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Enhancing an Autistic Child's Daily Reality Using Virtual Reality: The Benefits of Incorporating
Virtual Reality in Occupational Therapy

Bram Koch

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Heather Richardson

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Abstract:

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Autism spectrum disorder can drastically affect the social skills of people. There are several standard treatment methods used in the clinical setting of occupational therapy. Interestingly, there is potential for occupational therapists to use virtual reality as a treatment method to improve the social skills of patients with autism. Researchers are trying to find the most effective way to help children and adults improve their social skills. Unfortunately, most occupational therapists lack knowledge, resources, and training in order to adopt virtual reality into practice. A new form of therapy requires education and financial investment.

This research will provide information related to helping children with autism improve their social skills; current treatments for patients with autism; and examinations of recent studies involving virtual reality. This research may be beneficial to parents of children with autism, individuals working in healthcare, people who are interested in the topic or interested in entering a field that works with children who have autism, such as teachers, teacher assistants, and counselors.

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Dan Aykroyd, the writer and actor of the famous film, *Ghostbusters*, publicly announced that he has autism. He stated that his autism is the reason that he was able to come up with the idea for his blockbuster movie. Aykroyd noted, "One of my symptoms included my obsession with ghosts and law enforcement—I carry around a police badge with me, for example. I became obsessed with Hans Holzer, the greatest ghost hunter ever. That's when the idea of my film *Ghostbusters* was born" (Child Mind Institute). While this trait of autism helped his creative process, Aykroyd revealed that as a child he struggled socially until those issues were improved with treatment from an occupational therapist. So, "Who you gonna call?" -- an occupational therapist!

The treatment of autism by occupational therapists has been beneficial in the past. However, researchers are still trying to find more effective ways to help children with autism improve their social skills. Recent studies have been conducted using virtual reality as a treatment method to help improve the social skills of children diagnosed with autism. However, many occupational therapists lack knowledge, resources, and training in order to adopt this form of therapy. While occupational therapists should continue to use traditional methods, virtual reality should be incorporated into the treatment of the social deficits of autistic children.

According to a study by the Centers for Disease Control and Prevention in 2016, approximately 1 in 54 children are diagnosed with autism spectrum disorder in the United States. Autism spectrum disorder is a developmental disability that can result in particular social, communication, and behavioral troubles. Although many people with autism may be extremely

intelligent, they may still struggle socially. Symptoms of autism can generally be broken into two categories: difficulty with social interaction/communication and repetitive patterns and behaviors. Examples of social communication symptoms include trouble in understanding body language, when and how to properly respond in social interactions, and developing and maintaining relationships. Autistic individuals still desire social interactions, but often have difficulty making friends due to poor eye contact and difficulty with reciprocal speech which causes others to feel uncomfortable and avoid them. Examples of repetitive patterns and behaviors consist of repetitive use of movement, objects or speech and obsessive interests (as Dan Akroyd's obsession with ghosts and law enforcement). Common repetitive movements observed are hand flapping and spinning when the individual is excited.

Occupational therapy is a unique profession in the field of health care. Occupational therapists treat people of all ages by helping them to do the things they desire and are required to do through the practice of everyday tasks (occupations). Occupational therapists prepare individuals to make the most of their lives by adapting to their injury, illness, or disability. Treatments in occupational therapy generally encompass assisting children with disabilities to wholly take part in school and social settings, aiding individuals healing from injury to recover certain dexterities, and accommodating the elderly who are encountering physical and cognitive declines. Methods used by occupational therapists usually involve an evaluation of the patient, in which an individual, sometimes along with family, work with the occupational therapist to establish the individual's goals, as well as the creation of a treatment plan to enhance the patient's aptitude to complete everyday tasks and achieve his or her goals. Additionally, the occupational therapist will do a post-treatment evaluation to determine if the goals were fulfilled or if they need to modify the treatment plan (American Occupational Therapy Association). A

fascinating characteristic of occupational therapy is its constant demand for practitioners to have a “holistic perspective” (American Occupational Therapy Association). The occupational therapist’s focal point is to model the environment or exercise to suit the needs of the patient, and the patient is a partner in the treatment plan.

There are many traditional treatments used in occupational therapy to help individuals with autism improve their social skills. A few examples of traditional treatment methods are play therapy, role play, and using flashcards with facial expressions. The video, “Autism Social Skills Training” produced by the Public Broadcasting Service (PBS) and the Social Skills Training Group Program at the University of California, Davis MIND Institute, explains how using the game of dominoes can help children with autism learn valuable social skills. It details that for many with autism, social situations can be terribly overwhelming. This program provides these children with a comfortable place to practice recognizing emotions and body language by playing games such as dominoes. The line of dominoes falling and knocking each other over represent how reactions to a problem impact others reactions. The next thing they incorporate is role play, specifically having two sided, interactive conversations with each other. This method helps them learn to form basic relationships and is another way to practice recognizing emotions, facial expressions, and learning to reciprocate feelings in conversation. Another fun game that occupational therapists use to help improve social skills is called “OT Simon Says” (Brogren, MOT, OTR/L). Commonly, this is a game children learn how to play in school; however, Brogren suggests that it can also be used at home by parents of children with autism. She states that the parent can add a social skill aspect by giving the child a turn to direct them by being Simon. This inspires the child to understand different perspectives and be creative. Another activity that Brogren proposes for parents to utilize at home if their child is struggling socially is

to find video clips to address social skills. She recommends that the parent ask the child who their favorite cartoon character is. Once they determine the child's favorite cartoon character, they can search for video clips from the show. This should be used as encouragement to discuss how the characters are feeling, what they might be thinking, or what they are doing. This activity can be a great way to establish emotions and unique perspectives (Brogren). Occupational therapists use flashcards with facial expressions to help the child learn to read the emotions of someone they are conversing with. So, one side of the flashcard would have a facial expression, and the other side would have a one word or brief description of how that person is feeling. The therapist or the parent would then quiz the child on the flashcards while making a strong effort to keep the activity entertaining. These traditional therapies have been successful, Dan Aykroyd recalls: "I had physical tics, nervousness and made grunting noises and it affected how outgoing I was. I had therapy, which really worked and by 14 my symptoms eased" (Child Mind Institute).

Occupational therapy is beginning to implement a new method that involves virtual reality to help children with autism improve their social skills. Virtual reality "is a simulated experience that can be similar to or completely different from the real world" (Wikipedia). Utilizations of virtual reality involve entertainment, education, and business. An example of entertainment virtual reality would be video games and simulations. Virtual reality can be applied to education, such as using Zoom calls to hold online classes during a pandemic or other situations. Virtual reality could also be used in education relating to medical or military settings (Wikipedia). Regarding business, virtual reality could be employed to have virtual business meetings; especially during a pandemic or if different members of the business live far apart. Virtual reality may also be beneficial in professional evaluation video conferences, including occupational therapy.

Virtual reality can be helpful in several situations with occupational therapy and evaluating children with autism. One benefit of this is the ease of reaching people, especially people who live in remote or rural communities where there may not be an occupational therapist available for in person treatment (Schuman 18). The issue of people living far away from a therapist has been ameliorated by virtual reality using video conference calls. This application has been used as a solution to the unavailability of in person therapy sessions during COVID-19 pandemic. Dr. Shuman, Clinical Professor of Pediatrics at the Dartmouth School of Medicine, also described how this method can be more comfortable for a child with autism who has social issues and anxiety. Additionally, virtual reality provides numerous virtual environments in the comfort of their home or familiar practice location. It also presents them with the opportunity to practice and explore with virtual characters rather than with real people, along with allowing them to feel more comfortable making mistakes. This is something that is accessible for rural schools. As long as they have internet, they can use desktop virtual reality for treatment (Grandisson 35).

Virtual reality can address specific goals or skills such as interacting with people in certain situations, such as utilizing public transportation. In a blog, Richard van Hooijdonk, a futurist and lecturer at Nyenrode Business University and Erasmus University Rotterdam, puts forward a few examples of how virtual reality is currently being used to help improve the social skills of children with autism. The first example is a game in which the child is able to interact with avatars using a headset. The child is able to walk around and explore different social situations and environments. He or she may walk up to the computer programmed avatars and interact with them. Interacting with the avatars will help the child learn how to comprehend good or bad reactions. A prime example of this would be if the child is avoiding eye contact or looking

down repeatedly, the avatar will end the interaction or walk away. But, if the child is persistent with making eye contact, the avatar will stay, and a positive reinforcement is made. In this case, the avatar would talk and smile, making it a more enjoyable interaction for the user.

Another economical option that Hooijdonk presents is a mobile virtual reality application that uses Google Cardboard, called Floreo, which was created by two parents who have a son with autism to help with social and communication skills. Floreo is a headset made of cardboard where the phone is placed inside and the child looks through fiberglass lenses. It is much more affordable than a full virtual reality headset. Floreo presents many different training situations that simulate various social interactions. The virtual environments can be customized by the parents, allowing them to change the method and the level of the training. The storylines of the application put the child in situations that guide them on how to go about planned and unplanned interactions they may deal with in the real world. Another positive that can be taken from Floreo is that it gives the child a challenging atmosphere in a gradual fashion. This helps them learn to cope with stressful situations and times when their senses are overwhelmed. Parents are also able to see progress that their child is making and help them through it if necessary using a tablet.

Virtual reality can be beneficial in helping children adapt to specific tasks, such as utilizing public transportation. In a study held in San Diego, California, in 2020, five children with autism participated in virtual reality-based air travel functional communication treatment (Miller et. al). The researchers used iPhones and Google Cardboard virtual reality headsets for a three week period to administer practice for each of the children. During the fourth and final week, the five children took part in an air travel drill at the San Diego International Airport. The parents agreed to judge their child's air travel skills before the study started and then after the study was complete. According to the parents' answers, each of the children improved their air

travel skills significantly. They were all able to make their way through the airport independently after the virtual reality treatment.

One of the impediments for using virtual reality is cost. The typical cost of a virtual reality headset ranges from 50-400 dollars. However, cheaper options, such as the Google Cardboard Headset, help ameliorate this issue. Also, paying for quality coding or programming can be expensive, but there may be grants that organizations could apply for to offset these costs. If an autistic child has sensory issues it might take them a while to get used to the virtual reality headset, but this may improve with time and repeated exposure, or a tablet or desktop could be used instead if the headset is not tolerated. Many occupational therapists would require training due to lack of experience with virtual reality applications, but this is easily overcome with online classes and tutorials.

In an interview with Brian Adams, a practicing occupational therapist in Wilkes County, North Carolina, the feasibility of utilizing virtual reality in occupational therapy was discussed. Although he is interested in incorporating virtual reality into his practice to help children with autism, he has not had extensive training in its use and has not made a financial commitment to it. He is considering purchasing an Oculus Quest headset for use in his practice as he believes his adolescent autistic patients would engage well with virtual reality games. He has used telehealth platforms during the pandemic to meet with patients. Although this was essential during that time, he prefers in person therapy. He has incorporated technology such as using game applications on tablets and video modeling. He described a teenaged female patient who had a poor understanding of body language, social interactions, and would say inappropriate things. He gave an example: once when her mother took her to a movie, she was seated behind a woman and could not see well; her mother offered to move seats with her and she blurted out “I

didn't know you were going to sit me behind Marge Simpson!" She was oblivious to the fact that she hurt the lady's feelings. When he tried to work with her in live situations, she became anxious and had difficulty identifying her inappropriate responses or behaviors. He began using video modeling, a method where her interactions were videotaped and she was able to review them later with the therapist. When she was able to watch and reflect on her interactions from a different perspective, she was able to identify her actions that were odd or inappropriate. He felt that this was very effective and observed her improve tremendously.

Autism is a common disorder which interferes with the social interactions and daily functioning of the individual. Occupational therapists have many treatments to address the social deficiencies of children with autism and are beginning to use virtual reality in their therapy. Due to its unique properties and remote accessibility, virtual reality is a potentially transformative therapy to address the needs of autistic individuals and should be increasingly incorporated into occupational therapy practices.

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