THE ROLE OF AVATARS IN INFLUENCING ANXIETY AMONGST ADOLESCENTS WITH AUTISM SPECTRUM DISORDERS

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ABSTRACT and INTRODUCTION

Recently, *virtual reality* (VR) programs surfaced in mainstream media through the release of *Avatar,* giving new meaning and life to an already thriving form of technology. Aside from the various interpretations of the film, *Avatar* represents a rather whimsical look into the prosthetic elements offered by such technological advancements. In other words, virtual worlds remove an individual's reliance on assistive devices while fostering exploration into areas otherwise inaccessible in real-life.

Given such promising features, virtual reality technology has been a prime focus in the research community, with attempts aimed at discovering the efficacy of such modalities for treating individuals with autism. Although ambitious in their efforts, many studies lack a comprehensive review of the influence of such interfaces on the anxiety experienced by the autistic community. (Leonard, Mitchell, & Parsons, 2002; Mitchell, Parsons, & Leonard, 2007, Stroud, 2009; Moore, Cheng, McGrath, & Powell, 2005; Parsons, & Mitchell, 2002).

Autism has generated substantial media attention over the past several years as detection and diagnosis have increased nationwide (Centers for Disease Control and Prevention [CDC], 2009). Because of the comprehensiveness of the disorder, autism has been labeled as a spectrum disorder (ASD) and includes mild to severe cases across individuals. Hallmarks of ASD include deficits in the social domain resulting in a lack of eye contact, poor recognition of facial expression, limited expressive and receptive language, and difficulties sustaining relationships. Such deficits cause extreme feelings of anxiety since daily social encounters require such conventions. (American Speech-Language-Hearing Association [ASHA], 2010).

Like many intervention strategies designed for this cohort, deficits in the social domain have been at the forefront of scholar interest with regard to VR technologies. (Mineo, Siegler, Gill, & Salkin, 2009; Mitchell, Parsons, & Leonard, 2007; Moore et al., 2005). Because many virtual environments are collaborative in nature, referring to the multiuser dynamic, individuals with autism are given the opportunity to practice pragmatic skills. Many have touted the efficacy of virtual environments due to their natural appeal to this specific cohort. (Mineo et al., 2009; Mitchell et al., 2007; Moore et al., 2005). Many adolescents diagnosed with autism often find computer-based learning systems enjoyable and useful from an educational perspective. (Mineo et al., 2009; Mitchell et al., 2007; Moore et al, 2005). Some attribute this natural affinity to the limited engagement in real-world social interactions. Such features promote a safe and less threatening environment, causing some scholars to postulate potential reductions in anxiety. (Parsons & Mitchell, 2002).

Although successful in their attempts to teach social skills, many scholars have failed to explore the issue of anxiety any further than anecdotal evidence. Lacking from research is an understanding that anxiety is often caused by a *sensory integration dysfunction*; an underlying issue extending such feelings of anxiousness far beyond social interactions. Given such concerns, it is apparent that scholars are leaving their research vulnerable to groups who are classified by such disorder, presenting a rich opportunity to discover the role of the avatar and its influence on such characteristics. (ASHA, 2010). Following off such

logic, the purpose of this current study is to take advantage of such opportunities to discover how avatar presence influences the level of anxiety amongst individuals with autism.

Moreover, research has been limited to virtual interfaces that present issues of accessibility to the greater population. Given the recent global cut in educational spending, a need for more cost-efficient intervention methods has never been more apparent. Because the internet based Second Life is comparative to that of the aforementioned virtual interfaces, one can speculate that this modality mends such concerns. As of yet, no studies have ventured into such domains.

LITERATURE REVIEW

Existing research studying the benefits of virtual world technology and autism has been noted as having strong correlations to that of computer-mediated communication (CMC). Due to these similarities, a preliminary review of literature on CMC was conducted, providing a broad understanding of the efficacy offered by various computer-based modalities. Burke, Kraut, and Williams (2010) studied CMC amongst high-functioning adults with autism and noted that such mediums (i.e. Facebook, e-mail, and text messaging) were praised amongst the autistic community due to the asynchronous communication within these environments. Such features provide additional time to process and respond to input since there is no pressure for immediate reply. Moreover, the absence of physical presence makes typical social conventions, such as eye contact and facial expression, much easier to manage.

Similarly, in an attempt to discover the motivations underlying internet use within the autism community, Benford (2008) found that "the visual anonymity, flexible timing and permanent natures of the internet serve to diminish the social, emotional and time pressures of interpersonal communication and also the cognitive complexity of the processes involved" (p. 290).

Given the positive characteristics of CMC, it is apparent that one theme continues to reemerge across literature: anonymity. This aspect is of particular interest to this cohort since anxiety caused by a pressure to actively decipher linguistic and non-linguistic cues is significantly alleviated. (Parsons & Mitchell, 2002). Based on these findings, an investigation into virtual worlds and the role of the avatar seemed most appropriate. Reasoning stems from research that suggested the idea of avatars essentially masking the identity of communicators, therefore, providing a sense of anonymity (Galanxhi & Nah, 2007). Additionally, literature on video chat offered a look into another form of CMC where anonymity was not a feature. This modality serves as a control group to determine whether or not avatars are the driving force influencing anxiety, or if *all* communication via computers is responsible for such influence.

Virtual Worlds and Avatar Interaction

A virtual environment has been defined in literature as "a computer generated three-dimensional simulation of a real or imaginary environment" (Moore et al., 2005, p. 231). Operating within these electronic worlds is a species of avatars, identified by features that are physically comparable to their human counterpart. (Moore et al., 2005). Due to limited research, a general discussion of literature involving the beneficial features of virtual environments is presented.

Virtual world technology has been touted by researchers as an effective medium for teaching social and functional living skills to individuals diagnosed with autism. Parsons and Mitchell (2002) elaborated on such assumptions in a comprehensive review of common intervention strategies utilized amongst this cohort. Examination pinpointed the strengths and weakness of such methods, providing an opportunity to construct an optimal paradigm involving a VR environment. Concluding arguments from this study attributed the atheistic features of such environments to the generalization of knowledge from one context to another. In other words, skills taught in a virtual world are transferrable to real environments due to the naturalistic similarities. Additionally, the authors noted that social interactions, when compared with its real world counterpart, are essentially minimized. Such features suggest a decrease in anxiety, promoting practice of social skills in a "safe and non-threatening" (p. 437) environment.

Similarly, and providing more empirically based evidence from the above paradigm, Mineo et al. (2008) sought determine the level of engagement produced by four varying types of electronic screen media (ESM) commonly used in early intervention. Modalities included: "animated video, video of self,

video of a familiar person engaged with an immersive VR game (other VR), and immersion of self in [a] VR game (self VR)" (p. 172). Engagement was measured by duration of eye gaze and number of vocal utterances produced (i.e. vocalizations). Results showed that appeal differed depending on the type of engagement measure that was employed. Researchers found that Other VR footage resulted in an increase in vocalizations amongst some participants. The Self VR simulation in real time and Self Video were noted for longer durations of gaze.

Although significant in their findings, researchers from the above study cautioned that engagement does not always warrant learning and generalization across contexts, prompting further exploration into this area (Mineo et al., 2008). Narrowing the gap in such domains, Leonard et al. (2002) sought to target the issue of skill generalization and application of knowledge from one context to another. In this particular study, a virtual café was constructed to reinforce social conventions with regards to finding a seat in a café amongst five adolescents with ASD. After exposure to the VR, participants were subject to a video depicting seating on a bus to determine transfer of knowledge. This study reported that social discourse showed improvement in some participants following exposure to the VR café; however, generalization to the bus scenario was not as successful. In an attempt to approve such results, Mitchell et al. (2007) revisited this topic and found significant results with regard to generalization of knowledge to the bus scenario. Given such improvements, the efficacy of using virtual worlds to teach social skills is demonstrated.

While this body of research represents significant achievement in the virtual reality domain, there seems to be a consistent pattern of attributing success to the overall interface. While this may be the case, scholars are missing out on a rich opportunity to explore the role of the avatar in promoting such outcomes. Providing a preliminary look at this topic and offering a rich foundation for the current study, Moore et al. (2005) recognized the significance of avatar embodiment in relation to addressing the issue of ToM deficits in individuals with autism. The authors argued that "users embody themselves though their avatars, which makes their engagements with the virtual world more real" (p. 232). Such elements were thought to be the defining features that could potentially facilitate communication amongst individuals with autism. Because avatars could be programmed and designed to express human-like emotions, individuals could be taught to make inferences regarding the mental state of the avatar. To test such notions, a system was designed to gauge the comprehension of four emotions (i.e. happy, angry, sad, and frightened) on humanoid avatars. The study found that 30 out of 34 participants were able to successfully answer the correct response to questions measuring emotional comprehension. Although lacking in substantiated evidence regarding the influence an avatar has on anxiety, this research provides a fruitful application to this current study since it is understood that autistic children can interact successfully with avatars.

With an abundance of research supporting the usefulness of virtual reality and individuals with autism, it was surprising to find no empirical studies exploring Second Life (SL), a virtual interface already inhabited by hundreds of individuals with ASD. (Linden Lab, n.d.). Regardless of empirical work, Stroud (2009) discussed the implementation of SL in a special education curriculum throughout a school district in New York City. The application included a virtual block party and fostered participation in conversations with other adolescents diagnosed with autism. Participants also engaged in functional living tasks such as opening bank accounts and grocery shopping.

Taken as a whole, these studies represent an ideal starting point since the benefits of virtual worlds are demonstrated. Because scholars have had such a positive outlook and children have expresses great interested (Mineo et al. 2008), it is apparent that this modality is worthy of future considerations. As one could see, VR is noted for its lack of typical social conventions, similar to that of CMC. This is due to the use of an avatar that acts as a mask for an individual's identity while engaging in conversations. (Parsons & Mitchell, 2002). Given this anonymity, one could argue a potential positive shift in anxiety levels given its parallel characteristics to these various modalities. However, there is a common tendency across literature is to suggest rather than prove notions of effectiveness. (Parsons & Mitchell, 2002). Such criticism is presented because virtual worlds present a feature that contradicts earlier forms of CMC. This feature is that of synchronous communication, an element that would require

immediate response to comments offered by a communicator. Given these contrary elements, one should not consider these previous studies as comprehensive, rather a foundation for this current research.

Video Chat and Human Interaction

The online gratifications in use today, such as chat systems, are far more primitive than face-to-face conversation, making it problematic to disclose numerous basic cues. Additional congruencies and discrepancies, as described by Ivey (1994), are entirely obscured online: for instance, congruencies and disparities between nonverbal messages, behavior, and statements. This phenomenon of confined physical sensory information is called online disembodiment.   In fact, this means, "a 93 % decline in nonverbal communication" (p. 87). According to researchers, as a result of the reduction in nonverbal cues, in online interaction the participants in communication are anticipated to experience more intense self-disclosure and less social responsibility towards the others than in face-to-face communication (Barbovschi & Diaconescu, 2008, p. 87)

Although similar to face-to-face interaction, video chat contributes to the lack of physical sensory experienced by the participant while stimulating interaction being that their physicality is absent. This medium furthers the idea that online interaction is a primarily disembodied practice of computer-mediated communication. Additionally, this modality only makes it harder for participants to fully engage in interaction being that non-verbal communication is being obscured. Furthermore it creates a barrier for some populations, where disability deficiencies   already exist outside of computer-mediated communication.   More specifically, children with autism acquire deficits in the social domain resulting in poor eye contact, as well as confined expressive and receptive language; which again restricts them from understanding non-verbal cues.

Begeer, Rieffe, Terwogt, and Stockmann (2006) further investigated whether attention to emotion cues in others could be enhanced, specifically in children with autism spectrum disorders. This study has shown the deficits in the perception of emotions accounted for the social disabilities that can be observed in children with autism.   In fact, they conclude that children with autism seem to be less aware that others' emotional states might become relevant so instead they ignore emotion based cues. (p. 37).   In addition, researchers argue that the problem remains in which it will be hard to provide the autistic children with absolute instructions about how to make use of emotional expressions in inconclusive social situations, as is generally the case in daily life situations.

Similarly, researchers Celani, Battacchi, and Archidiacono (1999), combined a group of autistic and non-autistic children to perform two different tasks, which required subjects to match faces on the basis of the emotion being expressed or on the basis of identity. Results showed a significantly worse performance in autistic individuals than in both normal and down subjects on both facial expressions of emotion subtasks. In single-modality tasks performed, such as sorting or matching, the abiding features common to the sample and target pictures were intended to make it easy for autistic people to use emotionally neutral strategies. On the other hand, a cross-modal experimental procedure, in which subjects were required to pair the facial expression of emotion with a congruent voice, gesture or context, were intended to reduce the possibility of using these perceptual strategies based on visual-spatial cues. Despite these differences, when autistic individuals were matched with normally developed or with non-autistic mentally retarded children on nonverbal measures of intelligence significant differences between groups were found only in emotion, but not in control, recognition tasks. Upon the findings of this study, non-autistic individuals can directly read the emotional meaning of happy and sad faces, whereas autistic subjects were less proficient in their perception of these facial expressions.

The conclusions of past research have also demonstrated that impairment in the use of eye contact for non-verbal communication is a major characteristic for children with autism. A study conducted by Senju, Yaguchi, Tojo, and Hasegawa (2005), used an oddball task with three different stimuli. Each block consisted of a practice sequence, followed by a test sequence. A practice sequence involved the presentation of the series of standards and targets. Before beginning a practice sequence, the experimenter showed the child printed photographs of the standard and target, and the child was instructed to press one button on seeing the standard and another for the target, as soon as they detected the stimulus. The experiment consisted of six blocks. In each block, standards, targets, and non-targets were always photographs of the same model.   The presenting order of blocks was randomized among

children. Researchers concluded that the gaze direction of the stimuli had no effect on the performance of children with autism. Accordingly, normal developing children detected direct gaze better than children with autism, while performance in detecting averted gaze did not differ between the groups. These results suggest that direct gaze has a facilitative effect on the performance of typically developing children.

The studies presented above, further imply the ineffectiveness of children with autism using video chat as it has been proven that these deficiencies occur regularly in face-to-face interaction; however, while these studies represent an apparent deficiency that children with autism acquire, a widely accepted theory that explains these deficiencies is also known as 'theory of mind' (ToM). Theory of Mind is the notion that people with autism fail to represent the mental states of others and/or even possibly of self. In contrast, some research has directed attention to possible relationships between ToM and verbal ability (Ziatas, Durkin, & Pratt, 1998). Children and adults with Asperger syndrome have been found to pass theory of mind tests in the past. However, many studies have cultivated evidence to indicate a relationship between ToM and verbal ability in children with autism. The ToM development and greater verbal ability in this group suggests a link between these two abilities. Researchers, Ziatas et al., (1998), decided to explore and create a study based on a focus that has received minor attention. Researchers examined the relationship between ToM and belief term development in children with autism, Asperger syndrome, language impairment, and normal development.   Attention to individual patterns of performance revealed that the majority of children with autism performed as predicted by the ToM hypothesis; however, there were a small proportion of the children who did not behave as predicted. In the past, "The theory of mind account of autism has been remarkably successful in making specific predictions about the impairments in socialization, imagination, and communication shown by people with autism" (Frith & Happe, 1994, p.115).

Although there is a lack of measurable resources that focus on video chat and its effect on children with autism, it is evident that the social deficiencies they experience on a daily basis disable them to favorably engage in this modality.   Aforementioned literature, suggest that perhaps this form of computer-mediated communication precludes autistic children with the ability to foster the full engagement of video chat modalities, as it has shown to be synchronous to face-to- face interaction.

Anxiety and ASD
Existing studies that have examined the use of virtual world technologies on individuals with autism have focused solely on anecdotal evidence to support notions for reductions in anxiety. (Parsons & Mitchell, 2002) To date, there have been few empirical studies focusing on the influence of avatars on level of anxiety, a figure central to communication within virtual environments.

The term anxiety stems from the Greek *angho*, meaning "weighed down with grief, burden, [and] trouble" (Rabatin & Keltz, 2002, p. 164). Such etymology also runs parallel to the Latin *anxietas,* meaning "troubled in mind" (Rabatin & Keltz, 2002, p. 164). The National Institute of Mental Health (2009) provided firsthand accounts from patients suffering from such disorders, giving life to the previous word sources. "There were times I'd wake up wired in the middle of the night. I had trouble concentrating…My heart would race or pound. And that would make me worry more. I was always imagining things were worse than they really were. When I got a stomachache, I'd think it was an ulcer" (p. 12).

Often, confusion regarding the specificity of what constitutes anxiety is sometimes generalized to public speaking scenarios and first date jitters. Although stressful, these events are "relatively mild [and] brief" (National Institute of Mental Health [NIMH], 2009, p. 1). Contrary, true anxiety is often debilitating, causing physical pain and grief for extended periods of time. More specifically, according to the American Psychiatric Association (2000), generalized anxiety disorder includes "excessive anxiety and worry, occurring more days than not for at least 6 months, about a number of events or activities" (p. 472). Such symptoms are uncontrollable and occur simultaneously with physical symptoms including: muscle tension, fatigue, restlessness, irritability, etc. (American Psychiatric Association, 2000).

Because anxiety is a mere umbrella term for a dichotomy of related deficits, consideration must be given to its variations to understand the complexity and nature of the disorder. For the purpose of this

current study, an exploration into social phobia (i.e. social anxiety) is necessary for identifying observable behaviors often associated with the autism community.

Social phobia accounts for the fear of socially demanding scenarios in which the individual believes he/she will be berated for their actions. In some cases, anxiety is not limited to these socially overwhelming contexts; rather the individual will experience high levels of stress over a broad spectrum of environments. Immersion in such scenarios typically results in panic-like behaviors as well as physical behaviors including: profuse sweating, trembling, nausea, difficulty speaking, and blushing (NIMH, 2009). Often, social phobic children will turn to "crying, tantrums, freezing, or shrinking from social situations" (American Psychiatric Association, 2000, p. 456) to release feelings of anxiety.

Researchers, however, have noted that anxiety levels are not consistent when examining these symptoms amongst individuals in the autism community. According to a study conducted by Bellini (2004), results showed that "adolescents with autism spectrum disorders exhibit anxiety levels that are significantly higher than those of the general population" (p. 78). Explanations for such increases have been attributed to "physiological manifestations" (p. 78), referring to deficits in the area of sensory integration (ASHA, 2010). Such deficits cause insufficient organization and interpretation of sensory input (i.e. tactile, auditory, gustatory, vision, olfactory), resulting in an excess of stimuli. Because of this sensory overload, anxiety levels are often exacerbated and cause difficulties in social and daily living situations. (Hearing, Speech and Deafness center [HSDC], n.d.).

Given the debilitating symptoms that accompany autism spectrum disorders, it is surprising to find a limited pool of intervention options that attend to such distress. Moreover, it is wise to question the research community and their ignorance when studying new methods since few empirical studies have focused on this factor. Together, these two limitations present the need for empirical research on anxiety and provide justification for the purpose of this current study.

RESEARCH QUESTION and HYPOTHESIS

Because a significant share of research on VR has failed to empirically extend their studies past anecdotal assumptions regarding anxiety, the need to examine this topic has never been more apparent. Moreover, providing that Second Life (SL) has been left unexplored in relation to its efficacy within the autism community, an exploration into this domain is warranted. Studies focused on the broad topic of CMC effectiveness present parallel features to that of SL technology. Based on the inclusion of an avatar in SL the research question is: *Is there a correlation between the presence of an avatar and the level of anxiety experienced by an individual with autism?*

Following the logic of previous studies involving CMC, we expect to find similar results to experiences with a virtual world avatar. This is due to the anonymity that accompanies such modalities due to the existence of an avatar. However, because SL and video chat are both synchronous technologies, we understand that there are contradictions when comparing these with the asynchronous modalities advocated on behalf of the autism community. Given this inconsistency, caution was taken to avoid formulation of a directional hypothesis that would suggest assumptions. Therefore, the hypothesis is: *Avatar presence is correlated with the level of anxiety experience by an individual with autism.* The following research design is an attempt to explore this potential influence.

METHODOLOGY

The following is a proposed experiment that will attempt to measure an autistic child's anxiety levels in relation to face-to-face interactions via video chat, and through avatar-to-avatar interactions via virtual worlds.

Participants

The present study focused on twenty male and female adolescents and their families. The participants were between the ages of eight and fourteen and identified as having some level (from low functioning to high functioning) of autism.

The participants were all selected on a volunteer basis. Information regarding this study was sent to teachers to send home to the parents of every student at the Eden Institute of Princeton, NJ. This

institution provides tailored services to adolescent children from ages three to twenty-one with autism. Eden Institute was selected because it serves as the participants' primary source of education and has a strong focus on a sensory input program. (Eden Autism Services, 2010). For those families who are interested in participating, it will be required that they fill out consent forms (See Appendix A) allowing their child to be observed during the experiment. The first twenty individuals to send in consent forms will be selected as participants.

Since autism has many different levels and characteristic, it is important to find out each child's condition. Therefore, a questionnaire was produced for the parents to complete about their child and send back along with the consent form. The questionnaire is comprised of questions pertaining to the child's background in autism. The sole purpose for surveying the children and their relation to autism was to determine how they behave before, during, and after the experiment. All surveys regarding the child's background will be completely anonymous to demonstrate that the questionnaire had no affect on who will be selected for participation.

Instruments/Design
There will be several tools used throughout the experiment including: a parent questionnaire, Second Life as the virtual environment program, Skype as the face-to-face program, and a Behavior Assessment System for Children and Multidimensional Anxiety Scale for Children. The design of the study will be to measure the anxiety levels experienced in social interactions by having the participants experience preconceived scenario through the use of avatars and non-avatar programs. By comparing these two independent variables it can be determined if there is a difference in anxiety levels during the two interactions. The following describes the instruments in detail:

Parent/ Guardian Survey
The survey (See Appendix B) will be sent home to parents with the consent form and the information regarding the study. The purpose of this survey is to gain information on the child's type of autism, experiences (if any) using virtual environments, experiences with face-to-face interactions, and how the child deals with anxiety during these experiences.

The survey is composed of approximately ten questions that are multiple choice and likert scale (rating) and pertain to the child. The survey was completely anonymous for both the child and the parent; however, it does ask demographic questions regarding race, age, and gender of the child.

Additionally, it will be recommended that each parent include a headshot of their child. This will assist the graphic artist who will design an avatar to represent the participant. This will enhance avatar embodiment, a feature that may be essential for anxiety relief. (Moore et al., 2005).

Avatar: Second Life
The Second Life virtual world will serve as the independent variable utilizing avatar. This modality was chosen based on its inclusion of anonymity, a factor that was advocated amongst the autism community regarding benefits of CMC. (Benford, 2008; Burke et al., 2010). Additionally, this medium offered a more affordable alternative when considering future accessible options.

The SL experience will take place on 'Teaching 9', which is an island created for The College of New Jersey (TCNJ) students in the Department of Arts & Communication, for educational purposes. It is an open island that has an outdoor platform with classroom seating, a podium, and Power Point slideshow. The island is strictly monitored by TCNJ facility and only permits students on the land.

To facilitate conversation, a confederate will verbally narrate a story titled: *Grover's 10 Terrific Ways to Help Our Wonderful World.* An avatar representing the confederate will be seated at the podium holding the book similar to a classroom setting. Both the participant and the confederate will be viewed by the other through an avatar. Additionally, the participant will be able to see him/herself. This will be done through prior adjustments to the SL camera that will restrict the participants viewing field. (Mineo et al. 2008). Neither individual will see the avatar's human operator. Additionally, SL typically has multiple avatars on the land that are exploring and conversing; however, the Teaching 9 Island will only include the confederate and the participant's avatars throughout the duration of the experiment.

Each participant and confederate will be represented by a humanoid avatar that will aesthetically resemble each individual. Avatars will be created by a trained graphic artist that will generate an avatar based off a photograph sent in with the child's consent form and questionnaire. Having such features is essential to ensure there is no extraneous factors influence anxiety.

Non-Avatar: Skype
The Skype program (i.e. control group) will be serving as the independent variable utilizing non-avatar. This modality was chosen since it lacks anonymity. Additionally, this encounter is unique in the sense that it is a close simulation of a face-to-face encounter. Facial expressions, gestures, body posture, etc. will all be present. Because of this feature, there is an opportunity to single out the role of the avatar and its influence on levels of anxiety.

The Skype experience will use the 'video call' option and will display the confederate on the computer screen, as well as the participant. To eliminate outside factors that could distract participant the confederate will be displayed from the shoulders up. In contrast to SL, Skype will use the actual faces of the confederate and participant in order to measure the anxiety levels of the participant and be able to compare it to those anxiety levels of the participants in SL. To provide consistency, the same book (i.e. *Grover's 10 Terrific Ways to Help Our Wonderful World)* will be verbally narrated and held by the confederate.

Dependent Variable: Anxiety
The dependent variable in this study is the anxiety level of the participants, which could be influence during the procedure. There are two scales that will be utilized for measuring the exact levels of anxiety that were pulled from research conducted by Bellini (2004). The first scale is the Multidimensional Anxiety Scale for Children (MASC) and Behavior Assessment System for Children (BASC) are two scales created to measure the anxiety levels of adolescents between the ages of eight and nineteen. They are questionnaires that are take approximately fifteen minutes to complete by a professional and are composed of likert scale questions. (Bellini, 2004).

The MASC examines physical symptoms, somatic symptoms, tense symptoms, harm avoidance, perfectionism, anxious coping, social anxiety, humiliation fears, performance fears, and separation/panic. The respondent is required to answer the question by rating the behaviors of the participant in various situations (0=never happening to 3=often happened). (Bellini, 2004).

The BASC examines Aggression, Anxiety, Attention Problems, Atypicality, (Psychoticism), Conduct Problems, Depression, Hyperactivity, Learning Problems, Somatization, Withdrawal, Externalizing Problems Composite, Internalizing Problems Composite, School Problems Composite, Behavior Symptoms Index, Adaptability, Leadership, Social Skills, Adaptive Skills Composite, and Study Skills. (Bellini, 2004). Table 1 is an example of the rating system used for the BASC. See Appendix C for a complete version of the BASC.

Table 1
Sample Behavior Assessment System for Children

Descriptions	Very Low		Low	AVERAGE			"At Risk"		Clinically Significant	
Percentile Scores	0.4th	2nd	9th	25th	50th	75th	91st	98th	99.6th	99.9th
Internalizing Problems										
Anxiety										
Depression										

Somatization										

Note: From *Reynolds & Kamphaus* (1992)

PROCEDURE

After recruiting participants, they will be randomly placed into two separate groups: one experiencing SL and the other Skype. This will be done through a random number generator created through Microsoft Excel. Due to multiple participants, they were observed one-on-one in order to eliminate any factors outside of the study that could influence their anxiety levels. Experiences within each scenario (i.e. SL and Skype) will last approximately 30 minutes and will be administered during early portions of the day. The experiment and data collection will last approximately ten days (Monday through Friday) with two participants being observed daily. Observations and results of each participant will all be recorded and grouped together as either SL or Skype results.

Also in an attempt to reduce extraneous factors, two computer labs in the participants' school will be reserved. The use of one lab will be for the confederate and the other will be used for the participant. This way the participants' behaviors will not be influenced by the actions of the confederate during the experiment. The participants will enter the computer lab with a parent, or guardian, and use a computer that has already been set up with either SL or Skype.

Additionally, it must be noted that minimal instruction will be given for both interfaces. It was not deemed necessary to include a tutorial since the participant will not be required to explore the interfaces, rather, just be required to provide text-based feedback. Prior to the experiment, the setting will be set up by a researcher to ensure camera angles provide only a view of the participant's avatar as well as the confederate's avatar. Similarly, in the Skype scenario, the camera will be adjusted to view only the confederate. This will again ensure that participants focus is restricted to relevant stimuli.

Since the main focus of the study is on the anxiety level during an avatar to avatar interaction compared with a person to person interaction; the use of the confederate was imperative to the study. Each participant would experience either of the two described interactions. The confederate, through the use of a story and script, will initiate a discussion with the participants through either medium (SL or Skype). Given that two separate channels are being observed it is imperative that each participant receive the same experience, including similar avatars. Therefore, avatars need to physically resemble the human in the Skype communication. The participants who will be experiencing SL will go through the experiment with an avatar; while those participants experiencing Skype will go through a face to face interaction with an actual person via webcam.

For the procedure, each child will be accompanied by one parent, or guardian, as well as a speech pathologist, which will observe and record the participants' behaviors. The confederate will voice a story to the participant, which also be displayed on the screen to view, and encourage the child to interact, through text chat, by asking him/her questions that will require responses in hope of generating a natural discussion. These questions are pre-composed (See Appendix D) and will be asked in random order depending on the responses of the child. The child will also be encouraged by the confederate, parent, and speech pathologist to ask questions in return and make comments, also through text chat, during the duration of the experiment. The book that will be used in both settings is titled: *Grover's 10 Terrific Ways to Help Our Wonderful World.* Details including the confederate script and sample book pages are listed elsewhere (see Appendix D, E).

During the procedure, a speech pathologist will observe and record the anxiety levels and behavior of the child. The Multidimensional Anxiety Scale for Children (MASC) and the Behavior Assessment System for Children will be used by the observer to assess the child's anxiety. Both of which measure anxiety, aggression, separation/panic, social skills, attention problems, and many other symptoms. During the procedure, the observer will answer a variety of likert scale questions by rating how they view the child's behavior during the experience.

Results from the scaling systems will then be tallied and grouped together in SL results and Skype results. Groupings will be analyzed by the certified speech pathologist to gauge levels of anxiety across both modalities.

IMPLICATIONS

An important element that all intervention methods should contain is accessibility. Incorporating this element into such programs ensures dissemination of practices to various demographic regions. With inclusion settings being a large part of Individualized Educational Plans (IEPs), the need for effective, yet cost efficient methods have been a priority. Unfortunately, the methods described in previous research require specific software that is unlikely to find its way into an already deteriorating school budget. (Mineo et al. 2009; Mitchell, Parson, & Leonard, 2007; Moore et al. 2005; Tartaro & Cassell, 2008). Even families adamant about assisting their child with social and functional skill learning may remain at strategies that are easier on the wallet.ons

Regarding the nature of the current study, limitations as the one presented above have the potential to be significantly alleviated. This is due to the use of Second Life (SL) technology, a medium left unexplored in the research community. Suggesting hypothetically that our findings are successful in determining the influence of avatars on anxiety, future models of intervention can be deployed through this medium with greater confidence that such models will help, not hinder the child's recovery. School districts as well as families can incorporate such models into their education plans to expedite recovery and provide more hands-on experience.

Furthermore, previous research has already praised this medium for its ability to capture the attention of children with autism as well as teach skills pertinent to daily communication (Mitchell, Parsons, & Leonard, 2007; Mineo, Siegler, Gill, & Salkin, 2009; Moore, Cheng, McGrath, & Powell, 2005). Pairing the notable features from past research with this current study, an opportunity to construct an optimal paradigm is presented. Given the broad appeal of such interfaces, it is apparent that this form of technology is worthy of our time and consideration when exploring the future of intervention strategies.

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Appendix A

Parent Consent Form

The researcher is collecting this data with the permission of the Department of Communication Studies at The College of New Jersey for a course titled:

COM 345: NEW MEDIA AND HEALTH

The purpose of this research is to observe adolescent's anxiety level during their experiences using a virtual environment (Second Life) and Skype. The observation of your child will be reported collectively to determine as a group, how his/her anxiety level has been influenced during the use of either of these two programs.

I _____ understand that I am allowing my child to participate in an experiment being conducted for the class identified above. I understand that my child will be protected by an agreement not to use my name, my child's name, or any personal information in the report.

I willingly release the information collected during the experiment to be used for student and/or facility research _____ (initial)

Signature: _____ Date: _____

Appendix B

Parent/Guardian Questionnaire

COM 345   NEW MEDIA AND HEALTH   Survey #:_____

Respondent demographic:

(Please check all that apply to the child)

Sex: ___Female   ___Male

Race: ___African American   ___ Asian/Pacific Islander   ___Caucasian   ___ Hispanic/Latino   ____Multiracial
         ___ Rather not say   ___Other: _____

Age: ___ 8-9 yrs.   ___ 10-11 yrs.   ___12-13 yrs.   ___ 14 yrs.

DIRECTIONS: Please read the following questions and mark the answer that most appropriately applies to your child. *Please select only ONE answer for each question, unless stated otherwise.*

1. Where does your child place on the autism spectrum does the child have:
   ___ Autism
   ___Asperger Syndrome
   ___Childhood disintegrative disorder
   ___Rett Syndrome
   ___Pervasive development disorder

2. Has your child participated in any type of virtual environment program?
   ___ No   ___ Yes   If so, which one?:_____

3. If your child uses virtual environments:
   a. How often would you say he or she interacts?
      ___Daily   ___Bi-Daily   ___Weekly   ___ Biweekly   ___ Monthly   ___Once a year
      ___N/A

   b. Which interaction does your child seem the most comfortable with?
      ___Virtual Environments   ___ Face-to-Face   ___N/A

4. Rate your child's anxiety level during interactions (either in-person or virtually):

Minimum Anxiety= 0   1   2   3   4   5=Maximum Anxiety

5. Based on your observations, rate your child's comfort level during face-to-face interactions:
Very Uncomfortable=0   1   2   4   4   5=Very Comfortable

Appendix C

Behavioral Assessment for Children (BASC)

Participant Number:_____

BEHAVIOR ASSESSMENT SYSTEM FOR CHILDREN (BASC): TEACHER/PARENT RATING SCALE

The BASC-TRS and BASC-PRS are parallel behavior rating scales that measure both adaptive and problem behaviors experienced in school (TRS), home and community (PRS).
Administration Information:
Respondent: __ Teacher, _____; _ Parent, ____; Date ___; In: _ English, _ Spanish; _Other ___;
Modifications:
Comment on Validity of this Report (F-Index, L-Index, V-Index):

CLINICAL SCALES - Results:

Descriptions	Very Low		Low	AVERAGE			"At Risk"		Clinically Significant	
Percentile Scores	0.4th	2nd	9th	25th	50th	75th	91st	98th	99.6th	99.9th
Externalizing Problems										
Hyperactivity										
Aggression										
Conduct Problems										
Internalizing Problems										
Anxiety										
Depression										
Somatization										
School Problems										
Attention Problems										
Learning Problems										
Atypicality										
Withdrawal										
Behavioral Symptoms Index										
Standard Scores: 50 Average	23	30	37	43	50	57	63	70	77	84

Pattern Analysis:

Maladaptive (Problem) Behaviors			
	Composites	*Scales*	*Hypotheses Regarding Pattern(s)*[consider signif .items]
"At Risk"			
Clinically Significant			

Narrative Description of Reported Maladaptive (Problem) Behaviors:

ADAPTIVE SCALES - Results:

Descriptions	Clinically Significant		"At-Risk"		AVERAGE			High		Very High
Percentile Scores	0.04th	0.4th	2nd	9th	25th	50th	75th	91st	98th	99.6th
Adaptive Skills										
Adaptability										
Social Skills										
Leadership										
Study Skills										
Standard Scores: 50 Average	17	23	30	37	43	50	57	63	70	77

Pattern Analysis:

Strengths		
	Subtests	*Hypotheses Regarding Pattern(s)*
Normative (High or Very High)		
Relative (compared to AS)		
Weaknesses		
	Subtests	*Hypotheses Regarding Pattern(s)*
"At Risk"		
Clinically Significant		
Relative (compared to AS)		

Narrative Description of Reported Adaptive Behaviors:

Appendix D

Confederate Script

COM 345: NEW MEDIA AND HEALTH

EXPERIMENT: CONFEDERATE SCRIPT

CONFEDERATE: "Hello, I'm ___name___! What is your name? You can type it using the keyboard in the local chat."

PARTICIPANT: *Wait for response*

CONFEDERATE: "Hello, ___name___. I have a story here called "Grover's 10 Terrific Ways to Help Our Wonderful
             World". Have you ever heard of this book before?"

PARTICIPANT: *Wait for response*

CONFEDERATE: "That's wonderful! Do you want to hear it now?"

PARTICIPANT: *Wait for response*

CONFEDERATE: "Great! During the story you can stop and ask me any questions or comments by typing in the same local chat, okay?"

        Begin reading story. Be sure to show the child the pictures as you go along. Remember to look at the
        child as you read the story. Below are some possible questions for each page that you can ask the child
        to generate interaction:

Pages 1 and 2 Questions:

1.   Have you ever seen a rainbow that big!? If yes, where and when have you seen one that big?

Pages 3 and 4 Questions:

1. Do you live near any mountains or deserts? How about rivers or lakes?
2. Have you ever seen any of these?
3. Would you like to visit or live near any mountains or deserts?

Pages 5 and 6 Questions:
1. Can you think of some things that we get from our world to eat?
2. Do you like it when it's sunny or when it's rains? Why?

Pages 7 and 8 Questions:

1. Before we read about it, what do you think are going to be some of the ways we can help take care of the world?
2. Have you ever done anything to help take care of the world?
3. Number 1 says "Plant a tree". Would you ever plant a tree?
4. Why do you think all the people, animals, and plants need each other?
5. Where do you think you would plant your tree?
6. What kind of tree would you plant?
7. Do you know how to plant a tree?

Pages 9 and 10 Questions:

1. What do you think the second way to help our world is going to be?
2. Number 2 says "Protect our animal friends". How can you protect all of the animals?
3. Which animal to you love and would protect first?
4. Which animal to you not like? Why?
5. Have you ever protected an animal before? What kind was it? What did you do? What happened after you protected it?

Pages 11 and 12 Questions:

1. Number 3 says "Fix broken things". Have you ever fixed anything broken? How did it break? What did you do to fix it?
2. What do you think would be the hardest thing to fix?
3. Would rather fix something or just buy a new one?
4. Are you really good at fixing things? Why/Why not?
5. Where did you learn how to fix things?
6. Bert has a clock. Have you ever fixed a clock before?
7. When you grow up do you think you want to fix things as your job?

Pages 13 and 14 Questions:

1. Number 4 says "Do not waste water". Do you think you ever waste water?
2. How can you stop wasting water?
3. How many times do you use water a day? Do you think this is a lot of times?

Pages 15 and 16 Questions:

1. Do you know what energy is? What?
2. Do you watch a lot of TV?
3. If you're not watching TV, do you turn it off or leave it on?
4. Does someone always have to remind you to turn off the light or do you remember yourself?
5. Which do you like using better cold water or hot water? Now that you know cold water is better for the world, do you think you're going to start using it more?
6. What other things use energy? Does the computer? Radio? Telephone?

Pages 21 and 22 Questions:

1. Do you like to re-use things?
2. What have you re-used or recycled for something else?
3. Have you ever made a project using old things?
4. Would you want to plant seeds and grow something?
5. What would you plant?
6. Bert collects buttons and paper clips? Do you collect anything? Why/Why not? What do you collect? When did you start collecting this item? Will you collect it forever?
7. Do you know anyone else who re-uses old things?

Pages 23 and 24 Questions:

1. Do you have anyone that you share with?
2. What kind of things do you share with people younger than you?
3. Does anyone share things with you?
4. What kind of things do they give you?
5. Why do you think it's a good idea to share things?
6. If you don't share your things you're finished with what do you do with it?
7. What do you like or not like about sharing?

Pages 25 and 26 Questions:

1. Do you bring your lunch to school? What do you bring it in?
2. What do you have in your house that can be used over and over again?

Pages 27 and 28 Questions:

1. When you see trash on the ground do you pick it up? Why/Why not?
2. Why do you think people litter?
3. Can you think of some ways we can stop people from littering?
4. Do you know anyone, like your family or friends, who litter? What do you say when you see them litter?
5. Have you ever heard of community clean up day in your town?
6. Would you ever start a community clean up day?
7. Do you know what happens to the world when people litter? Explain.

Pages 29 and 30 Questions:

1. Do you and your family recycle?
2. Why do you think it is important to recycle?
3. What types of things can be recycled?
4. Do you recycle in school?
5. What can you do to help your friends recycle?

6. Do you think your friends would help you recycle the same way Grover's friends helped him?

End book.

CONFEDERATE: "Did you like that story? Why/why not?"

PARTICIPANT: *Wait for response*

CONFEDERATE: "Can you think of any other ways you could help the world?"

PARTICIPANT: *Wait for response*

CONFEDERATE: "Do you think you're going to go and tell our family and friends all of the different ways they can help the world? Do you think that they'll help you?"

PARTICIPANT: *Wait for response*

CONFEDERATE: "Well it was very nice meeting you ___name___! I'm glad that you came and listened to my story today.   I hope that you had a great time. I must go read the story to more kids so they can help the world too!
I will talk to you soon. Don't forget to ___insert of the ten ways to help the world___!"

PARTICIPANT: *Wait for response*

CONFEDERATE: Exit the program so the child, speech pathologist, and parent know the experiment is over. Wait for instruction to re-enter the program and begin process again for new child. Continue this process until all participants have experienced the dialogue.