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Research Article

USING IMMERSIVE REALITY TO INCREASE PARENTS' KNOWLEDGE ABOUT THEIR CHILDREN WITH INTELLECTUAL DISABILITIES: A PILOT STUDY REPORT

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Abstract

Immersive Reality(IR) is a form of Virtual Reality (VR) that has evolved in terms of usability and accessibility. This study sought to ascertain whether we can increase parents' knowledge and experiences about their children with intellectual disabilities by using immersive reality. We used an Immersive software known as IMERCYVE to depict the real life of people living with intellectual disabilities. The study investigates the possibility of using IM to educate parents of children with intellectual disabilities and how this experience affects their day-to-day interactions with their children. Using a qualitative method, data was collected through semi-structured interview questions. The study discovered that prior to this experience, parents had no idea how to aid a child with intellectual disabilities. However, after the IMERCYVE practice with the help of the oculus technology, they now have proper knowledge about what their children with intellectual disabilities could be experiencing in real life. The findings suggest that in the future, we may need to increase education at all levels for parents who have intellectually disabled children through immersive reality experiences.

Keywords: Virtual reality (VR), Immersive reality (IR), Educational Virtual Condition (EVC),IMERCYVE, User experience, Oculus Quest 2, Intellectual Disability.

INTRODUCTION

There are more K–12 and higher education institutions than ever before. Investing in technology such as Immersive Virtual Reality (IVR) can provide students with high-fidelity and three-dimensional experiences. Recent developments in higher education, including the rise of learning spaces and innovative cultures, have led to the Horizon Report predicting that IVR will be widely adopted over the next few years [1]. Recent IVR research has focused on the effects of IVR on children's learning with examples from [2,3], as well as the ethical and organizational considerations for the practice of using IVR in schools [4–6]. It has also been the subject of research into how likely people are to use IVR systems, with a particular emphasis on whether or not college students plan to use such a system to help them learn science [3]. IVR is a promising new tool for schools but knowing how and why educators want to incorporate it into their classrooms is crucial for improving student outcomes and educators' ability to grow professionally [7]. However, these can be extended to other stakeholders in education, including parents. The expectation that conventional schooling can present opportunities for all people to engage in rigorous, challenging, authentic, and real-world educational programs regardless of nationality, orientation, geological area, and financial drawbacks [8] is a likely benefit of using IVR. This requires an educational teaching method that gives substitutes the persuasive structure to connect effectively in a new learning environment and exercises outside their individual experience. It is generally recognized that advanced innovation has become a fundamental component of day-to-day existence for the overwhelming majority [9].

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Students have been celebrated in mainstream education as digital learners who use technology and multimedia as part of their fundamental learning strategies to resolve and handle real-life problems at school and home creatively. [10, 11]. Twenty-first-century learners are visually oriented, entertainment-focused, goal-oriented, and capable of successfully multitasking and communicating at various digitally sophisticated and integrated levels [10, 12]. Computerized advances, including video conferencing, virtual environments, and online home rooms, are now turning into standard learning instruments [13, 14]. Through the production of worldwide local area organizations, advanced innovation works with cooperative coaching and improving educational plans to reflect digital constructionist teaching methods that embrace advancements [15].

Review of Current Literature

Immersive Reality and Virtual Reality

"Immersion or immersive" and "presence" are two distinct terminologies. According to researchers, "immersion" describes the depth of technical integration [16, 17]. An effort by researchers to explain the technicality within surroundings found a correlation between the size of the screen, the way sound is presented (speakers vs. headphones), and the viewer's sense of being in a simulated situation or environment [18–20]. Further classification within the immersion studies identified High-immersive [16, 21] and full-immersive [22, 23] experiences as categories that have emerged to describe how far a virtual world goes. Complete immersion facilitates the viewer's transition into the simulated setting. The degree to which one feels like they are actually in a simulated setting is one metric that can be used to evaluate immersion [24]. While

in contrast, the actual physiological state may be different. The term" presence" refers to the subjective experience of being in an environment [16,21,24–28]. The user's subjective experience of a virtual environment can be split into three groups: (1) spatial presence, which explains the user's physiological feeling of being in a virtual environment; (2) involvement, which defines the user's focus on the virtual environment and, by extension, their sense of participation in the virtual world; and (3) experienced realism [27]. However, the term "virtual reality" (VR) refers to a technology that uses personal computers to create computer-generated images of real-world settings and intelligently designed symbols that appear realistic enough to give the user the impression that they are there in another physical location (VE). Other studies define Virtual Reality (VR) as replacing real-world cues with computer-generated ones as a digitally built representation of a natural or artificial environment [29–31]. According to[17] enhancing's definition, virtual reality (VR) is a computer-generated simulation that attempts to replicate aspects of the natural world and offers unlimited possibilities for presentation in the virtual environment. Although the first version of VR was already used in 1987 by Jaron Lanier, its breakthrough was not achieved until 29 years later with the aid of large companies like PlayStation VR or HTC Vive, Oculus Rift, and Google [32]. In VR, individuals employ either their body movements or a remote controller. As a result, users can artificially create the sensory experience of being within a virtual environment, allowing them to navigate through an imaginary setting and interact with goods or other virtual creatures. Virtual reality (VR) has been implemented in various hardware forms over the years, with a head-mounted display (HMD) being a relatively new and popular kind of VR technology. The potential for online presentations is thus vastly expanded [17].

Oculus Quest 2 Adaptation

Since the early 19th century, researchers and developers have been working on perfecting virtual reality (VR) technology, which gives the user the feeling of being physically present in a different location. Using this technology, one can interact with a computer-generated three-dimensional environment as though one were in a usual, non-disturbed physical location. The goal is to provide a more effective presentation of a complex object by simulating its behavior. In recent years, many manufacturers, including Oculus, have released virtual reality (VR) headsets. Although it has found applications in several other areas, its usage in education is still somewhat limited [33]. Recent years have seen a surge in studies devoted to user experiences in immersive technologies like Virtual Reality (VR) and Augmented Reality (AR). However, direct comparisons between these and other immersive technologies are rare. Studies like [34] used a between-subjects design to compare visitors' reactions to Virtual Veronese, an immersive gallery experience available in both virtual realities (VR) and augmented reality (AR) at London's National Gallery. Enjoyment was intense across the board, with the Oculus Quest (VR) obtaining better mean scores than both AR devices, Magic Leap and Mira Prism, according to the analysis of the survey data from 368 respondents. Despite the Oculus Quest obtaining a substantially better mean score than the Magic Leap on realism, the Oculus Quest also received higher scores on the criteria of spatial presence, involvement, and sense of being there than the other two augmented reality devices. Only" I knew what to do" was rated better for Quest than Mira Prism, but otherwise, the three gadgets had an equivalent cognitive engagement. Feelings of immersion were similar amongst gadgets. In terms of user behavior, all devices performed well, with Oculus Quest slightly outperforming Mira Prism on the statement, "I would like to see more experiences like this." Rare cases of adverse events, such as nausea, were documented. The varying degrees of immersion provided by these gadgets certainly contributed to the varying user experiences [34]. In the experimentation of[35], the authors adopted two different VR headsets in two distinct locations (outpatient and inpatient) to provide mindfulness therapies in virtual reality. Virtual reality (VR)-based mindfulness training was tested in both settings in a pilot study approved by their Institutional Review Board. With Oculus Quest 2 VR Headsets and an outpatient schedule of twice-weekly sessions, they created a guided meditation experience for the elderly. However, the conclusion was that the need for virtual real behavior videos (360 videos) on YouTube that were suitable for the Oculus Quest 2 VR and DESTEK V5 VR Headset to promote mindfulness was a significant barrier to their widespread adoption. For instance,[36] educational analyzed the affordances of wearable technologies like the Oculus Rift. They found that factors like a distraction, overuse, familiarization with the interface, technical problems, and lack of support could limit the effectiveness of such tools. [37]'s goal for this project was to develop a Virtual Reality (VR) program with a haptic therapeutic vibration device to motivate patients with Alzheimer's and dementia to exercise. The Oculus Quest 2 was adopted for the simulated features of an interactive 3D world. The approach adopted was to challenge people with cognitive impairments to exercise with the combination of a positive reinforcement strategy with the calming effects of virtual worlds. According to [33], with the rise of online education comes a growing demand for hands-on training for diverse participants. Therefore, one can enhance their experience with virtual reality software like Unity 3d and Oculus Quest to assist with online practicum.

Educational Virtual Conditions (EVCs)

Virtual educational environments (EVCs) can include more or fewer updates and interruptions depending on the student. One can alter the environmental and social factors to facilitate learning at varying depths, lessen the impact of social anxiety, and promote the transfer of skills throughout the disciplines. Importantly, EVCs provide risk-free, no-repercussions environments for exploring new avenues, shedding light on hidden problems, bolstering self-assurance, and enhancing social skills and motor coordination [9,38]. Studies have argued that immersive virtual reality's (IVR) increased sense of presence and the realism of computer-reenacted situations can help students retain information. As a result, students are more ready to apply what they have learned in real-world settings [39, 40]. As IVR has developed, its many advantages have become more evident. First, through sensory immersion, actionable immersion, and symbolic immersion, users can improve their learning and take in new views [41]. Whenever students are given" first-order experiences," they can develop their knowledge within the virtual setting [42]. According to [42] educational, students can also be given the power to teleport immediately to other locations and change their size so they can engage with micro and macro worlds or both [41]. In the situation of [43], students have employed Cave Automatic Virtual Environments (CAVEs) to investigate the implications of relativity in a fully immersive virtual reality setting.

Symbolic immersion is when students' emotional states (such as terror on a fast rollercoaster) enhance their sense of presence to react to the experience [42]. Learners can move forward at their own pace thanks to the virtual worlds' flexible structure and the option of taking whatever route they like [44]. Student's behavioral intention to use IVR increased when they had high levels of intrinsic motivation because such high levels of motivation led to greater student engagement with learning and higher levels of academic accomplishment [45]. However, several concerns could arise from implementing IVR in the classroom; thus, by way of illustration, [36] educational analyzed the affordances of wearable technologies like the Oculus Rift, and they found that factors like distraction, overuse, familiarity with the interface, technical problems, and lack of support could limit the technology's usefulness. Furthermore, there is the issue of whether or not IVR enhances learning, with studies demonstrating that a more immersive IVR experience only sometimes leads to better results in terms of knowledge retention [45, 46]. Regardless, with Immersive Virtual Reality (IVR) becoming increasingly common in mainstream education as of late, practitioners must broaden these studies to additional adult learners like parents of children with disabilities. Thus, the rationale behind this study is to determine whether or not parents of children with intellectual disabilities benefit from participating in an immersive reality experience.

Purpose of study

This study aims to use immersive reality to increase parents' knowledge and experiences about their children with intellectual disabilities.

Study Questions

- How does IMR inform the behavior of parents toward their children with disabilities?
- Was the use of IMR effective in increasing parents' knowledge and experiences?

METHODS

Participants

Two parents voluntarily participated in this study and were willing to be educated on using Immersive Reality with Oculus Quest 2.

Parent 1: A 38year-old woman with a bachelor's degree. She has three children, one of them a 12-year-old girl diagnosed with an intellectual disability.

Parent 2: A 43-year-old woman with a master's degree has a son diagnosed with an intellectual disability.

Setting

This research was conducted in a suburban setting in the northeastern part of the USA. All task-based interviews were conducted in the parents' homes at an agreed time to accommodate the participants' schedules.

Study Procedures

Before we began training parents on the use of Oculus Quest 2 for the IMERCYVE experience. We asked parents to rate their knowledge and experiences of people with intellectual disabilities using a Likert scale (see Appendix A). The Likert scale was developed with a 1 item questionnaire. Parents were asked to rate themselves on a scale of 1 -5, with 1 being" not knowledgeable," "no idea," "somehow knowledgeable, "knowledgeable," to 5 being "very knowledgeable." This was used to determine parents' prior knowledge and experiences of people living with intellectual disabilities. After the study, parents were asked to use the Likert scale to rate their knowledge and experiences of people living with intellectual disabilities. The questionnaire has two sections. The first section asks for the demographic information of the participants. The second section has four items about their IMERCYVE experience (see Appendix B).

Training for Parents

In the participants' homes, the Oculus Quest 2 system was set up to be used during the debriefing sessions. Parents were asked to try the headset and adjust the settings to suit them. Parents followed the system instructions and got familiar with using the hand-tracking software. The researcher stood just outside the specified VR play zone while the participant was engaged in the VR session. This was done by observing the participant and being available to support the parents as needed. The researcher walked through the events occurring in the IMERCYVE by asking parents what they saw and what they felt that scene was teaching them. The actual IMERCYVE experience lasted for 5 minutes. Furthermore, the computer operating the VR was situated at the far end of the room on a table, facing the examiner so that the authors could examine or monitor the activity of the participants. After the IMERCYVE experience was over, parents were asked to share their experiences with the researchers.

IMERCYVE

Imercyve is a software developed by a team at Valley General Hospital in Australia. The virtual environment depicts the day-to-day life of a person living with an intellectual disability. The virtual reality setting is mid-morning, with the sun peeking through the blinds into an accessible living room and kitchen that is unkempt and filled with everyday objects. Participants will experience how this recognizable place suddenly becomes the backdrop for unfamiliar challenges. Parents will learn first-hand experience how many of the interactions generally taken for granted may look or feel different to people living with intellectual disabilities.

RESULTS

Parents prior knowledge: Both parents rated themselves as "somehow knowledgeable" on the Likert scale when asked about their knowledge and experiences of people living with intellectual disabilities. After the IMERCYVE experience, parents rated their knowledge and experiences of people living with intellectual disabilities as "knowledgeable."

How was your experience with IMERCYVE

Parents reported having a positive experience with IMERCYVE.

"I think it was a great experience, and I did not know that people with intellectual disabilities had so many struggles with daily activities."

"I love the experience. I was shocked at how I struggled to do certain basic things like picking vegetables, reading the clock, and processing information."

How did this experience increase your knowledge of people living with intellectual disabilities?

Parents expressed their difficulties with some basic tasks in the virtual world. They also expressed how such experience informed their knowledge about people living with intellectual disabilities.

"I did not know that people with intellectual disabilities had so many struggles with daily activities. I did not expect it to be that tough to accomplish. So I appreciate this lesson learned."

"I was really surprised at how I struggled to do certain basic things like picking the vegetable, reading the clock, and processing information. This helped me understand my child's struggle and other people with intellectual disabilities."

How will this experience change or inform your behavior towards your child?

When parents were asked how this experience would change their behavior toward their children with disabilities, they responded that they would be more patient and tolerant toward their wards.

"I feel bad for misunderstanding my child most times. However, I now understand better what they go through and will be more patient towards him."

"I appreciate this experience and understand what my child could be going through with the basic everyday task. I have to learn to be more patient and tolerant towards her."

Any other comments?

Parents suggested the need for a more extended experience with IMERCYVE.

"I just wished it lasted longer. I would love to experience other areas that people with intellectual disability struggle with."

"It was so fun and interesting, and I wish it were a longer experience."

Summary of Results

The results from this pilot study indicate a positive increase in parents' knowledge and experiences of people living with intellectual disabilities. In addition, reports from parents show how this immersive reality experience has influenced their behaviors toward their children with intellectual disabilities.

Social Validity

Parents were given a social validity questionnaire(see Appendix C) after the IMERCYVE experience. When parents were asked if they would like to experience this again, they said, 'yes, they will. We asked if the training on the use of Oculus Quest 2 was easy. They reported that it takes time to get used to the virtual hands and use them for activities. However, both parents think they will become experts if they keep practicing. Parents were also asked if they would recommend this experience to other parents of children with intellectual disabilities, and both answered 'yes.'

DISCUSSION

Based on the analysis discovered by both parents who have a child with an intellectual disability, the use of IMERCYVE through an IMR was successful in increasing parents' experiences and knowledge about people living with intellectual disabilities. Parents reported gaining more understanding which in turn informed their behaviors toward their children with intellectual disabilities. However, discussing the results is difficult due to the need for previous evidence from similar experiences concerning using IMR with parents as adult learners. Most of the research on parents' VR training so far concerns using desktops, large-screen displays, and virtual 3D worlds such as second life. The results seem promising regarding the development of a virtual environment that can provide parents with practical and convincing encounters as though they were in real-world scenarios to help them understand the daily experiences of people living with intellectual disabilities. [47–49] The results indicated that using the IMR system elicited an increase in parents' knowledge and experiences of people with intellectual disabilities.

Limitations

As with many pilot studies, the sample size was too small to make generalizations out of this study. First, due to the sample size, we could not assess the adverse reactions this immersive experience can have on parents' emotional states. Secondly, even though the parents voluntarily participated in the study, one of the researchers was familiar with the parents, so there was an existence of selection bias. Finally, we foresee a threat to internal validity in terms of testing. This is because participants knew the purpose of the study. Thus they could influence their behaviors or give answers to suit the researchers' expectations.

Recommendation for future research

Based on the findings from this pilot study, we recommend that future studies should use a larger sample for the study to be generalized to a larger population of parents of children with intellectual disabilities. Secondly, we suggest that participants be selected randomly to alleviate any threats to internal validity. Study Implications:

To provide digital technology, larger educational systems must be dynamic and spontaneous. While digital devices can tailor the learning process to the individual child's needs, research collaborations could open up new avenues for children with intellectual disabilities to learn various daily living and social communication skills. This allows them to become more self-sufficient and productive members of the community. In addition, we may need to make improvements at various education levels for parents with children with intellectual disabilities. One method we can use to accomplish this is to incorporate immersive reality experiences. This pilot study adds to the body of literature on the benefits of immersive reality when used with a different category of adult learners: parents.

Conclusion

The study's main objective was to use immersive reality to increase parents' knowledge and experiences about their children with intellectual disabilities. These opportunities to maximize learning for adult learners should be a fundamental right for all parents who have children with intellectual disabilities. The integration of Oculus Quest 2 has been particularly effective in providing specific real-life experiences for study participants. The Oculus Quest 2 can be programmed to stimulate participation and demonstrate the daily activities and experiences of people with intellectual disabilities, as depicted in IMERCYVE. Contexts.

Declarations of Interest: The authors declare no conflicts of interest.

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APPENDIX

Appendix A

Assessing Parents' Prior Knowledge and Experiences of People Living with Intellectual Disabilities

Question:

1. How will you rate your knowledge and understanding of people with intellectual disabilities?

- () Not knowledgeable
- () No idea
- () Somehow knowledgeable
- () Knowledgeable
- () Very knowledgeable

Appendix B

IMERCYVE Experience Questionnaire

Participants Demographics

1. What is your gender? (a) Male (b) Female
2. What is your level of education? (a) Bachelors (b)Masters (c) Doctoral
3. How many children do you have?
4. What category of disability is your child diagnosed with? How old is your child?

Interview Questions

1. How was your experience with IMERCYVE?

2. How did this experience increase your knowledge of people with intellectual disabilities?
3. How will this experience change or inform your behavior toward your child?
4. Any other comments?

Appendix C

Social Validity Questionnaire
Question:
1. Would you like to have this experience again?

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