
Short Commentary

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The role of virtual reality in art therapy to mitigate autism spectrum disorder (ASD) symptoms

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Abstract

Traditional art therapy sessions are designed for face-to-face engagement with patients as with other mental health services such as counseling. However, the pandemic of 2019 severely limited access to these services and, initially, led to widespread cancellation and postponement until the nature of COVID-19 could be better understood. When treatment resumed, video conferencing was the preferred method of holding therapy sessions one-on-one to diagnose patients and provide services. Similar approaches were taken in art therapy with less efficacy given the hands-on nature of the required activities. With the rise of virtual reality (VR) as a more widely accessible technology since 2020 has provided the ability to engage with individuals in a simulated virtual environments (VEs) from any location. Of those that have need of acute attention paid to sensory issues are those with autism spectrum disorders (ASD), and VR is well-suited to benefit the population. The expansion and availability of immersive reality content and hardware has positioned clinical psychology and art therapy to capitalize on the customizable VEs for therapeutic purposes. But the potential benefits of VR to support those with ASD through art therapy have only recently been broached. Research has hitherto focused on how the technology may be adapted for use in addressing methodological and clinical issues in psychological assessment. This study seeks to expand the discourse on the use of VR for art therapy in providing services to the neurodiverse community and ameliorate the symptoms of autism spectrum disorder (ASD). Through the abilities of immersive reality to adjust light, sound, smells, haptics, and other environmental factors to the needs of an individual, as well as the ability to ease cognitive load and stress associated with eye contact through the use of avatars, art therapy sessions can focus on reducing environmental variables and thus limit the need for masking and other behaviors that impede the therapeutic process.

Keywords: Virtual reality; Art therapy; Neurodivergence; ASD; Autism spectrum disorder.

Introduction

With the expansion of the use in clinical settings of immersive reality technologies- virtual reality (VR), augmented reality (AR), and mixed reality (MR)- the benefits of treating patients virtually has presented more opportunities for research and treatment options, especially for Experimental and Clinical Psy-

chology [1-3]. The use cases for VR were greatly expanded since 2020 due to the pandemic. The quick pivot of clinical psychological and counseling interventions to online and video conference platforms such as Zoom saw mixed results [4,5]. The limitations in telehealth services led to further investigation of alternatives [6]. In clinical psychology, virtual reality (VR) is ef-

efficacious due to the importance of memory and imagination in psychotherapy. Since these variables are consistent with the whole population, virtual environments and experiences provided by VR are able to move beyond these limitations. The virtual world that can be inhabited is able to be seen as more real, allowing subjects opportunities for self-reflection on their own memories and imagination [1]. Other applications have been developed to treat mental health problems, most commonly using virtual environments (VEs) to manipulate problematic situations associated with the specific patient. Successful intervention is made possible by VR because it is a form of human-computer interface capable of creating a feeling of “presence” in virtual environments. In essence, VR provides an “empowering environment” that is removed from the real world and shields the patient, allowing them to explore and act without threats that would exist outside the virtual world. The obstacles encountered in face-to-face sessions are removed and patients are able to freely explore scenarios, feelings and thoughts without traditional, social consequences [3].

Research on the use of VR in fields associated with psychology has hitherto focused on how the technology may be adapted for use in addressing methodological and clinical issues in psychological assessment. Instances include studying a cognitive model within a virtual reality environment to predict occurrences of nonclinical paranoid thoughts; reviews of treatments using VR in psychiatry; investigating the usefulness of VEs for psychological research on behaviors in the real world; evaluation of methodological trends in VR for behavioral research on data collection, data availability, etc.; investigating racial and ethnic socialization in VR narratives [7-13]. The benefits of using VR in psychological fields are derived from the fact that the brain interprets movement and sensory input in a virtual environment the same as in a real space [9]. With respect to psychological research VEs are able to provide interface flexibility and reproducible experiences. Additionally, researchers are able to monitor performance live and online while virtual experiences are underway. The research reiterated the findings of Riva [3] where the ability of VR to create the feeling of “presence” in an “empowering environment” allows patients to act without outside threats. As noted, removing many obstacles faced in face-to-face sessions, patients are able to freely engage with environments and explore without anxiety produced in real-world interactions [3]. The potential for VR in psychology, Foreman notes, was previously limited to availability of hardware and software. At the same time, “the use of programmable agents has great future potential in relation to training and interpersonal skill development, also perhaps in clinical diagnosis and therapy” [9].

Treating ASD with VR

The ability afforded by VEs to create and, if desired, mitigate stimuli is through “imagined or implied presence” is more cost effective, less rife with human subject research compliance, and allows for greater control over experiments than replicating in a real-world scenario [14]. The ability has led to early adoption of VR to treat ASD [15]. Furthermore, with greater access to hardware and easy-to-use software that allows for customizable experiences, a range of parties are now developing applications and resources to address the mental health “crisis” in the wake of the pandemic. In the area of ASD, applications have been

developed to reduce anxiety associated with public speaking (77% of the population) and lower social anxiety for those with autism, such as with Ovation [16]. Research has already demonstrated that all populations report less anxiety in engaging via avatar in virtual social environments. Those with ASD especially benefit given the reduced need for eye contact and resultant lowered masking behaviors [17]. Other applications have been developed, such as Floreo VR to support social, behavioral and communication skills in those with ASD [18].

In fact, the use of VR in the treatment of ASD has received extensive attention [19-26]. For example, studies point to the increase in ASD cases, and note how these continue to accelerate, and how VR may be used as a potential intervention strategy [27-30]. Such research identifies the deficits in three areas or domains. These core deficits include difficulties with communication, social interaction, and with limiting repetitive behaviors. Interventions are recommended as part of a strategy to intervene in support of those with ASD via educators and caregivers. As noted, the benefit of VR is in patients being able to inhabit a safe and controllable virtual environment. The simulations, moreover, can be altered as needed, updated and changed based upon the need of the individual. Within a VE, stimuli that can be overwhelming or competing are removeable unlike in more traditional social contexts. Also, time can be altered as part of the playful experience [31].

Reducing social anxiety

The ability to modulate, mitigate, control, or eliminate certain sensory stimuli is ideal for the treatment of ASD. Previous studies have confirmed that those with ASD prefer to engage with others through virtual environments rather than face-to-face before VR became widely used. For instance, a study [32] of the use of online chat services on the internet found that introverted and “neurotic” individuals self-identified their true self in virtual interactions via the web. On the other hand, extroverts and “non-neurotic” individuals found their “real me” authentically located and revealed in face-to-face communication and traditional social interaction and events. Likewise, recent studies confirm that the use of a virtual avatar reduces anxiety in VR simulations. Those with social anxiety disorder reported greater benefits and being more at ease in social interactions with others using avatars in VEs. As such, individuals with ASD have seen greater success in effective communication in social VR as opposed to socializing in person [33,34].

VR and ASD in education

The VEs afforded through the VR experience allow those with ASD to practice social interactions in an environment that is free from social consequences. Lorenzo et al. [35] noted as such in a study of the use of VR to improve emotional skills of ASD students. Participants in the study were between 7 and 12 years of age and had a confirmed diagnosis of ASD. The students were placed in different social situations and asked to engage with in a visual manner, while computer vision monitored their emotional states. The study was designed to determine if behaviors were appropriate for a given situation and if emotional states aligned with those situations. With the diagnostic ability afforded through online observation of real-time responses of participants, emotional competences improved compared to other approaches. Other studies have also investigated the ef-

ficacy of VEs as a “habitation tool” for children with ASD. As with the example cited above, researchers continue to express interest in alignment of appropriate behavior with specific social situations in order to provide social convention education to students [36,37]. One environment took the form of a virtual café where social skills could be practiced in VR. Through the scenario, students could improve time-on-task and move more quickly to different social tasks successfully. In another VE, participants were placed in a virtual supermarket. Different scenarios were presented in order to improve understanding of the functional, physical and symbolic functions of objects. The question remained for researchers whether participants, who improved in the simulation, could replicate the experiences in a real-world scenario. The transferable skills could, in fact, be brought over in real supermarkets. Still other research has looked at Collaborative Virtual Environments (CVEs), which enable multi-user functionality. Patients and therapists are able to inhabit the same VE using virtual avatars and can communicate with one another. The shared experience improved emotional recognition among patients [38], while also encouraging unprompted social interactions, as well as a better understanding of the emotions of others [39]. Such collaborative approaches to multi-user experiences have been replicated in other research, such as with OpenSimulator. Such examples provide access to social-oriented and role-playing games [40]. It should be noted here that in playing another character, those with ASD are able to avoid masking behaviors as they are not required to modify their own reactions as themselves but instead as a separate agent. The studies above confirm the efficacy in improved social skills through the use of VR either via individual simulations or collaborative ones.

Treating ASD using art therapy in VR

While the benefits of VR have been studied in clinical settings, few use cases are available to art therapy in treating ASD. The field of art therapy has only recently found the use of virtual reality (VR) can ameliorate various symptoms through sessions as a new tool [41,42]. In fact, given the use cases already noted, social VR has demonstrable psychological benefits for many populations, such as those with ASD, and is ideally suited for art therapy. Addressing the effects of the pandemic, Barreda-Ángeles and Hartmann [43] looked at the relationship between feelings of presence and activities of participants in a study using VR. Results of the study found that feelings associated with spatial presence were predictors of feelings of relatedness and enjoyment. The benefits of the technology, which include immersion and presence, are essential to providing a comfortable and safe social environment, well-suited for art therapy [44]. In the fields of art and psychotherapy, using creative expression through visual media may be leveraged to support treatment in a variety of mental health areas. As ASD prefers minimally stimulating environments [45], the environment provided by VR for art therapy (VRAT) is both ideal for the control offered over sensory stimuli and the readily accessible library of ever-growing art and design applications, such as Tilt Brush, MasterpieceVR, SculptVR, Blocks, Gravity Sketch, Mozilla A, King Spray, ANIMVR, and more. Whereas in-person creative activities include the same real-world social anxiety and distractions for those with ASD, using avatars in a VE removes those variables and allows for creative activity to be used as an intermediary to improve symptoms that include sensitivity to stimuli, auditory or photosensitivity, repetitive actions or words, inappropriate social interaction [46].

The benefits of VR are ideally suited to support those with ASD in one-on-one art therapy sessions in VEs. Existing VEs designed for collaborative multi-user functionality – Horizon Workroom, Horizon Worlds, MeetingVR, Rumii, Spatial, Engage, and more – come standard with adjustable lighting, sound, and interactable. The user has the ability to control how they interact with the environment and other avatars in the space, including muting others. Avatars can be customized to be a photo-realistic digital twin of the user, or any digital embodiment preferred, such as the dissociative inhabitation of an alien, monster, or cartoon character of choice. The untapped potential of avatars should be further investigated as the performative act of embodying another entity allows agency over how users wish to present themselves to the virtual world and others in it. In summary, VEs can not only offer a telemedicine alternative to video conferencing, the environments are able to become part of the therapeutic process itself and adjust in ways that no other clinical setting can. The ability to remove obstacles and limitations in experimental and clinical settings, VR also has the potential ability to control stimuli in a virtual environment for the benefit of neurodiverse individuals. Future investigations should consider investigations into the technology as a diagnostic tool and further use as a scenario simulator [47].

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