

The Use of Metaverse Approach in the Management of Autism

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ABSTRACT:

Although researchers know more about autism and its various social and behavioral symptoms, there are no interventions that can help in a dynamic and engaging way. The metaverse offers a chance to design platforms specifically for those with autism. This rapidly growing technology must take engagement, sensory experience, and ethical accountability into account. This paper studies how the metaverse helps in treating autism and the problems that arise in using it.

Because of spatial computing, it's important for engagement to design virtual environments for managing AR and VR headsets like motion breaks or providing sensory cocktails. The study also takes into account how brands engage within the virtual environments as well as the technology and overall business competition. The analysis looks at how tech and software including consoles, computers, and interactive platforms affect experience and comfort.

Also, the study examines architecture in cyberspace as it further impacts engagement. This is through the working of textures, realism, photogrammetry, symbols, etc. The paper also includes a discussion about metaverse growing into an industry-standard platform for social engagement and content consumption. As designs become more advanced, it is an important ethical consideration that designers use them responsibly and not mislead people, especially vulnerable ones. This paper notes this concern for instance for individuals with autism. The paper calls for the design of engaging, dynamic, and forward-thinking virtual environments that promote usage and enhance accessibility.

Taken together, the use of metaverse in the treatment off autism is considered as a good new approach to integrate autistic patients within the community to solve their social communication skills.

Keywords: Autism, Metaverse, Virtual Environments, Immersive Technology, User Engagement

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1. Introduction

Since the emergence of the computer-based Internet in the early 1990s, there has been an expansion into the capabilities of the information and communication technologies, leading to the possible arrival of the metaverse (1). The metaverse offers a new layer as it branches out from the existing World Wide Web and therefore creates a spectacular digital backdrop (2). This digital backdrop may advance creativity, amplify conversational engagement, and reinstate elements of real-world contact (3) (Figure 1).



Figure 1: The Expanding Metaverse: A Digital Evolution Beyond the Web

In the case of Autism Spectrum Disorder (ASD), this new digital backdrop offers an uncalculated potential for communication and learning (4). ASD is a complex lifelong neurodevelopmental disorder affecting one in 54 youths (5). Core aspects of ASD entail challenges with communication and interpersonal skills, restrictive and repetitive behaviors, agitation, and sensory hypersensitivity (3, 6) (Figure 2).



Figure 2: The Metaverse as a New Frontier for ASD Communication and Learning

In the present day, there are some evidence-based strategies to handle these bulky barriers (7). Behavioral therapies, speech-language therapy, therapy using visual supports, peer-based strategies, and pharmaceutical handling are some of the frequently adopted treatments (8).

Nevertheless, because of the wide-ranging nature of this ailment, handling mediators remain unique for every person with ASD (9). Controversial demands for constant funding towards the treatment and handling of ASD have given rise to some trials with avant-garde treatments, embracing prospective targeted medical treatments and technologies related to virtual reality (10). However, it is still under scrutiny if they are equally effective in managing ASD as the methods that already exist (11). To explore the intersection between the metaverse and Autism Spectrum Disorder is an urgent, pressing need (12). In the increasingly digitalized lifespan of modern societies, this question is relevant not solely to individuals with autism and to the grown-ups who engage with them, but to all around them themselves (13). Growing into such an ecosystem demands extensive cohabitation (14). The metaverse comprises diverse public and secluded formats and services, each of them comprising individual governmental idiosyncrasies that might emulate actual existing societal structures (15). Social networking in the metaverse might hence resemble social strategies

struggles in real-world circumstances and boost identical difficulties in people with autism (16-18).

2. Understanding Autism Spectrum Disorder

Autism Spectrum Disorder is a lifelong developmental condition that affects how people perceive the world and interact with others (19). The word “spectrum” is used because autistic people have such strong individual differences (20). There is no ‘one-size-fits-all’ when it comes to autistic people (21). Many autistic people have highly unique traits, abilities, and needs, but autistic people do share some common characteristics (22) (Figure 3). The difficulties that are often most frequently encountered for autistic individuals include social and communication, sensory sensitivities, and the higher percentage of other health or learning difficulties (23-25). A big part of autism research and media representation has been either curative or depicted the suffering or worries of caregivers paired with the rigid, fixed viewpoint of what autism itself is thought to look like (26, 27).



Figure 3: Autism Spectrum: A World of Unique Perspectives and Abilities

However, there are also numerous good representations and first person accounts of positive things that come with an autistic identity, and how the world is experienced by a very different lens than a non-autistic typical one (28). There is much about a regular person’s everyday life that can be very difficult for an autistic person that they themselves wouldn’t otherwise see (29). That’s why it’s pretty difficult to pick just a few

specific pieces of digital media that help to communicate aspects of autism, and the plethora of lived experiences, traits, and perspectives of what has been termed the “autistic spectrum.” Therapy or counseling approaches can be significantly more effective when they are personalized (30-34). Trouping to see a therapist who specializes in cognitive behavioral therapy for autistic adults is likely to be a lot more beneficial than seeing someone who does exclusively art therapy for young children (35, 36). What works for early intervention for language development in a three-year old will not necessarily be efficacious for teaching emotion regulation techniques to a 45-year old (37). Just as no two autistic people are exactly the same, the personalization of therapy should also consider the entirety of the person being treated (38, 39).

3. Metaverse Technology: Concepts and Applications

The Metaverse is an advanced interconnected virtual architecture that integrates immersive virtual environments and augmented reality services, and it is foreseen as the next evolutionary stage of the internet (40). The concept of the Metaverse was sketched for the first time in the dystopian SF novel “Snow Crash” in 1992 (41). The metaverse is a collective virtual shared space, created by the converging of virtually enhanced physical reality and physically persistent virtual worlds (42). This shared space will be accessed by a common software interface, is sequentially seen as the eventual evolution of the web, implying a new form of the internet that will support a myriad of experiences, businesses, and services, that are now spread in extended, divided online or offline spaces (43-45). Obvious metaverse features include virtual worlds interaction, 3D modeling, virtual exhibitions and vast e-learning open-air campuses (46). More recently, interest in the Metaverse was revived by the surge of non-fungible token (NFT) industry, as large capitals are invested in blockchain-based NFT arts, collecting, gaming, and virtual worlds, and big corporations join the ‘metaverse arms race’ to obtain rights over distinct virtual universes (47). In general, the preference is given to the virtual

environments coupled with enhanced sense of presence, specialty in terms of person-avatar embodiment, and real-time modes to interaction, making them shared spaces of perception, thinking, and experience (48, 49).

Virtual and Augmented Reality have been used for various purposes as point-of-care, treatment or monitoring medical conditions, delivering remote and expert consultation, executing surgeries, practicing surgery procedures, managing stress, anxiety, and healthy habits, training on diagnostic procedures or therapeutic performances (50). The Metaverse could offer improvements in the care of patients affected by neurodevelopmental disorders, guaranteeing safe, easy and stable therapeutic environment, facilitating supervision and follow-up of experimental groups, and streamlining teachers, practitioners, and researchers to operate jointly (51-53). On the detection end, metaphysical technologies guide to constructive experience of virtual and expanded actuality, reducing the Burlington criterion-related costs for expansion hardware and services (54) (Figure 4).



Figure 4: The Medical Metaverse: Transforming Healthcare with VR and AR

Applied technologies in roaming and virtual realities are video conferencing and the internet enhanced with data stratum and interactivity (55). Major social media reciprocation expanded reality know-how is concentrated in visual and auricular effects, with vivid imposes and obtained results, though only in 2D (56-60).

4. The Potential Benefits of Metaverse in Autism Management

Autism is a multifaceted developmental disorder with a range of social and cognitive symptoms often involving challenges navigating “normal” social settings (61). While immersive environment tools have been used to foster various learning paradigms, persons with autism can particularly benefit from the metaverse (62). Gamified activities designed to help individuals on the autism spectrum better connect include animated social characters that are carried out in a socially inclusive, real-time multi-user virtual environment (63-65). The VIBE research project investigates how joining interactive playsonas in a social virtual environment affects persons on the autism spectrum specifically with regard to making social connections (66-69) (Figure 5).



Figure 5: The Autism-Friendly Metaverse: Enhancing Social Connections through Gamified Virtual Environments

The metaverse environment could provide a myriad of tools for educating these students with such needs (63). Such tools include the virtual embodiment of social agents who can instruct about different life skills, interaction in a story, or who can role-play important social encounters (57). The use of gamification combined with a “sandbox” virtual environment is envisioned to be particularly useful for students with autism (62). The environment is envisioned to be a safe space where students can interact and practice

various social skills without the pressure of interaction with a real-world peer (70). The virtual characters can act as both mediator to interact with the user and as intelligent conversational agents which can read the script of a social scene, increasing the level of profile knowledge (71). Resultantly, this meta-script is encoded in a set of narrative units related to the situation and its protagonists (66). The story is also tagged according to the agents' state of mind, intentions, emotional status, etc., allowing the characterization of a series of actants (72). The analysis of the metaverse story script paves a novel and interesting approach to the study of social interaction in the metaverse (73). It allows measuring the reciprocity of the interaction by evaluating, from the profile of the story characters, the number of output communicative events originated as a response to the interaction partner (74).

5. Case Studies and Examples

One-on-one behavior analysis and therapy, originally developed by Ivar Lovaas in the late sixties, is still considered as "state of the art" to help individuals with autism to acquire various skills: language and communication, adaptive living skills, fine and gross motor skills, academic skills, social behaviors (75-81). Although state of the art, traditional therapy has inherited potential causes that practitioners, teachers, parents and even therapists should be aware of: an important role of this therapy is played by therapists' ability to generalize the analysis and to foster the building of a generalization repertoire on the patient (82). For many therapies, it is hard to cope with issues related to time (involving restricted number of trials), number of therapists (very short time of interaction means lack of stimuli), high level of individuals performing the same activities in the very same place (83). In current years, review articles have shown a growing interest in eXtended Reality (XR) technologies in the domain of autism, including Virtual Reality (VR) and Augmented Reality (AR) (84). However, the bar is still too high for XR technologies: the need for the therapist, pilot, and mediator role implies highly specialized operators, effectively

reducing the potential of carry over in real-world settings (85).

Many examples from the literature have demonstrated that VR and AR environments can be an effective way to help patients' building up their skills in several disciplines: public speaking, conversation skills, job interview training, solving problem skills, treating phobias and anxieties, teaching abstract concepts across different domains and kind of skills, incident training and spatial cognition, auditory stimuli mapping, motor skills, task performances (86-90). In the domain of autism, few examples have been presented in respect to social skills, emotion recognition, daily living skills, imitation skills, skills to develop a job, new conversion skills, encoding and retrieval of temporal order, recognize visual and auditory matching stimuli, teach attention skills (91-93). Heterogeneity among these examples is worth stressing for the different context of use of XR technology, floating from highly sophisticated settings to everyday therapy centers, to schools, families and, eventually, independent use by the patients themselves (94).

6. Challenges and Limitations

Progressing from student investigator to expertly trained professional in any field requires the development of many sophisticated technical abilities, as highlighted in readings outlining both the teacher as craftsperson and the teacher as minister of the moral imperatives of the seller (95-97). In crafting lessons, the teacher must have a wide enough 'mobile [technical] repertoire' to make pedagogically significant choices from among the 'varied methods and styles' at his or her disposal from the beginnings of human civilization, or 'packages of already-created activities and resources' like workbooks or software that were designed with particular pedagogical ends in mind (98-100). As minister, the teacher must consider the systemic moral implications of the 'capitalist solicitation' of educators to inculcate competitive consumer values, as well as the broader social and personal responsibility of educators to either challenge or

adapt to the values and systems inherent in a 'national culture' through the imposition of educational standards (101). The literature suggests that, while still in the early stages of adopting technology in general and metaverse technology in specific, the discipline of education is beginning to address two of the 'broad classifications' of barriers to the implementation of any kind of technology (102, 103).

7. Future Directions and Research Opportunities

Technology has historically been the domain of the pursuit of advances in the fields of science and engineering (104). Despite significant advancements within those fields, the majority of today's modern-day technologies function as consumer devices and have saturated into virtually every corner of the industrialized world. Within this context, immersive technologies like virtual reality, augmented reality, and mixed reality, collectively known as XR, have seen a renaissance within both academia and technology startups (106). With the release of the first major consumer headsets just a few years ago, exploration of applications beyond gaming for the metaverse, a collective and adaptive XR environment, have begun to emerge (107). Nevertheless, there are significant gaps in understanding how these technologies can be best harnessed to promote mental health, particularly in young populations (107). Proposals for high-impact research and uses are brought together application for a collective and adaptive mental health metaverse, shared disciplines in psychology, education, and technology, and a possible interdisciplinary project (105). Globally, there has been an increase in the prevalence of autism spectrum disorder (104). Estimates suggest that around 1 in 33 children globally have autism (104). Despite this, research efforts, including into digital therapies, have stalled. Meanwhile, there have been significant advances in technology, with artificial and virtual intelligence starting to be applied to educational problems elsewhere (105). The metaverse could allow vast educational and mental health resources to be gamified and brought together in

a single accessible location to create a low-cost treatment option (106). However, there are a range of ethical, practical, and technical challenges associated with this undertaking. Incorporating an intersection approach to the study of the metaverse in autism is anticipated to develop a more holistic understanding of how educational and health outcomes are affected, and thereby help to create a safe, ethical, and effective digital environment (107). With the rapid progress of technological development, especially after the emergence of wireless technology, the metaverse is becoming increasingly feasible and influential (107). So, this is an emergent research direction with great potential.

7. Conclusion

Implications of metaverse technologies in education and job-based interventions have been discussed for their potential in the management of autism, highlighting boundaries, potential benefits and challenges, and real-world applications of metaverse technologies as therapeutic tools (61). What is more, the importance of personalization in intervention development has been stressed throughout—here's hoping that technological innovations will pave the way for more favorable and individual outcomes in each case. However, challenges going beyond technological concerns concerned with the ethical, participatory, and economic implications of the integration of these technologies may be complex, and so, hasty attempts to do so are discouraged from moving forward (108). Instead, emphasizing the need for careful, evidence-based implementations and explorations in this evolving field is hoped to foster discussions among practitioners, researchers, beneficiaries, and all other stakeholders alike (57). Being of the disputed opinion that there is no going back to a 'primitive' life as it was known it, the hope for homes, schools, workplaces, and societies that are research-backed, supportive, inclusive, and respectful of neurodiversity through the collective harnessing of emerging technologies is currently being shared (which opinions, most likely, are also shared, to different extents (70).

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