with a satisfactory experience, due to the availability of different types of locomotion, the cameras to detect more subtle movements

using the controllers, and the adjustable headset. However, it became clearly illustrated that newcomers to VR had no idea how the controllers were supposed to function, or disliked the headset for its rigid shape. Many of them felt that the hardware and UI was responsive to their actions, but actually conducting those actions were difficult due to buttons or precision. For future studies, it would be important to discover what button arrangements would prove the most fluid and intuitive to users because the current set-up falls short. Researchers should ensure that they record playthroughs and re-watch for content analysis due to the sheer number of problems that became apparent through players' unconscious actions, or simply how long it took them to perform a task. Researchers should also aim to understand what players tend to do in virtual reality to get an idea of how they should design the UI, as scrolling in game was difficult for many players.

7. REFERENCES

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