The Use of Virtual Reality to Promote Communication and Recognition of Emotions in Children with Pervasive Developmental Disorders (PDDs)

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Abstract

This research paper aims to analyze the use of virtual reality (VR) with children suffering from pervasive developmental disorder (PDD). Particular emphasis is placed on factors that contribute to the improvement of communicative and emotional skills. This study focuses on understanding the factors facilitating the improvement of these two skills. To answer our questions, we based ourselves on experimental studies. The main results of this research paper demonstrate how these skills can be improved through the use of virtual reality. This helps to highlight the need for further research addressing these uses with the creation of new scientific studies.

Keywords: Virtual reality (VR); Pervasive developmental disorder; communicative and emotional skills

Introduction

VR has widely developed in the field of education in various forms. These tools have a large number of benefits for specialized learning. Thanks to an IT tool, we can observe an increase and simplification of communication possibilities. Currently, technologies are constantly evolving to help children with pervasive developmental disorders who have difficulties both physically and cognitively. This work aims to analyze research in the field of virtual reality (VR) applied to pervasive developmental disorder. Children with a pervasive developmental disorder (PDD) will be exposed to the advantages and disadvantages of using computer technology, a pathology that has been widely studied in recent years. Focusing on the debates on support modalities, we will address questions of computers or other technologies as an educational instrument. With children with a pervasive developmental disorder (PDD) [1], we will try to verify whether virtual realities (VR) are effective or not. VR in specialized learning has many benefits. This document presents a reflection on the use of virtual realities (VR) and the care of these children based on current research. Our analysis will be completed by three exploratory interviews. Throughout this work, we will note the influence of VR on the modification of the activities carried out with these tools on the didactic and methodological level. We will be able to answer the following research question thanks to these analyses.

How can the use of VR with children with pervasive developmental disorder (PDD) improve their communication and emotional skills?

The terms "New Information and Communication Technologies" (NICT) are used in this research document to designate any computer equipment used in educational contexts and likely to help children with a pervasive developmental disorder (PDD) In order to answer this question. We will then explain the advances of virtual reality (VR) in terms of learning in the field of pervasive developmental disorder. The intention

is to make a presentation focusing on the alterations those children with "pervasive developmental disorder (PDD) present in communication and emotions. The processing of information, the instruments used to collect and gather information, finally we will discuss the elements contributing to the development of communicative skills with children in PDD situations [2].

Virtual reality (VR) and specialized learning

In this chapter, the intention is to present the reasons why the subject of virtual reality (VR) occupies an important place in current research in terms of interventions with children suffering from a pervasive developmental disorder with a disorder invasive development (TED). In order to explain these processes, we briefly go through the most significant stages of the introduction of virtual realities (VR) in the field of learning and then more specifically in specialized learning. In addition, we explain the main applications in the field of pervasive developmental disorder and the reasons why this method seems, according to researchers, preferred for working with children suffering from pervasive developmental disorder.

Problematic

According to Adel Fridhi we can confirm that NICTs are an area of application with many advantages for treating certain characteristic aspects of children suffering from a pervasive developmental disorder PDD. Following these findings, the research question posed is as follows:

How does the use of virtual reality (VR) with children suffering from a pervasive developmental disorder contribute to the improvement of their communicative and emotional skills?

To answer this question, we focus on several dimensions.

• What are the factors that contribute to the improvement of children's communication skills?

• What are the factors that make it possible to strengthen learning capacities?

• The emotions of TED children?

• What are the limits of computer tools for children with PDD?

Methodology

We seek to understand how the use of virtual reality (VR) with children with pervasive developmental disorder (PDD) improves their communication and emotional abilities. Our research focuses on the use of NICTs in the communication and emotional domain with children suffering from a pervasive developmental disorder. Scientific resources and exploratory interviews are carried out with three children suffering from a pervasive developmental disorder from a center specializing in the education of this population. By carrying out experimental studies, it is possible to more easily find avenues for reflection and

ideas [4], they were accompanied by observation work in the field. The special education school organizes the meetings. During these interviews, we were also able to observe certain uses of these new technologies. We noted the phenomena and events observed as well as all the useful information during the experiments. As described, many technologies are used as educational instruments. The concept of "VR" brings together computers, adapted programs, virtual environments, instruments helping vocal reproduction. Our objective is to detail this presentation by focusing on studies aimed at developing communicative and emotional skills linked to VR.

Discussion

Virtual reality would be especially useful as a tool of intervention in the case of children with PDDs [5]. certain opportunities that are especially advantageous for this type of population are offered by this new technology. This strategy has the distinct advantage of enabling a remarkable method for establishing a secure and approachable virtual environment. An autistic person's perception of the outside world, especially the real one, can be jarring [6]. A person with an invasive disorder can exercise many skills without being worried about the consequences that would likely happen in a real-life situation because VR allows them to be placed in a non-real but effectively controlled environment. This group typically exhibits sensory sensitivies [7]. Thus, a person with PDDs may feel encroached upon by certain elements of the real world, whereas VR succeeds in controlling their number/quantity [8].

Furthermore, the crafted virtual setting can be customized to suit each individual's requirements. It is possible to create well-defined specific intervention programs for each child. Being unique, individuals with PDDs may speak [9], while others may not. The world of virtual reality permits the creation of a private environment based on the child's strengths and weaknesses and his/her interests, in order to enhance the level of his/her involvement in the tasks [10]. Furthermore, it is straightforward to gradually increase the complexity and alter environments with virtual reality, allowing for a broad range of knowledge acquisition [11]. People with PDDs usually have difficulties with mental representation and also with creativity [12]. In many cases, it is not easy for them to be involved in or to imagine a realized scene. Virtual reality allows us to ease these complexities by presenting them with 3D objects or an imagined scene that resembles the real world. The artificial nature of this type of intervention has led to the caution of numerous researchers in this field.

The latest report suggests that VR/AR may not be sufficiently secure or engaging for someone with a PDD. Being dependent on this new universe is easier, and they're more likely to avoid encounters with the real thing. The dangers of abuse and dependence would be controlled if VR were only used in clinical settings with surveillance. Furthermore, it is recommended to combine virtual reality and/or augmented reality interventions

with more "traditional" methods, such as social scenarios or role-playing The potential gains of VR or AR for people with PDDs appear to be as important as the potential risks. Intervening strategies make VR/AR a practical option for children with PDDs, demonstrating benefit and serving our needs. The initial identified research examining the use of virtual reality/augmented reality with this type of population was to determine whether children with ASD and minimal verbal ability could tolerate an immersive virtual world and provide solutions for this population. The virtual environment broadcasted in the visiocasque representing a boulevard with vehicles can be used to teach children how to safely cross the boulevard (Figure 1).

Figure 1: Virtual environment displayed on the visiocasque and used for teaching children ASD to safely cross a boulevard.

Children with PDDs could either go toward the stop sign and stop or at least recognize the location, even if they didn't move toward the goal, thanks to the way researchers set up scenes. They didn't seem to understand that these actions were replicated in the virtual environment. They also attempted to remove the visual cue to check out the image on the monitor. These children with PDDs were able to move around in the virtual environment and identify many of its peculiarities, such as vehicle colors. It's worth noting that there were no pre-testing protocols in place. Preliminary research suggests that children with PDDs will be intrigued by this recent innovation. Children in this study appeared to be proficient in employing visual cues. Some children with PDDs [13], were likely to encounter some difficulties, but they didn't like having their vision messed up or having an extra thing on their head. The visiocasque has thus been the subject of minimal investigation. The port is intriguing, but it also shields visual obstacles and ultimately mobilizes attention, even if virtual environments are created to captivate the interest of children with PDDs.

In fact, virtual reality is a scientific device that reveals the advantages of individuals with developmental disabilities. The behavior of children with PDDs was observed by a few researchers in this field in 2009, based on the media coverage they received. We believe that employing more advanced technology, such as augmented reality, will yield better outcomes, as simulated immersion in this case is more logical, and the child will be able to interact more effectively with the surrounding environment. A visiocasque can be recognized as a foreign body for some children with PDDs if you create this type of interface. The projection screen allows the child with PDD to move freely and without any worries when the environment is displayed. Virtual reality has been used to intervene with children with PDD primarily in a social-skills program. The effect of VR on social abilities was not specifically assessed in many of these studies, instead focusing on how individuals with PDDs navigated within the created virtual environment. Several individuals with PDDs had to complete several tasks of a social nature by moving around to find a seat or buying and going to the checkout to pay in the virtual café modelled by [14]. The virtual environment was utilized by individuals, and their performance grew with each attempt. The duration of navigating a virtual environment grows from one exercise to another, regardless of the degree of executive functioning of individuals with PDDs. Children with better planning abilities, nonetheless, took the shortest time to complete the majority of tasks in the simulated environment.

The virtual café was utilized by [15], to teach social etiquette to six individuals with PDD aged 14-16. After two attempts at learning in the virtual world, patients were required to watch videos that simulated cafes and cars, before deciding to sit and explaining their decision. The results showed that, for four participants, the degree of social acceptance of a task or the choice of a seat increased as they grew accustomed to the virtual environment created. Consequently, the reasoning abilities of all patients grew stronger. The mentioned researchers think VR would be a great tool for teaching social skills to kids with PDDs. The outcomes of this investigation appeared promising in terms of the enhancement of interpersonal abilities, but they also revealed several apparent drawbacks. Other research teams are interested in using virtual reality to enhance social abilities and have created a 3D virtual learning environment that allows users to interact with each other in real time. This project had the additional objective of assisting youngsters with PDDs in enhancing their interpersonal abilities.

Children with PDDs were able to communicate with each other through avatars in different virtual environments created (a restaurant, a castle, a car, and a mosque) Four children were the subjects of our test-run study. The goal was not to regulate the therapeutic effects of the virtual reality application, but rather to describe the user's actions within the virtual environment. The purpose of this program was not to cultivate interpersonal abilities, but rather to provide a social setting for interactions between children with developmental disabilities. The undertaking enabled a thorough examination of the users' conduct and methods of interaction with one another. The outcomes, for instance, revealed that patients relied heavily on verbal communication for interpersonal interactions. A large number of socially valuable behaviors can be controlled objectively with this tool. In the previous analysis, patients were not given feedback regarding their social method in the created virtual environment. Improving social skills would be achieved by having a clinician who offers feedback on transactions. With a few children with PDD [16], attempted to create a social environment in VR that facilitated a dialogue between the patient and a specialist in the field of PDDs via avatars.

Figure 2: Teaching children with PDDs safe behavior in a fire.

The scenarios described covered a variety of scenarios, including interacting with others, making a social decision, and preparing for an interview for a position. After trying to see their impressions, the healthcare professional met with the patient in person. Feedback on the patient's conduct was also provided, and a re-enactment of the scenario was arranged to give the patient the chance to incorporate the feedback they received. The patients' success rate in recognizing facial expressions increased after 10 attempts, and their mental assumptions improved as well. Furthermore, the patients acknowledged possessing exceptional interpersonal abilities in everyday life: They were capable of engaging in a dialogue, assimilating the viewpoints of others, and establishing connections with others. It appears that such virtual reality is even more effective when paired with advice from an expert to build up interpersonal abilities. Learning safe behaviors for children with PDD in dangerous situations in virtual reality would be an interesting tool. Thus, we employed a 3-D application to teach children with PDDs some precautionary practices during a fire (Figure 2). The simulated setting featured an animated character who performed various gestures that could be employed during a fire. The child with PDD had to follow the same instructions while moving around the virtual space after the attempt and under the guidance of the medical professional. The outcomes revealed that all children achieved near-perfect outcomes after completing the exercises. Moreover, it appeared that the majority of participants had applied what they'd learned to everyday situations.

Results

The study is carried out as part of the Program supported by the Higher Institute of Specialized Education (ISES) for children. "TED and VR" is a search title. The literature review focuses on the use of VR and its effectiveness for communicating and recognizing emotions and social interactions in children with pervasive developmental disorder.

Sample

After selecting 16 thematically relevant researches, the Higher Institute of Specialized Education (ISES) called them applied research. The latter use VR in the care of children whose communication and recognition of emotions and social interactions is weak.

We must first apply the research and the results obtained must be applicable in order to develop good practices between the different actors. A methodological guide aimed at improving the aspects of communication, recognition and emotions and social interactions is available to stakeholders. The common thread of this research chosen by our committee is the proven effectiveness of VR in improving communication and the recognition of emotions and social interactions in children with PDD. Fig. 3D: Use modeled avatars to create scenes with the sound of a lizard or dragon. The promising Figure 3.

Figure 3: Use of 3D modeled avatars by adding a sound of a lizard or dragon to the scene.

Avatars modeled by communication have been created, some are currently being tested. Young children with PDD benefit more from immersive and interactive interfaces, and daily living aids are offered.

Conclusion

We wanted to investigate the effectiveness of using virtual reality to enhance communication and emotional abilities in children and young adults with persistent developmental disorders. We relied on the modeling of different types of avatars by adding the sound of each avatar addressed to special educators, adopting an explanation method, thanks to the data collected, we were able to grasp the value of these means in their pedagogical practice.

We demonstrated the application of virtual reality in the everyday routine of specialized educators, and the examination of their responses revealed that they are convinced of the potential of these aids, which targets a variety of areas, focusing specifically on the enhancement of interpersonal and emotional communication abilities.

The virtue of these tools deserves to be emphasized; we're talking about their attractive, facilitating, fun, and repeating qualities, which explain the intense interest of PDDs in this field technology. We emphasized the fear of teachers, triggered by the use of these tools, that manifested itself in the fear of confinement or isolation. The actions needed to be planned and organized. Parental involvement is another aspect that deserves to be acknowledged. The necessity is paramount, but the domestic activities must be approved by the intervening team, as they are part of a bespoke educational endeavor.

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