



Play Therapy

Minecraft™: Just a Game or a Conduit to Enhance Social-Emotional Learning?

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Abstract

Minecraft™ is a popular game that immerses the player in a virtual world in which they can be creative and interact with others. Results of a 2017 survey of public educators utilizing Minecraft™ in the classroom, indicated that 90% of the teachers felt the game enhanced student problem-solving, creativity, critical thinking, and collaborative skills. One continued area of need in the practice of game-based interventions in context of clinical programming, is monitoring the effects of virtual reality and games on social-emotional and behavioral needs of participants. In January 2020, Minecraft™ launched a new Social-Emotional Learning (SEL) content packet to address this gap in services and research. The use of games and virtual reality (VR) in clinical practice are gaining popularity and are being used more readily to enhance

outcomes for identified clients. This article will discuss the design and development process of using the Minecraft™ SEL content packet in practice as a basis for group social skills training in latency age children with high functioning Autism. A review of current and best practices in virtual reality and game-based programming will be included.

Keywords: social skills, virtual reality, game-based interventions, groups, autism, and social-emotional learning

Introduction VR and Game Based Activities

The use of technology in the applied setting is not new to the field of medicine and social-behavioral sciences; however, the integration of technology into practice is growing rapidly and providing practitioners and clinicians much to think about as it relates to direct practice work. To date there is limited research addressing technology in social work practice, and the direct effects that the technology has on client outcomes. Therefore, further research is needed to fully understand the impact of technology as a tool in social work practice (Hill & Ferguson, 2010). As technology use increases in the population at large, the same technologies are gaining momentum within the field of behavioral sciences as a means of assessment, support, and intervention. Informatics in social work practice is an emerging field, and some technology-based supports are better than others (Ellison, et al., 2016). As practitioners we must take an active role in rigorously evaluating the technology for appropriate use within our practice and in developing these versatile technologies for use in practice. Historically, technology-based programs and supports are developed by computer science specialists who may have little understanding of human behavior and the behavioral and mental health needs of the consumers who are using these supporting technologies. The use of science convergence in technology development is an attempt to address this issue. Science convergence and convergence research is a means of solving complex problems, including social and emotional needs of individual consumers, while also focusing on the larger societal needs (NSF, 2020), particularly for the purposes of this article as it comes to the integration of social and behavioral sciences and technological applications (Aquirre et al, 2017). This type of collaboration and research will create changes that extend beyond the field and into the future of a technology-rich social service delivery system (Elswick, 2017). As these technological advances impact every aspect of modern life, social work and behavioral science practitioners will have to become more able to utilize and integrate them in their practices. Telehealth and other technologies were rapidly adopted due to the COVID-19 pandemic, but they were already on the cusp of broad adoption (Hirschi et al., 2022). Therapeutic interventions have benefited from the implementation of online counseling, self-help web-based interventions, social networks, telehealth/cyber therapy, and more recently the use of virtual reality and game-based interventions. For purposes of this article, Virtual Reality (VR) is defined as, “a computer-generated digital environment that can be experienced and interacted with as if that environment were real” (Jerald, 2015, p. 9). It is important to make clear that while there are many possible virtual reality games/ game-based treatments, the focus of this article is Minecraft™, a game that takes place in a virtual world, which is a subset of virtual reality.

Virtual reality and immersive gaming have been used successfully in a variety of interventions including pain reduction (Hoffman et al., 2000; Naylor et al., 2008), depression and anxiety

(Zeng et al, 2018), social connection and skill training (Botella et al., 2004), specific phobias (Gerardi et al., 2010), and post-traumatic stress disorder (PTSD) (Gerardi et al, 2010; McLean et al, 2010). Virtual reality immersive gaming has become a potential option for treatment intervention for clients both inside and outside of the behavioral health clinic space, merging other supportive computer science practices is imperative. For example, merging VR with the processes of Ecological Momentary Interventions (EMIs) and Ecological Momentary Assessments (EMAs) will assist the clinician in developing an effective and evidence-based intervention for use in practice. EMIs were defined as momentary health treatments provided via hand-held mobile technologies that deliver psychological interventions while people are engaged in their typical routines in their everyday life (Heron & Smyth, 2010). Further, Ecological Momentary Interventions (EMIs) are defined as treatments which are provided to patients between sessions during their everyday lives (i.e., in real time) and in natural settings (Shiffman, Stone, and Hufford, 2008). Clinicians have tried to extend some aspects of psychotherapy into patients' everyday lives to support their needs between the clinical sessions provided. In addition to continuity of service delivery beyond the clinical "four walls," clinicians have struggled with collecting ongoing data. Ecological Momentary Assessment (EMA) may be the answer to that issue. EMAs involve repeated sampling of subjects' current behaviors and experiences in real time, in subjects' natural environments. Ecological momentary assessment (EMA) aims to minimize recall bias, maximize ecological validity, and allow study of microprocesses that influence behavior in real-world contexts, with clear applications in behavioral health interventions. This article will focus on virtual reality and game-based interventions, specifically for use with high functioning autism as an adjunct to social skills interventions.

The article will show how the merging of VR and games and use of EMAs and EMIs can potentially enhance client outcomes. The suggested VR intervention will utilize grounding theories from multiple disciplines in conjunction with a well-known children's game. Explicitly, the authors hope to assist the reader in understanding the theoretical foundations, the importance of technology as an adjunct to therapy, the affordability of such an enterprise for a clinical practitioner, how to track progress of the client within the VR framework, and the development process for this type of technology. Specifically, Minecraft™ is useful because it provides milieu in which the children can practice and observe behaviors in interactions with others and with the environment (Ellison, 2016; Junco, 2014). The authors provide insight into the utilization of virtual-reality environments, specifically Minecraft™ in practice as a clinician in order to support social and emotional learning among youth experiencing deficits in this area.

Minecraft: Its Use in Practice with Autism

One of the defining characteristics of autism, as listed as *Category A* in the Diagnostic and Statistical Manual of Mental Disorders is lack of social skills (DSM-V; APA, 2013). The DSM-5 describes Category A (autistic social communication and social interaction) as "Persistent deficits in social communication and social interaction across multiple contexts, as manifested by the following, currently or by history" (DSM-V; APA, 2013). Examples in this category include but are not limited to deficits in social-emotional reciprocity, deficits in nonverbal communicative behaviors used for social interaction, and deficits in developing, maintaining, and understanding relationships.

Social skills are a combination of cognitive, behavior, and affective components that are necessary to occur together in order for social functioning to occur. Additionally, social skills can be defined as pivotal skills that when successfully acquired, can elicit positive clinical gains in other domains of functioning especially when developed in the natural environment (Koegel & Koegel, 2012). In order for social skills to be identified as effectively learned, they must be seen in multiple settings, with many different people, during different conditions, and with a high level of fluency. It is important that these skills are not just seen within the setting in which they were taught, such as the clinic setting, but in other areas of the client's life. In fact, many studies over the years have been conducted on the need to increase social skills in this population but to date the research remains limited in studies that measure the generalization of social skills outside of the group setting/classroom. Research focusing on generalization of social skills is a critical area, but current research is currently lacking (de Marchena, Eigsti, & Yerys, 2015; Watkins et al., 2015). This gap in the literature is surprising considering the notion of and importance of the generalization of skills and the focus on social skills as a core dimension of services delivered to individuals with Autism dating back to Stokes and Bear (1977). Generalization also ensures that outcomes of interventions should be applied and should be actively pursued or taught to the client (Stokes and Bear, 1977). While some existing social skills curriculum and clinicians do embed generalization plans into their programming, many of these attempts fall short of testing for generalization in the community and in real life opportunities that can elicit appropriate behaviors. Thus, skill generalization of newly learned social skills into the clients' lived environment is extremely difficult yet critical to the client's social success in the areas of friendships, later employment, and navigating future relationships. Because of the current lack of interventions supporting generalization and the increased need, there is an opportunity to develop a tool that can support skill generalization as it relates to social skills. Therefore, setting the stage for the expansion of the use of VR to a relatively new population (Autism) and a new skill domain (social skills) goes beyond traditional clinical approaches. This article and future research endeavors will expand to a new population and skill set and explore VR as a social skill learning tool. The development of the Minecraft™ social skills intervention is rooted in proven theories such as social learning theory (Bandura, 1971), activity theory in human computer interaction (Draper, 1993), and pivotal response training (Koegel & Koegel, 2012) as it ties universal design to human-computer interactions and ecological momentary assessments and interventions to promote generalization and maintenance of social skills in individuals with autism to set the stage for a myriad of future opportunities across many domains.

Grounding Theory for Developing Game based VR Interventions for Practice

When developing specific technology, such as virtual reality programming for a specific population, we must consider what theories are necessary to ground this work. Because this form of intervention includes social science and computer science, it is important to include grounding theories from both disciplines to ensure effective science convergence occurs. For the purposes of the technology development, both disciplines identified the more evident theories that would properly guide this new VR intervention tool. The following paragraphs will give a brief overview of each proposed theory so others seeking to do this work can develop understanding of discipline specific theory. The theories used in this work were Behavioral Learning Theory- in the form of pivotal response interventions, Social Learning Theory (SLT), and Activity Theory

in Human-Computer Interaction. The convergence of these fields and practices will ensure that effective outcomes within social behavioral sciences are produced.

Behavioral Learning Theory- Pivotal Response Interventions

Behavioral Learning Theory sets the groundwork for the virtual reality intervention developed by the researchers. When using behavioral learning, Pivotal Response Training is often used to assist and aid in the participant obtaining new skills in the “real world” environment. Hollet and Ehret (2015) have found that using Minecraft™ can recreate complex emotional situations found in the real world. Pivotal Response Training (PRT) is an intervention that is used in the client’s natural environment to teach needed skills. This intervention model is developed from the principles of applied behavior analysis. Instead of teaching a client one skill at a time in the clinic environment, the clinician uses pivotal activities and areas of a child’s development in the natural environment to teach skills. Pivotal Response Training and interventions use techniques such as motivation (Koegel & Koegel, 1990), cue prompting and responses (Schriebman et al, 1982), self-monitoring, and social interactions as a way to teach new skills necessary for social functioning. By targeting these specific foci, the intervention becomes more supportive of the client’s everyday life, and skill generalization across environments occurs more readily. Often found in PRT is the notion that each individual participant should be motivated by the intervention, and that the intervention should include the following whenever possible: choice, task variation, interspersing maintenance tasks, rewarding attempts, and the use of direct and natural reinforcers (Dunlap & Koegel, 1980). The client plays an important role in the activities they participate in during the intervention, the reinforcement obtained for their activity, and their attempts are reinforced naturally within the intervention itself. Research shows that PRT can be used to teach skills, decrease disruptive or unwanted behaviors, and increase social, communication, and academic skills (Koegel & Koegel, 1990). Research also shows the positive impact that play environments have on teaching pivotal social skills. Play environments are often used to teach social skills, such as turn-taking, communication, and language. For purposes of this work and technology development, the only difference is the “play environment” is a virtual environment where all the same social interaction and opportunities exist. PRT is widely considered a child-directed intervention, in that the child makes choices during the play that are then directed in the group therapy environment. Minecraft™ places the child into a setting in which that the child can interact with the environment and other players, practicing actions (Junco, 2014).

Social Learning Theory

Adult caregivers play an important role as primary intervention agents who also monitor progress towards goals. The Minecraft™ virtual reality intervention relies heavily on behavioral theory and pivotal response training for guiding outcomes, but because social interaction is so vital to the identified virtual reality intervention, Social Learning Theory is also utilized as a core theory in the development of this virtual reality intervention.

Social Learning Theory is often seen in interventions that focus on behavioral outcomes and shifts in human behavior. Social Learning Theory (SLT) notes that learning is part of the human cognitive processes and occurs within social context of being around others. The theory indicates

that learning is influenced by three specific elements which are environment, behavior, and cognition (Bandura, 1971).

Within the context of SLT, the process by which an individual learns includes activities where the individual must role model exhibiting behavior, the individual must be capable of understanding and have internal cognition of the task being asked, and the individual must ultimately perform the activity. Throughout this learning process the individual's behavior is reinforced by positive or negative consequences provided by the environment.

Most frequently, social learning theory activities occur in the context of social skills group interventions for children and adolescents. This form of intervention is very popular in supporting the needs of children who are on the autism spectrum. The purpose of social skills groups is to practice learned social behaviors in a facilitated environment. The social skills group intervention incorporates imitation, observing, and modeling into the group activities which are parts of SLT. One of the core components of social skills group interventions is that participants engage in cooperative activities during the group which facilitates the growth of newly learned social behaviors by all members (Kasari, 2016). The research will explore how social skills groups hosted in clinics are extending into the client's community through the online environment of Minecraft™, and thus, broadening the opportunity for social learning to occur in between live face-to-face group interventions. Offering participants, the opportunity to practice and enhance their newly learned skills through virtual interactions guided by a clinician.

Activity Theory in Human- Computer Interaction (HCI)

It is important to consider the human focused theories of practice, and to evaluate and incorporate theories that look at the interactions between humans and the specific technology. Activity Theory in Human-Computer Interaction (HCI) is a general theoretical framework for the analysis of human and communal action within the world. Activity is defined as an interaction between the participant and the world. Participants have needs that are met through interactions with the world and there is a reciprocal effect that occurs between the person and the environment. Activity theory focuses on the notion that humans utilize activities to complete pre-determined goals, and that the activity is necessary for them to gain access to goal achievement (Moran, 2006). However, over time the theory developed into identifying tasks that lead to a goal and engaging the participant in activities that provide so much more than goal attainment. Understanding and designing technology in the context of purposeful, meaningful activities is now a central concern of HCI research and practice. Because humans are complex creatures, the process of activity theory understands that individuals have goals, motives, and actions, but they are different for each person, and the technology being used should be able to adapt to the individual participant in order to ensure successful outcomes (Kaptelinin & Nardi, 2006). By monitoring how individual participants in the Minecraft™ intervention and world interact with each other and individually, and by ensuring the participant has some autonomous choice but guided by social interaction and natural reinforcers within the game, the activity theory in human interaction is evident.

The Theoretical Framework: Using Minecraft™

The combination of these theories was integral to determining the processes and steps to be used in the development of the Minecraft™ social emotional intervention. If this work were to only focus on the behavioral theory frames, the important interaction between human and computers would be left by the wayside. It is important that practitioners start to utilize interventions that focus on science convergence and the interdisciplinary collaborations to enhance activities and interventions for client use.

Process and Procedures Setting up Minecraft SEL Intervention

After the grounding theories for developing the tool were identified, the authors then spent time reviewing what specific games already exist that may be easily adapted to a VR platform and develop a social emotional intervention for use in practice. Minecraft™ was noted as a strong option for this work. Minecraft™ is a popular game that immerses the player in a virtual world in which they can be creative and interact with others. There are versions of the Minecraft™ game that can run on multiple platforms: personal computers, major game consoles, and many handheld devices. Depending on the platform and personal preference, play can be either solo or multiplayer. In multiplayer, the gamer is either playing local multiplayer (i.e. two people playing on the same game console) or playing online. The base software is extensible, allowing modding (incorporating software add-ons (“mods”) that alter the game environment) for the player. Since the launch of this game in 2009, there have been reportedly more than 50 million copies sold worldwide (Ovide & Rusli, 2014). With its intense growth and use across the nation and worldwide, it started to gain much interest among the educational researchers. For this Minecraft™ social emotional intervention, the platform is on a single server manned by the therapist and only used for assigned clients of the social skills intervention.

Minecraft™ has gained popularity by teachers as a potential platform to enhance student engagement and motivation (Fan et al, 2022; Getting Smart, 2017; Hollett & Ehret, 2015; Junco, 2014). Results of a 2017 survey conducted by Microsoft Education and *Getting Smart Staff* of public educators utilizing Minecraft™ in the classroom, indicated that 90% of the teachers felt the game enhanced student problem-solving, creativity, critical thinking, and collaborative skills (Ellison et al., 2016; Getting Smart, 2017; Junco, 2014; Kersánszki et al., 2023; Other surveys conducted by Microsoft Education and Economist Intelligence Unit (EIU) in 2019, where more than 760 educators in 15 countries participated, indicated that 58 percent of educators mentioned immersive experiences that allow students to explore scenarios from the perspective of others, which showed strong promise for promoting social-emotional skills, particularly empathy were very valuable and needed. From the same survey 46 percent of educators surveyed favored tools that help collect and analyze data about students’ emotional states.

Beyond the context of education, Microsoft Education decided to look at the need for current learners in the broader view as it relates to future employment and needed skills. In 2018, Microsoft Education brought together 70 thought leaders around the world, reviewed 150 pieces of existing research, and surveyed 2,000 teachers and 2,000 students across Canada, Singapore, the United Kingdom, and the United States to determine these needs. Results of this work identified 2 core themes as important skills to teach: social emotional skills and personalized

learning. The results noted that employers are placing a premium on social skills and emotional literacy with up to 40% of future jobs requiring explicit social emotional skills. With these recent surveys and research reviews, it is evident that one continued area of need in the practice of game-based interventions in context of clinical programming, is monitoring the effects of games on social-emotional and behavioral needs of participants. Teachers who frequently used Minecraft™ in the classroom were also looking for options to enhance the social-emotional learning of students. Minecraft has increasingly been used in education (Pusey & Pusey, 2015), and it is versatile enough to teach a variety of topics including renewable energy (Kersánszki et al., 2023), creativity (Fan et al., 2022), elementary education (Marín-Díaz et al., 2019), and math and science (Lane & Yi, 2017) or other common core standards (Magee, 2015). Minecraft is also useful in cooperative learning as it promotes collaboration in an environment that mimics the real world (Fan, et al., 2022).

In addition to the interest that educators have for the use of Minecraft™ as a tool for skill development, some researchers were also interested in the use of the game for specific populations such as children with Autism. In 2017, Zolyomi and Schmalz studied the effects of Minecraft™ on social skill development in the home and therapeutic environments for neurodiverse youth. The focus of this research was on the perceptions of therapists and parents on the use of Minecraft™ as a tool for teaching social skills to children with neurodiverse needs. Results of their study suggest that the intervention enriches the experiences and practices of social among neurodiverse children (Zolyomi & Schmalz, 2017) and this has applications in the real world.

The authors decided to focus on the existing three Minecraft™ SEL content packs within the VR space as a potential intervention for group social skills training in latency age children with high functioning Autism. These pre-developed social emotional Minecraft™ lesson plans and content packs were used to develop a virtual space that would allow and support this work within a secure server. This assisted the therapist and researcher to ensure only assigned students in the social skills group intervention were able to join the VR space during the slotted intervention time. Each of these lesson plans were also used to identify potential data collection parameters in order to monitor progress towards an increase in social emotional literacy and learning. Additional assessment processes and data collection practices for this intervention will be discussed later in this manuscript.

It is important to remember that in the field of behavioral sciences, technology is not the only piece to the therapeutic intervention. Technology is to be used as an adjunct to therapeutic services and not as a replacement. It has been noted that technology-based interventions can serve to be “clinician extenders” that support the client’s needs between therapy sessions and enhance the opportunity for the skills learned in the clinic environment to be used beyond the four walls of the clinician’s office (Bickel, Marsch, & Budney, 2013). Technology can assist in supporting prevention and promotion programming for clients, but it is not intended to be a stand-alone support for individuals seeking social-emotional and behavioral health (Webb, Joseph, Yardley, & Michie, 2010). It is important to note that this intervention, in order to be successful in teaching needed social-emotional skills, must include both the live interaction of a therapist and the use of the virtual reality world with opportunities for peer interaction.

Minecraft™ Social- Emotional Learning (SEL) Content Packets

To address the need in supports for socio-emotional development supports for autistic children and youth, in January 2020, Minecraft™ launched three Social- Emotional Learning (SEL) content packets to address this gap in services and research. These three SEL content packs currently available for free by Minecraft™ for use in community and educational practice, each of the SEL packs come with an overview and guided lesson plan for the group facilitator or teacher. The three SEL packs are entitled as follows: The Mindful Knight, Digital Citizenship, and Inspiration Island. The following paragraphs will briefly describe each of SEL packs and their purpose in developing social-emotional skills in children ages 8-15.

The Mindful Knight

The Mindful Knight, developed by Rebecca O'Connor, is an interactive world that introduces mindfulness, social awareness, and self-regulation through a series of exciting quests through a medieval world. This activity was produced by an interdisciplinary team of game designers, Microsoft Hackathon participants, and educators. The Mindful Knight introduces four mindfulness practices focused around self-awareness and management of emotions. A link to the lesson plan: <https://education.minecraft.net/lessons/the-mindful-knight>

Figure 1.



Figure 1. Mindful Knight Sample Screenshot

Digital Citizenship

The lesson called “Digital Citizenship” teaches participants how to become a responsible internet user. As they explore a Minecraft world, students will encounter areas that address issues like “griefing” (the purposeful interference with other people’s play in multiplayer games), trolling, plagiarism, and respectful online conduct. The accompanying lesson plan includes a discussion guide and sample social contracts for your classroom:

<https://education.minecraft.net/lessons/digital-citizenship-2>

Figure 2.



Figure 2. Digital Citizenship Sample Screenshot

Inspiration Island

Inspiration Island, developed by Minecraft Education, is a floating theme park designed to introduce students and educators to Creative Mode in Minecraft: Education Edition. The lesson plan covers self-awareness, communication, and self-expression. This world was created by the Minecraft game design team and is available on all versions of Minecraft. The accompanying lesson plan supports the clinician in implementing in practice:

<https://education.minecraft.net/lessons/inspiring-self-awareness>

Figure 3.



Figure 3. Inspiration Island Sample Screenshot

Intervention and Research Protocol

The developers of the virtual Minecraft™ social emotional intervention decided to create a 14-week virtual social skills group intervention using the three identified SEL content packs. The intervention was administered by a licensed clinical social worker with extensive knowledge and training in working with neurodiverse populations. Participants included four children who were diagnosed with autism spectrum disorder (ASD) (Level 1), who ranged in age from 9-11. All

four participants were male, and for this pilot intervention the developers decided to not conduct a pilot with a mixed-sex sample. All four participants had participated in some type of therapeutic intervention in the past and were already habilitated to therapy interventions focusing on behavioral needs. The racial demographic makeup of these participants was as follows: one Asian American, two Caucasian, and one African American male.

The intervention is a 1-hour weekly group intervention that utilizes approximately 15 minutes for assessment purposes, and 45 minutes to conduct the intervention. The SEL content packs are implemented per the instructions provided by Microsoft. Before each intervention week started, the group members complete a review of the scripted lesson plan, led by the trained therapist, for each of the SEL content packs. After direct instruction is provided on the content pack, each group participant is assessed to determine their comprehension of the content. Each of the three lessons or packets includes specific concepts that must be understood before engaging with the Minecraft™ activity. These concepts include social awareness, self-regulation, mindfulness, grieving, trolling, plagiarism, and respectful conduct, among others. The participants must meet a set 80% criterion for accuracy in understanding prerequisite concepts as described above before being placed in the virtual platform with peers.

The therapist provided support to the participants in each session by guiding the activities in the virtual worlds, supporting, and reinforcing positive approximations to the terminal behaviors, and gathering data on each participant based on their individualized needs and treatment goals and objectives. The trained therapist observed the participants during the session and gathered the individualized data using identified data sheets through and an event recording/rate data collection process. Data were gathered for each session and analyzed using a visual analysis of data across sessions. The results of the intervention and outcomes will be shared in a future article.

The first week of the 14-week intervention starts with a parent orientation and student and parent screening session. The baseline screenings include the SSIS-RS from both parent and child self-report. The SSIS-RS is completed at the beginning of the intervention, and during the final week of the intervention to track progress.

The next week of the 14-week intervention is the introduction to The Mindful Knight content for 4-weeks of the intervention. This was the initial curriculum chosen for implementation because it focused on skills of self-regulation and social awareness. This first week of the intervention the individualized observation data collection for participants began. This observational data was gathered throughout the intervention across all 14 weeks. The next 4-weeks focused on the Digital Citizenship curriculum and the participants learned about appropriate social conduct within the virtual world. Observations and data collection continued. The final 4-weeks of the 14-week intervention utilized the Inspiration Island curriculum to develop the participants skills in cooperation, critical thinking, and social interaction. At the end of this full intervention phase, the participants and caregivers complete a social validity rating scale. The participants complete the Child Intervention Rating Profile (CIRP) and the parents complete the Intervention Rating Profile (IRP). These assessments are used to determine what parts of the intervention were perceived as positive, and to support the researchers in enhancing and modifying the intervention in the future for enhanced success. The final week of the 14-week intervention is used to review

progress, discuss growth and continued needs, to review maintenance programming for each member, gather final social validity data from the participants, and provide a closure ceremony.

The Instruments

The instruments chosen were selected because they have been found to be valid and reliable, are widely used by therapists, and have been found to be useful through extensive experience of the principal investigator.

The Social Skills Improvement Systems Rating Scale (SSIS-RS)

The Social Skills Improvement Systems Rating Scale (SSIS-RS) was developed by Gresham and Elliot in 1990. The scale is designed to be used as a multi-rater instrument (students, teachers, and parents) and it assesses social skills among children 3-18. There are 46 items subdivided into seven subscales: the 7-item prosocial subscale; the 30-item problem behavior subscale, and the 7-item academic competence subscale. The scale was normed based on a representative sample according to the U.S. Bureau of the Census. The SSIS-RS has high reliability (median Cronbach's alpha = 0.96 (teacher), 0.96 (parent), and 0.94 (student) and high test-retest reliability within a three-month period for all subscales (median correlation = 0.83 (teacher), 0.86 (parent), and 0.79 (student). Additionally, interrater reliability was calculated for parents (median reliability coefficient, 0.55) and teachers (median reliability coefficient, 0.62). The validity and reliability of this scale has been assessed by other researchers and has been used to assess other scales (Merrell et al., 2001; Reynolds & Kamphaus, 2004; Walker, 1995).

The Children's Intervention Rating Profile (CIRP)

The Children's Intervention Rating Profile (CIRP) (Turco & Elliot; 1986a) was adapted from an earlier version, the Child Intervention Rating Profile (CIRP) (Witt & Martens; 1983). The CIRP is a 7-item instrument on a 5-point Likert scale (Strongly Disagree, 1, to Strongly Agree, 5). Three of the items are reversed. Maximum score is 35. A higher score indicates higher positive perception and acceptability of intervention. The Children's Intervention Rating Profile (CIRP) has been found to have good validity and reliability (Turco & Elliot; 1986a; 1986b).

The Intervention Rating Profile (IRP)

The Intervention Rating Profile (IRP) (Witt & Martens, 1983; Martens et al., 1985) is an instrument designed to assess the caregiver's perception of the intervention as useful/not useful in developing social skills among the participant children. The IRP utilized is a modified 11-item instrument on a 5-point Likert scale (Strongly Disagree, 1, to Strongly Agree, 5). The maximum possible score is 55 with a higher score indicating higher positive perception of the proposed intervention. Tarnowski & Simonian (1992) assessed the 20-item instrument and found it to have high internal consistency (0.89).

Notes on Data Collection

This intervention provides the clinician with both direct and indirect data collection practices. Indirect data collection involves sourcing and accessing existing data that were not originally collected by the researcher or practitioner directly through observations. Indirect data can include assessments, questionnaires, and surveys that are completed by the direct research participant or third-party supporters. Indirect data is a form of subjective data and is typically gathered through participant self-reported data. There are two forms of indirect data that will be gathered in this intervention. The first is a social skills survey that is completed by both the client and the caregiver. The social skills assessment is a standardized assessment of social skills that is gathered at baseline and post intervention. Specifically, the Social Skills Improvement System (SSIS-RS; Elliott & Gresham, 2013) is used as the external pre-post method of growth analysis of this Minecraft™ virtual reality intervention. The Social Skills Improvement System (SSIS-RS) Rating Scales enables targeted assessment of individuals and small groups to help evaluate social skills, problem behaviors, and academic competence. It takes about 10-25 minutes to complete the assessment. The scoring uses a standard score and percentile ranking system, and evaluate across behavior levels on a below average, average, above average rating scale. The assessment is appropriate for age range of 3 years to 18 years of age, and there is a parent and student rating option. The reading level of the student is a 2nd grade level, and parents is a 5th grade level for the SSIS-RS. The SSIS-RS parent and child is administered prior to beginning the Minecraft™ virtual reality social skills intervention and can be obtained during a parent and participant meet and greet to obtain consent for the intervention. The pre and post assessment across participants and parents will allow us to review the positive impact and affect that the Minecraft™ virtual reality social skills intervention had on student social skills. This pre and post assessment will also provide an understanding of skills learned during the Minecraft™ Social Emotional Group intervention based on baseline scores obtained through the SSIS- RS.

The second indirect assessment that can be used for this work, is a social validity measure that aims at gathering participant and caregivers' perceptions of the Minecraft™ virtual reality intervention. The Intervention Rating Profile (IRP) will be used to gather parent perceptions, and the Child Intervention Rating Profile (CIRP) will be used to gather the client perceptions. The IRP and CIRP are administered during the final week of the intervention during the closure ceremony. Social validity measures may help us to identify common features of procedures that are likely to be adopted and persist in a specific environment overtime by being deemed acceptable by the participant. This information will be used to alter future iterations of the intervention to be more accepted by the participants and caregivers.

In addition to the indirect data measures that will be gathered, the intervention will utilize direct data collection. Direct data is obtained when the researcher observes the participant in their natural setting perform the identified behavior. Direct data collection can also include knowledge-based assessments where there is a set criterion for the participant to pass before moving to the next level of the intervention. The criterion-based assessments are administered in the first week of each of the SEL content pack curriculum being reviewed. Once the participant passes the content-based assessment with a score of 80% or higher, they are allowed into the secure server and intervention. The 80% mastery is required because Minecraft is used to teach skills that the client needs to be able to implement in "real world"/"natural setting" with direct observation by the clinician/researcher. As a result, if this 80% benchmark is not met, it is

difficult to take the next step. The next phase of direct assessment occurs once the participant is in the virtual world.

The direct data collection for the Minecraft™ virtual reality social skills world involves obtaining data on the following data points: the frequency of curriculum/ intervention use; frequency of pro social skills observed (using manners, asking for assistance, positive group collaboration, peer to peer interactions in the virtual world, positive words spoken, reinforcing peers, positive conflict resolution skills, etc.); the time spent in the virtual intervention; and successful completion of the virtual group mission. This direct data is obtained by hosting the Minecraft™ virtual intervention at identified times so that a therapist and data recorder can also be present to collect the data and support pro-social behaviors in the virtual setting. This data can easily be displayed in a visual graph showing a visual analysis of progress being made across participants. A sample data collection sheet for the therapist/ researcher collecting this data can be found below noted as Table 1.

Table 1

Client Name	Curriculum Use in Session	Pro social skills observed	Time spent in intervention	Behaviors Needing redirection	Mission Completed Successfully? Y/ N
<i>John Doe</i>	<i>Used 5 out of 6 times offered</i> <i>8/10/2020</i> <i>8/13/2020</i> <i>8/16/2020</i> <i>8/19/2020</i> <i>8/21/2020</i>	<ul style="list-style-type: none"> • <i>Asked for help 5 times</i> • <i>Said 5 nice things to peers</i> • <i>Showed 2 opportunities to collaborate with peers</i> • <i>Conflict resolution skills used 1 time this session</i> 	<i>30 out of 30 minutes the client was engaged in appropriate activity</i>	<ul style="list-style-type: none"> • <i>Client trolled 4 times</i> • <i>Client yelled at a peer for not building the world “correctly” 5 times</i> 	<i>Yes</i>

Table 1. Sample direct data collection sheet for the Minecraft™ Social Skills Virtual Reality Intervention

The following table (Table 2) provides an overview of the 14-week Minecraft™ Social Skills Virtual Reality Intervention from week to week as a template for replication in clinical practice.

Table 2

Week 1	Assessment- 30 minutes	Activity- 30 minutes
Parent and Client orientation	<ul style="list-style-type: none"> • Parents complete the baseline SSIS-RS 	Parents

<ul style="list-style-type: none"> • Discuss the purpose of the intervention • Gather baseline data on SSIS-RS from the parents and the client • Identify what the parents want from the intervention and what the clients want from the intervention • A brief overview of the content found in the Minecraft™ Social Skills Virtual Reality Intervention 	<ul style="list-style-type: none"> • Clients complete the baseline SSIS-RS 	<ul style="list-style-type: none"> • Getting to know their child through question and answer sessions • Working with parents to answer questions and concerns about the intervention • Sharing with the parents the intervention schedule <p>Clients</p> <ul style="list-style-type: none"> • “Getting to know you” activities for the clients and ice breakers • Gathering information about their interests and likes • Gathering information through game play about their social skill needs through live and virtual game play • Discussing client expectations and roles as well as sharing the intervention schedule
Week 2	Assessment- 15 minutes	Activity-45 minutes
Mindful Knight Curriculum	<ul style="list-style-type: none"> • After direct instruction about the Mindful Knight Curriculum is completed, assess the client content knowledge about the topic (must pass with 80% or higher) • If a client does not meet criteria, identify areas of need and send homework packet to address the deficit area 	<ul style="list-style-type: none"> • Mindful Knight Curriculum introduced • Identify key terms and skills needed as pre-requisites • Play a game to build knowledge and skills • Send home parent letter about skill development and tips
Week 3	Assessment- 15 minutes	Activity- 45 minutes
Mindful Knight Curriculum	<ul style="list-style-type: none"> • Re-assess those clients who did not pass with 80% accuracy or higher • Once in the virtual world collect direct data on each client regarding 	<ul style="list-style-type: none"> • Review Mindful Knight Curriculum • Review key terms • Start the virtual intervention

	<p>their specific observable behaviors (this is a baseline for the direct data)</p>	<ul style="list-style-type: none"> • Direct data collection happens for the duration of the intervention • The therapist is in the virtual platform to address needs, reinforce, and prompt • Data is shared with the clients individually before leaving as a form of direct feedback • Send home parent letter about skill development and tips
Week 4	Assessment -15 minutes- duration of the intervention	Activity- 45 minutes
Mindful Knight Curriculum	<ul style="list-style-type: none"> • Re-assess those clients who did not pass with 80% accuracy or higher (everyone should meet criteria by this point) • Once in the virtual world collect direct data on each client regarding their specific observable behaviors (you will begin comparing weekly data in this session) 	<ul style="list-style-type: none"> • Review Mindful Knight Curriculum • Review key terms • Start the virtual intervention • Direct data collection lasts the duration of the intervention • The therapist is in the virtual platform to address needs, reinforce, and prompt • Data is shared with the clients individually before leaving the intervention as a form of direct feedback • Send home a parent letter about skill development and tips
Week 5	Assessment- duration of the intervention	Activity-45 minutes
Mindful Knight Curriculum	<ul style="list-style-type: none"> • Once in the virtual world collect direct data on each client regarding their specific observable behaviors (you will begin comparing weekly data in this session) 	<ul style="list-style-type: none"> • Review Mindful Knight Curriculum • Review key terms • Start the virtual intervention • Direct data collection lasts the duration of the intervention • The therapist is in the virtual platform to

		<p>address needs, reinforce, and prompt</p> <ul style="list-style-type: none"> • Data is shared with the clients individually before leaving the intervention as a form of direct feedback • Send home a parent letter about skill development and tips
Week 6	Assessment- 15 minutes	Activity- 45 minutes
Digital Citizenship	<ul style="list-style-type: none"> • After direct instruction about the Digital Citizenship is completed, assess the client content knowledge about the topic (must pass with 80% or higher) • If a client does not meet criteria, identify areas of need and send homework packet to address the deficit area 	<ul style="list-style-type: none"> • Digital Citizenship Curriculum introduced • Identify key terms and skills needed as pre-requisites • Play a game to build knowledge and skills • Send home parent letter about skill development and tips
Week 7	Assessment-15 minutes	Activity-45 minutes
Digital Citizenship	<ul style="list-style-type: none"> • Re-assess those clients who did not pass with 80% accuracy or higher • Once in the virtual world collect direct data on each client regarding their specific observable behaviors (this is a baseline for the direct data) 	<ul style="list-style-type: none"> • Review Digital Citizenship Curriculum • Review key terms • Start the virtual intervention • Direct data collection happens for the duration of the intervention • The therapist is in the virtual platform to address needs, reinforce, and prompt • Data is shared with the clients individually before leaving as a form of direct feedback • Send home parent letter about skill development and tips
Week 8	Assessment-15 minutes to duration of the intervention	Activity-45 minutes
Digital Citizenship	<ul style="list-style-type: none"> • Re-assess those clients who did not pass with 80% accuracy or higher 	<ul style="list-style-type: none"> • Review Digital Citizenship Curriculum • Review key terms

	<p>(everyone should meet criteria by this point)</p> <ul style="list-style-type: none"> Once in the virtual world collect direct data on each client regarding their specific observable behaviors (you will begin comparing weekly data in this session) 	<ul style="list-style-type: none"> Start the virtual intervention Direct data collection lasts the duration of the intervention The therapist is in the virtual platform to address needs, reinforce, and prompt Data is shared with the clients individually before leaving the intervention as a form of direct feedback Send home a parent letter about skill development and tips
Week 9	Assessment- duration of the intervention	Activity- 45 minutes
Digital Citizenship	<ul style="list-style-type: none"> Once in the virtual world collect direct data on each client regarding their specific observable behaviors (you will begin comparing weekly data in this session) 	<ul style="list-style-type: none"> Review Digital Citizenship Curriculum Review key terms Start the virtual intervention Direct data collection lasts the duration of the intervention The therapist is in the virtual platform to address needs, reinforce, and prompt Data is shared with the clients individually before leaving the intervention as a form of direct feedback Send home a parent letter about skill development and tips
Week 10	Assessment- 15 minutes	Activity- 45 minutes
Inspiration Island	<ul style="list-style-type: none"> After direct instruction about the Inspiration Island Curriculum is completed, assess the client content knowledge about the topic (must pass with 80% or higher) If a client does not meet criteria, identify areas of 	<ul style="list-style-type: none"> Inspiration Island Curriculum introduced Identify key terms and skills needed as pre-requisites Play a game to build knowledge and skills

	need and send homework packet to address the deficit area	<ul style="list-style-type: none"> Send home parent letter about skill development and tips
Week 11	Assessment-15 minutes	Activity- 45 minutes
Inspiration Island	<ul style="list-style-type: none"> Re-assess those clients who did not pass with 80% accuracy or higher Once in the virtual world collect direct data on each client regarding their specific observable behaviors (this is a baseline for the direct data) 	<ul style="list-style-type: none"> Review Inspiration Island Curriculum Review key terms Start the virtual intervention Direct data collection happens for the duration of the intervention The therapist is in the virtual platform to address needs, reinforce, and prompt Data is shared with the clients individually before leaving as a form of direct feedback Send home parent letter about skill development and tips
Week 12	Assessment-15 minutes to the duration of the intervention	Activity- 45 minutes
Inspiration Island	<ul style="list-style-type: none"> Re-assess those clients who did not pass with 80% accuracy or higher (everyone should meet criteria by this point) Once in the virtual world collect direct data on each client regarding their specific observable behaviors (you will begin comparing weekly data in this session) 	<ul style="list-style-type: none"> Review Inspiration Island Curriculum Review key terms Start the virtual intervention Direct data collection lasts the duration of the intervention The therapist is in the virtual platform to address needs, reinforce, and prompt Data is shared with the clients individually before leaving the intervention as a form of direct feedback Send home a parent letter about skill development and tips
Week 13	Assessment- duration of the intervention	Activity-45 minutes

Inspiration Island	<ul style="list-style-type: none"> Once in the virtual world collect direct data on each client regarding their specific observable behaviors (you will begin comparing weekly data in this session) 	<ul style="list-style-type: none"> Review Inspiration Island Curriculum Review key terms Start the virtual intervention Direct data collection lasts the duration of the intervention The therapist is in the virtual platform to address needs, reinforce, and prompt Data is shared with the clients individually before leaving the intervention as a form of direct feedback Send home a parent letter about skill development and tips
Week 14	Assessment-30 minutes	Activities- 30 minutes
Closure ceremony	<ul style="list-style-type: none"> Parents complete a post SSIS-RS for review Parents complete an Intervention Rating Profile about the intervention (social validity) Clients complete a post SSIS-RS for review Clients complete a Child Intervention Rating Profile (social validity) 	<ul style="list-style-type: none"> Graduation and closure ceremony where clients receive awards and review progress Parents attend as social supporters Games/celebration/show parents the completed world and discuss what they learned Extension activities as well as maintenance activities provided to the parents and the clients

*** If students want to continue in the intervention beyond 14 weeks (and they have made sufficient progress) they should be trained as client “leaders” and assist in facilitating and running the intervention for the future cohorts.

Table 2. The 14-week Minecraft™ Social Skills Virtual Reality Intervention Schedule- Complete curriculum available

Future Outcomes

The researchers believe that a new generation of highly integrative, deeply personalized EMIs is possible if certain advances in technology can be incorporated into already existing behavioral interventions. This Minecraft™ virtual reality social skills intervention can be the first of many

interventions to address the needs of children with neurodiversity. Much work is needed to advance this research in the future such as evaluating comparison data of VR supported intervention and face-to-face interventions; identifying ways in which the technology can utilize predictive analytics to support the client within the intervention based on client responses; and more supportive technology to gather specific target data without the need for a live data collector within the intervention.

This proposed example of how a virtual reality intervention can be developed by incorporating Minecraft™ and social skills group interventions for children on the Autism Spectrum is just the tip of the iceberg. Because this work is so novel, and given the paucity of evidence for effectiveness, more research is necessary to evaluate the outcomes of EMI and virtual reality interventions in comparison to the typically used face-to-face behavioral interventions often used in social behavioral practices.

Currently the use of VR and EMI used in this social-emotional Minecraft™ intervention consists of passive detection derived from a live therapist in the Minecraft™ world with the participants. As work continues and VR practices in social behavioral sciences progress, EMIs of the future might require a “live” support watching and responding.

Additionally, predictive analytics and machine learning algorithms can be used to identify needs and personalize instruction so that interventions can be delivered in intelligent and responsive ways while still remaining evidence based. We propose future VR interventions and programming to be implemented and piloted with the identified population to determine the effectiveness in social skill-building and improvement in social functioning as well as skill generalization of clients identified with high functioning Autism. Future VR research should investigate the development of game-based apps characterized by dynamic feedback to the client which would enable them to be an active participant in managing their own care in addition to interacting with a therapeutic group leader.

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