Spring 5-18-2018

Mental Health Practitioners Perceptions' of Presence in a Virtual Reality Therapy Environment for Use for Children Diagnosed with Autism Spectrum Disorder

Panagiotis Markopoulos
University of New Orleans, pmarkopo@uno.edu

Mental Health Practitioners Perceptions' of Presence in a Virtual
Reality Therapy Environment for Use for Children
Diagnosed with Autism Spectrum Disorder

A Dissertation

Submitted to the Graduate Faculty of the
University of New Orleans
in partial fulfillment of the
requirements for the degree of

Doctor of Philosophy
in
Counselor Education

by

Panagiotis Markopoulos

B.A. & M.A. National and Capodistrian University, Athens/Greece, 2007
B.A. Western Kentucky University, United States, 2008
M.A. Eastern Kentucky University, United States, 2012

May 2018

Dedication

I dedicate my dissertation research work to my parents, as well as to the autism research. Special feelings of gratitude to my beloved parents Aggelo and Eleftheria Markopoulou for their unconditional love and support. Without your love and ongoing courage, I would not have been able to make it so far. You both taught me how to be a humble person, kind to others, never give up in life, and always be optimistic. I love you, mom and dad.

I also dedicate this dissertation work to Dr. Roxane L. Dufrene for chairing my research study. Thank you for your ongoing hard work, mentorship love, believing in me and my research, as well as for taking the time to teach me how to become a researcher. I will always be grateful to you.

Lastly, I dedicate this work to Dr. Bianca M. Puglia for her non-stop mentorship, love, wisdom, and for helping me to become the good clinician I am today. I will always be grateful to you.

Acknowledgments

Thank you to all my friends for your love,
support and encouragement. I will be forever grateful.
Thank you to my faculty committee members Drs. Ann M. O'Hanlon
and Zarus E. Watson for your time, feedback and ongoing guidance.

Table of Contents

List of Tables

List of Figures

Abstract

Children with autism spectrum disorder (ASD) think and understand social contexts primarily from a visual stand point. Feelings of being present in their social environment are a key component to their development (Strickland, Marcus, Mesibov, & Hogan, 1996). A virtual reality environment (VRE) can provide a therapeutic setting for children with ASD to learn social skills (Ehrlich & Munger, 2012). In the present research, a pilot study was used to assess the validity of a Second Life VRE developed by the researcher (Markopoulos, 2016b) by comparing the VRE to a real life film by The National Autistic Society (2016) in the United Kingdom. Feedback from the pilot study was used to make revisions to the VRE. The validated virtual reality therapy environment (VRTE) was used in the main research study. Twenty-eight Louisiana mental health practitioners' perceptions of the VRTE were assessed using two random order conditions. Condition A required participation in the VRTE twice, first using a laptop computer only and then using the laptop with the new 2016 Oculus Rift head-mounted display (HMD, Oculus VR, LLC, 2016). Condition B required participation in the VRTE twice, first using a laptop with the new 2016 Oculus Rift HMD and then using a Laptop alone. Four out of eight subscales from the Temple Presence Inventory (TPI) (Lombard, Weinstein, & Ditton, 2011) were used to assess practitioners' perceptions of presence in the VRTE. Results of a repeated-measures MANOVA showed that the order of the conditions were not significantly different. Additionally, participants' TPI total and subscales scores were significantly higher when using the HMD than when using the Laptop, as well as their likelihood of using the HMD with children diagnosed with ASD than using the Laptop. All of the correlations for participants' age and experience with technology were insignificant except for the subscale III, engagement was significant for participants' age.

Keywords: Autism spectrum disorder, therapy, virtual reality environment, head-mounted display, temple presence inventory, presence

Chapter I

Introduction

According to Christensen et al. (2016), approximately 1 in 68 children in the United States have been diagnosed with Autism Spectrum Disorder (ASD). Boys are five times more likely to be diagnosed with ASD (1 in 42) than girls (1 in 189). In addition, an ASD diagnosis occurs in all ethnic, racial and/or socioeconomic groups, by being more prevalent among White children than African American or Hispanic children. ASD was first clinically defined in 1801 by Jean-Marc-Gaspard Itard, a French physician and author of "The Wild Boy of Aveyron" (Lieberman, 1982). One hundred years later, *autism* was coined by a Swiss psychiatrist, Eugen Bleuler, to describe a schizophrenic patient who was profoundly withdrawn. In 1943, Leo Kanner further described autism, what is now known as ASD, as a more distinct syndrome than schizophrenia followed by Hans Asperger's studies in 1944, in which he described children as autistic (Martin, 2012).

It was not until 1968 when ASD appeared in the American Psychiatric Association's (APA) Diagnostic and Statistical Manual of Mental Disorders II (DSM-II) as a category under the code of 295.8 Schizophrenia, Childhood. In later editions of the DSM, the definition of and classification of ASD were continually revised. In the latest 2013 DSM-5 edition (APA, 1994 & 2000), the five categories of ASD [i.e., Autistic Disorder, Asperger's Disorder, Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS), Rhett's Disorder, and Childhood Disintegrative Disorder] listed in the DSM-IV and DSM-IV-TR, code 299.00 were merged into a single category; ASD, code 299.00. According to the National Institute of Neurological Disorders and Stroke (2015), ASD is characterized by a person's persistent difficulties with social-emotional, communication, and behavioral interactions; problems forming, sustaining, and understanding relationships in a social context; as well as restrictive and repetitive patterns of behaviors.

Mental health practitioners use many traditional social skills treatment approaches when providing therapeutic interventions to children and adolescents diagnosed with ASD; such as cognitive behavioral therapy (CBT), social skills training, and applied behavior analysis (ABA). During the last 15 years, technology and its use as a treatment method for children and adolescents diagnosed with ASD has increased. Virtual reality environments (VREs) have become one of the new treatment approaches that use technology. According to Rizzo, Parsons, Kenny, and Buckwalter (2012); a VRE is a three-dimensional (3-D) immersive stimulus environment used to assess and intervene with children's social and behavioral difficulties (i.e., forming, sustaining and understanding relationships).

Over the past few years, attempts have been made by mental health practitioners and educators to use VREs with head mounted devises (HMDs) when treating children diagnosed with ASD, with the ultimate purpose to increase the sense of immersion (i.e., presence) in a VRE. Past attempts have shown that HMDs have caused temporary cyber-sickness including symptoms of headaches, nausea, loss of balance, eyestrain, or other difficulties (Parsons, Mitchell, & Leonard, 2004; Wang & Reid, 2011). As a result, research has focused on VREs without the use of HMDs. For example, in 2012, Ehrlich and Munger used a HMD in conjunction with a VRE to teach social skills to children diagnosed with ASD. Their research involved assessing how realistic (i.e., immersive) a VRE was to children and to study how *present* children felt in the VRE. Ehrlich and Munger (2012) noted that previous research with earlier HMD models was not successful because participants experienced headaches and eyestrain from the HMDs and they complained of poor viewing angles and annoying latency (also known as lag) times. Ehrlich and Munger hoped that the 2012 Oculus Rift HMD would be more effective, but their results showed that while a few children did complete the tasks using the 2012 HMD, several children also experienced difficulties following directions while wearing the HMD. The authors suggested that more research is needed with advanced technology.

Purpose of Study

Children with ASD think and understand social contexts from primarily a visual perspective. Feelings of being present in their social environment is a key component to their cognitive, emotional, and behavioral development (Strickland, Marcus, Mesibov, & Hogan, 1996). Mental health practitioners provide services to children diagnosed with ASD. Practitioners use various forms of therapeutic interventions when working with children diagnosed with ASD to assess and assist children in their social-emotional and behavioral development (Batool & Ijaz, 2015; Beeson, & Jones, 2015; Berard, 1993; Coulter, 2009; Field, Beeson, & Jones, 2015; Flippin, Reszka, & Watson, 2010; Gutstein, Burgess, & Montfort, 2007; Karim-Abdel & Mohammed, 2015; Laugeson, Ellingsen, Sanderson, Tucci, & Bates, 2014; Rogers & Dawson, 2010; Rubin, Prizant, Laurent, & Wetherby, 2013; Schoen, 2003; Skinner, 1957). A VRE is an advanced technology that can provide a therapeutic intervention to assist children with ASD, where they can learn how to develop their social-emotional and behavioral abilities by communicating and interacting socially (Ehrlich & Munger, 2012). As noted by Rizzo et al. (2012), a VRE can assess and intervene with children's social-emotional and behavioral difficulties such as those children diagnosed with ASD. However, as found by Ehrlich and Munger (2012), more research is needed with VREs and the technology used with VREs.

The purpose of the present research was to assess mental health practitioners' perceptions of a virtual reality therapy environment (VRTE) developed by the researcher in a Second Life (SL) virtual reality platform (Markopoulos, 2016b). Two conditions were used; Condition A required participants' participation in the VRTE using a Laptop only, then using the new 2016 Oculus Rift HMD with the laptop (Oculus VR, LLC, 2016). Condition B required participants' participation in a VRTE using the new 2016 Oculus Rift HMD with the laptop first, then using a Laptop only.

Significance of the Study

Various traditional counseling interventions have been used with children and adolescents diagnosed with ASD, including common approaches; such as CBT (Field et al., 2015), ABA (Schoen, 2003), as well as the Program for the Education and Enrichment of Relational Skills (PEERS, Laugeson et al., 2014), Start Denver Model (SDM, Howlin, 2011), Sensory Integration Program (Karim-Abdel & Mohammed, 2015), Picture Exchange Communication System (PECS, Flippin et al., 2010), Speech-Language Therapy (Batool & Ijaz, 2015), and Auditory Integration Therapy; a digital technology approach by Dawson and Watling (2000). Since the 1990's, a new era of research has evolved where technology is used in a VRE as a treatment intervention with individuals diagnosed with various mental health concerns. The main purpose of a VRE is to create a 3-D immersive stimulus environment for clinical assessments and treatment interventions with individuals who experience emotions such as fear, anxiety, phobias, Post-Traumatic Stress Disorder (PTSD) or motor impairments (Linden Research, Inc., 2016; Rizzo et al., 2012). According to Parsons and Mitchell (2002) and Stendal, Balandin, and Molka-Danielsen (2011), virtual worlds can provide an environment in which individuals diagnosed with high functioning ASD can socially interact and learn to stay engaged in a simulated safe environment, by ultimately enhancing their social and communication skills.

A limited amount of research exists using VREs and HMDs with children diagnosed with ASD. Wallace et al. (2010) reported that previous studies, such as Strickland et al.'s studies in 1996 and 1998, exposed children with ASD to an immersive VRE using a HMD; however, due to the sensory deficits reported by the children, restrictions were placed on the use of HMDs. Thus, research has mostly focused on VREs without the use of HMDs. Later research by Wallace et al. (2010) conducted without a HMD in which children diagnosed with ASD were exposed to the Blue Room project, a screened space where various animations (e.g., residential street and school scenes) were projected onto the walls, the children reported significant levels of presence and attending behaviors in the scenes. However, children who were passive observers of the scenes (i.e., looking outside of a window) were limited in their VRE interactions. Wallace et al. reported that cost effectiveness of their technology and concerns of utilization by educational programs were limitations in their study. Ehrlich and Munger (2012) in their latest research, used a VRE and the 2012 Oculus Rift HMD to assess how realistic (i.e., immersion and presence) the VRE was to children. The ultimate goal was to help children stay engaged in the VRE and learn social and communication skills. The results showed that while a few children did complete the given tasks, several children had problems following directions, and experienced headaches, eyestrain, nausea, and high latency effects (i.e., delay in technology transfer of data), while wearing the HMD.

Since 2012, VREs with HMDs have not been used in research with children diagnosed with ASD. With Oculus VR, LLC's (2016) new Rift HMD, the company hopes for positive outcomes including; high presence (i.e., immersion) in a VRE, low-latency with greater sensation of presence, and less cyber-sickness (i.e., less headaches, nausea, eyestrain, etc.). The new HMD provides also a 360 degrees' sensor tracking system that records a user's movements and translates those to the VRE. Additionally, no research has been conducted from mental health practitioners' perspectives regarding the viable use of a VRE with children diagnosed with ASD. For the present research study, the primary goal is to use a VRTE developed by the researcher (Markopoulos, 2016b) to assess mental health practitioners' perceptions of their presence in a VRTE and their likelihood of using a VRTE in therapy with children diagnosed with ASD.

Cognitive Development Theory

In the present research study, Piaget's cognitive development theory (CDT) was used as the conceptual framework. In 1936, Piaget's CDT was introduced as a stage theory that focuses on the development of human intelligence from childhood to adulthood. Piaget believed that children gain knowledge from facts when people communicate in social settings (Feldman, 2008). While Piaget's theory assumes that children progress from one cognitive developmental stage to another at the same sequence, children do so at different rates (Slavin, 2005).

According to Piaget, a child's stages of cognitive development begin with the sensorimotor stage from birth to 2 years old, when a child differentiates self from others. In this stage, the main goal is for a child to reach *object permanence* (i.e., knowing that an object still exists, even if hidden). The second stage, preoperational, is from 2 to 7 years old, when a child learns to use language to understand that objects represent images and words. At this stage, the child starts to think about an object and uses a word that symbolizes the object, *symbolism*. The third stage, concrete operational, occurs at the age of 7 to 11 years old when a child can think logically about objects and events. The last stage is the formal operational stage, from 11 years old to adulthood, when a child or adult can think logically about abstract propositions and test hypotheses in a systematic way (Feldman, 2008).

Piaget (1952) viewed a child's intellectual and biological development as an adaptation (i.e., adjustment) and organization process to the world. Piaget believed that for a child to acclimate to an environment, he or she has to first adapt to mental and physical stimuli. Adaptation occurs when a child experiences cognitive conflict. When cognitive conflict occurs, a child perceives the world in one way in comparison to what actually is experienced (Piaget, 1952). During the adaptation process, a child's schema becomes more sophisticated as the child's motor capabilities are increased and behaviors are changed based on the new knowledge the child gains. "Schema is coördinated with all the other schemata and itself constitutes a totality with differentiated parts. Every act of intelligence presupposes a system of mutual implications and interconnected meanings" (Piaget, 1952, p. 7). Schemata are the basic building blocks of knowledge related to behaviors that assist a child in interpreting and understanding the world around them. Schemata tend to be simple during the infancy stage then become more complicated and sophisticated as a child gets older. As a child's cognitions progress, new schemas are developed and existing ones organize to adapt to new information (Feldman, 2008).

A child seeks a state of equilibration, when he or she is able to understand new information through assimilation and accommodation. Assimilation and accommodation are parts of the adaption process. During cognitive conflict, assimilation occurs when a child understands and processes a specific experience based on his or her current cognitive stage. Accommodation occurs when a child, due to new concepts and experiences, changes his or her way of processing, thinking, understanding, and behaving (Piaget, 1952).

Counseling application of CDT. Since its inception, Piaget's theory has been used as an essential framework for mental health practitioners and educators to understand children's cognitive development. CDT assists mental health practitioners and educators to more effectively communicate with children who need mental health services (McLeod, 2015). Additionally, from a therapeutic standpoint, CDT can assist mental health practitioners how to understand and provide effective counseling services to children with ASD, based on each child's cognitive stage of development. Whitelaw (1982) highlighted the importance of each counselor understanding of Piaget's theory and knowing how to effectively implement his theory into practice with clients. One of the important aspects that the author stressed is that counselors should be aware of the stage of intellectual growth that a child has reached. Other authors, such as Ivey and Ivey (1988), emphasized that the ultimate goal of Piaget's theory is to foster a child's cognitive development. The authors described Piaget's cognitive stages, and how essential it is for counselors to be able to assess a child's current cognitive stage. Additionally, knowledge and application of Piaget's theory in mental health treatment with a child is essential for treatment planning, as well as helping counselors to effectively communicate with a child (e.g., if a child talks and processes in the concrete stage, the counselor should also be able to approach the child based on the child's current stage of development).

In school settings, Myers, Shoffner, and Kielty (2002) discussed the importance of school counselors helping children to construct knowledge and understand their environment. To achieve this goal, the authors encouraged counselors to implement in their practice an understanding of Piaget's theory to provide specific treatment needs to each child and use interventions that address the presenting problem. Assessing the child's current intellectual growth is important and can assist counselors in infusing techniques that can be useful and understandable by the child and for the child to be able to progress from one cognitive stage to the next stage.

Problem Statement

Over the last 15 years, advanced technology and VREs are more available and widespread in society. Beginning in the US Air force, VREs were first used in the form of flight simulators (Gigante, 1993). Then, VREs spread to secondary educational systems, such as the ECHOES project, a 3-D multi-modal computer-based virtual learning environment (Porayska-Pomsta et al., 2012), to classrooms in universities and professional/research conferences (Stendal et al., 2011), as well as in clinical and research settings, such as the Blue Room project (Maskey, Lowry, Rodgers, McConachie, & Parr, 2014).

In recent years, VREs were used to assess and intervene with children's social-emotional and behavioral difficulties in forming, sustaining, and understanding relationships (Rizzo et al., 2012). The main goal of VREs is to create a 3-D immersive learning environment to assist individuals who experience social and behavioral deficits. The latest research using a VRE and a HMD (i.e., Oculus Rift 2012) was by Ehrlich and Munger (2012). The authors' main goal was to teach children with ASD social and communication skills, as well as assess how realistic (i.e., immersive and present) the VRE was for the children. However, their research indicated that while a few children with ASD completed the tasks depicted in the VRE, several children had difficulties following the directions in how to use the technology, thus more research was needed using VREs and HMDs. Additional research from various mental health practitioners regarding their use of a VRTE and a HMD has not been conducted.

For the present study, a VRTE was developed by the researcher using the SL virtual reality platform (Markopoulos, 2016b) to be used by mental health practitioners as a treatment approach when working with children diagnosed with ASD. The new 2016 Oculus Rift HMD (Oculus VR, LLC, 2016) was used in the study. As of this date, the VRTE and the 2016 Oculus Rift HMD have not been used in a research study. The goal of the present research was to assess mental health practitioners' perceptions of presence in the VRTE. Two conditions were used in the study. Condition A required participation in a VRTE using a Laptop computer only, then using the new Oculus Rift HMD with the Laptop, and Condition B required participation in a VRTE using the new 2016 Oculus Rift HMD with the laptop first, then using a Laptop only (Oculus VR, LLC, 2016).

Overview Methods and Research Questions

Overview of Methods

The present research study was conducted in two phases. The first phase was a pilot study that occurred from June 1 to August 19, 2016. The purpose of the pilot study was to establish validity of the VRTE by comparing the SL VRE video developed by the researcher (Markopoulos, 2016b) to the film, "Can you Make It To The End?" by The National Autistic Society (2016). Selection of participants was based on a convenience and purposeful method of sampling.

The second phase, the main research study, occurred from January 1, 2017 to July 31, 2017. A quasi-experimental, within-subjects, repeated-measures MANOVA research design was used. Selection of participants was based on a convenience and purposeful sampling of mental health practitioners in Louisiana. Participants were exposed to one of two random order conditions; Condition A required participation in an approximately 5-minute VRTE using a Laptop first, then the 2016 Oculus Rift HMD with the laptop. Condition B required participation in an approximately 5-minute VRTE using the 2016 Oculus Rift HMD first, then a Laptop only.

Research Questions

This study included four research questions:

1. Is there a significant difference in mental health practitioners' likelihood of using VRTE with children diagnosed with ASD and their perceptions of presence in the VRTE using two conditions (i.e., Condition A, first experiencing the VRTE using the Laptop, then the HMD or Condition B, first experiencing the VRTE using the HMD first, then Laptop)?
2. Do mental health practitioners' demographic factors (i.e., age and years of experience and/or knowledge working with children diagnosed with ASD) correlate with their perceptions of presence in the VRTE when using the Laptop and the Oculus Rift HMD [i.e., TPI total scores and four subscales for spatial presence, social presence-actor within medium (i.e., parasocial interaction), engagement (i.e., mental immersion), and social realism]?
3. Is there a significant relationship between mental health practitioners use of technology (i.e., number of years using technology, hours spent using technology, and years of experience playing online games) and their perceptions of presence in the VRTE when using the Laptop and the Oculus Rift HMD [i.e., TPI total scores and four subscale scores for spatial presence, social presence-actor within medium (i.e., parasocial interaction), engagement (i.e., mental immersion), and social realism]?
4. Is there a significant relationship between mental health practitioners' number of times they used interactive virtual technology and years of experience using technology in therapy with children diagnosed with ASD and their perceptions of presence in the VRTE when using the Laptop and the Oculus Rift HMD [i.e., TPI total scores and four

subscales: spatial presence, social presence-actor within medium (i.e., parasocial interaction), engagement (i.e., mental immersion), and social realism]?

Limitations and Delimitations

The present research had five anticipated limitations. First, participants' self-report of their use of technology and their knowledge and professional experience when working with children diagnosed with ASD could be a limitation. According to Creswell (2014), self-report by participants are prone to response biases, such as responding in a way that is socially desirable or makes participants appear good. The second limitation involved participants' comfort level while wearing the Oculus Rift HMD as found in Ehrlich and Munger's (2012) study. The third limitation was the reliability and validity of the Temple Presence Inventory (TPI). The TPI has been used and tested in a gaming and media environment with college students without a diagnosis of ASD (Lombard, Weinstein, & Ditton, 2011); however, the present research was focused on a different participant population, mental health practitioners viewing a VRTE and the Oculus Rift. The fourth limitation involved the internal consistency and reliability of the TPI subscales. Lombard et al. (2011) used all eight TPI's subscales; however, for the purpose of the present study only four subscales (i.e., spatial presence, social presence-actor within medium [i.e., parasocial interaction], engagement [i.e., mental immersion], and social realism) were used. The fifth limitation involved the researcher's design of the VRTE. While the validity of the VRTE was assessed in the pilot study, the VRTE has not been used in prior studies. A last limitation was that in the pilot study no significant findings were found; however, participants' mean ratings at the second part of the pilot study were higher.

Three delimitations were in the present research study. First, participation in this study was delimited to mental health practitioners (master's or doctoral) who live in Louisiana and who identified as a provisional licensed professional counselor (PLPC), licensed professional counselor (LPC), licensed psychologist, psychiatric doctor (MD), licensed clinical social worker (LCSW), licensed clinical social worker-BACS (LCSW-BACS), licensed master social worker (LMSW), registered social worker (RSW), or licensed applied behavior analyst (ABA). Second, the study was delimited to examining mental health practitioners' perceptions of a VRTE compared to their perceptions of a VRTE using the Oculus Rift. Third, the results of the present study were generalizable to mental health practitioners with reported working knowledge with children diagnosed with ASD.

Assumptions of the Study

Anderson (2015) reported that 73% of adults who reside in the United States own a desktop/laptop computer, 68% own a smart phone, 45% own a tablet computer, and 40% own a gaming console. For young adults ages 19 to 29, 78% own a computer/laptop and 56% own a gaming console. Based on Anderson's study of adults who use technology, the first assumption made in the present study was that participants had knowledge of technology. A second assumption was that participants felt comfortable using technology. A third assumption was that all four TPI's subscales were reliable. A fourth assumption was that participants would report higher likelihood of using the Oculus Rift HMD in the VRTE in treatment with children diagnosed with ASD, versus lower likelihood of using the laptop in the VRTE in treatment with children diagnosed with ASD.

Definition of Terms

Avatar

An avatar is "a graphical representation of the user or the user's alter ego or character" (Lessing, 2000, p. 15). An avatar comes in two forms; as a 3-D form in virtual worlds or online gaming platforms (e.g., SL, world craft, The Sims, etc.) or a 2-D form as an icon (i.e., a graphical representation of an online bot that helps the user to navigate through a mobile device or a computer system) (Fink, 1999).

Engagement

In a VRE, engagement, also referred to as *involvement*, and *psychological immersion*, is defined as "when part or all of a person's perception is directed towards objects, events, and/or people created by the technology, and away from objects, events, and/or people in the physical world. Note that the person's perception is not directed toward the technology itself but the objects, events and/or people the technology creates" (International Society for Presence Research, 2000, Presence defined, para. 7d).

Head-Mounted Display

A head-mounted display (HMD), also referred to as *virtual reality goggles*, *virtual goggles*, *virtual glasses*, or a *Oculus Rift*, is a device that attaches to a person's head, which uses a liquid crystal display (LCD) panel to project images directly to the person's eyes and peripheral vision. To ensure full immersion into a VRE, a HMD uses head and eye tracking technology. A built-in headphone and audio system can be included with a HMD (Virtual Reality Society, 2016).

Latency

In a computer environment, latency is defined as "the delay before a transfer of data which begins following an instruction for its transfer" ("Latency", 2015).

Mental Health Practitioners

For the purpose of this study, mental health practitioners are those who are licensed in a mental health field in Louisiana (i.e., provisional licensed professional counselor, PLPC;

licensed professional counselor, LPC; licensed psychologist; psychiatric doctor, MD; licensed clinical social worker, LCSW; licensed clinical social worker-BACS, LCSW-BACS; licensed master social worker, LMSW'; registered social worker, RSW; or licensed applied behavior analyst, ABA).

Oculus Rift

The Oculus Rift is a virtual reality head-mounted display (HMD) that includes a sensor, remote, cables, and Xbox One controller. The Oculus Rift HMD was developed and manufactured by Oculus VR, LLC (2016).

Presence

In a VRE, presence, a shortened version of the term *telepresence,* is defined as "a psychological state or subjective perception in which even though part or all of an individual's current experience is generated by and/or filtered through human-made technology, part or all of the individual's perception fails to accurately acknowledge the role of the technology in the experience. Except in the most extreme cases, the individual can indicate correctly that s/he is using the technology, but at *some level* and to *some degree*, her/his perceptions overlook that knowledge and objects, events, entities, and environments are perceived as if the technology was not involved in the experience" (International Society for Presence Research, 2000, Presence defined, para. 1).

Second Life

According to Linden Research, Inc. (2016), Second Life (SL) was launched in 2003 by Linden Lab. SL is a three-dimensional (3-D) online VRE platform. Linden Lab was founded in 1999, and its headquarters is located in San Francisco, California.

Sensory Processing Disorder

Sensory processing disorder is an interruption in the organization of sensory input that impacts children's social behaviors, as well as the way they play and learn throughout their development (Walbam, 2014).

Social Actor within the Medium

In a VRE, social actor within the medium and parasocial interaction, is defined as "when part or all of a person's perception fails to accurately acknowledge the role of technology in her/his perception that s/he is engaged in two-way communication with another person or people, or with an artificial entity (e.g., a computer "agent"), when the communication is in fact one-way, from the technology to the person without feedback from the person to the other entity(ies)" (International Society for Presence Research, 2000, Presence defined, para. 7e). Social actor within the medium is interconnected with social presence.

Social Presence

In a VRE, social presence, distinct from social realism, is defined as "when part or all of a person's perception fails to accurately acknowledge the role of technology that makes it appear that s/he is communicating with one or more other people or entities" (International Society for Presence Research, 2000, Presence defined, para. 7e). Social presence is interconnected with social actor within the medium.

Social Realism

In a VRE, social realism is defined as "when part or all of a person's perception fails to accurately acknowledge the role of technology that makes it appear that s/he is in a physical location and environment in which the social characteristic correspond to those of the physical world, i.e., s/he perceives that the objects, events, and/or people s/he encounters do or could exist in the physical world. Note that although technology-generated environments in which objects, people, and events act as they do in the physical world are more likely to evoke this, and perhaps other, type(s) of presence, it is the *perception* that the social characteristics of the technology-generated environment and those of the physical world correspond that defines this type of presence rather than the *actual* correspondence of the characteristics" (International Society for Presence Research, 2000, Presence defined, para. 7c).

Social Skills Training

Social skills training is a behavioral intervention that assists individuals in developing effective skills in communication, decision-making, and problem solving in relationships. Interventions take place in both special education and regular environmental settings (Institute of Education Sciences, 2013).

Spatial Presence

In a VRE, spatial presence, also referred to as *physical presence*, *sense of physical space*, *perceptual immersion*, *transportation*, and *sense of being there*, "occur when part or all of a person's perception fails to accurately acknowledge the role of technology that makes it appear that s/he is in a physical location and environment different from her/his actual location and environment in the physical world" (International Society for Presence Research, 2000, Presence defined, para. 7a).

Virtual Reality Environment

"The terms virtual reality environments (VREs), virtual reality worlds, virtual cockpits, and virtual workstations were used to describe specific projects…. In 1989, Jaron Lanier, CEO of VPL, coined the term virtual reality to bring all of the virtual projects under a single rubric.

The term therefore refers to three-dimensional (3-D) realities implemented with stereo viewing goggles and reality gloves" (Steuer, 1992, p. 5).

Virtual Reality Therapy Environment

Virtual reality therapy environment (VRTE) was developed by the researcher (Markopoulos, 2016b) using the SL online virtual reality platform. In the VRTE, participants were depicted in the form avatars. Each participant was the *Therapist* avatar who assisted a child avatar named *ASDchild* walk through the VRTE mall.

Virtual World

A massive multiplayer online world (MMOW) is commonly known as a virtual world. It is a simulated computer-based environment, where a person can create an avatar and explore a virtual world, by interacting and communicating with other avatars (computer users) and participating in various in-world activities (Bartle, 2003).

Chapter II

Literature Review

In Chapter II, the literature will include an introduction to the history of Autism Spectrum Disorder (ASD), including but not limited to the definitional changes in the Diagnostic and Statistical Manual of Mental Disorders, the clinical characteristics and symptoms of ASD, as well as the societal perception of ASD. In addition, the cognitive development theory as a framework in this study will be discussed in detail. Furthermore, the literature review will also focus on the traditional therapeutic interventions used with ASD and benefits, general implementation of technology in mental health, as well as advanced technological approaches used in mental healthcare, specifically related to social skills development of children with ASD.

The Birth of Autism: Then and Now

According to Lieberman (1982), in the 1800's a French physician, Jean-Marc-Gaspard Itard, highlighted the characteristics of what is now defined as ASD. Itard published a book, "The Wild Boy of Aveyron" was about a 12-year-old boy named Victor who lived in the forest since his early childhood. Victor's presenting issue was the social isolation he experienced living in the forest, which included speech impairment, lack of engagement in play, severe difficulties in communicating, selective attention to various sounds, and problems with memorization (Lieberman, 1982). Based on Itard's research with Victor, Lane (1995) suggested that Victor's behaviors were associated with those of a child diagnosed with ASD. According to Lane, a child with ASD has limited social communication and can experience major shifts in emotions; such as laughing to crying or calmness to aggression.

The word *autism* was derived from the Greek word *autos* (εαυτός), which stands for self. In 1910, the word autism first appeared in the medicine when the Swiss psychiatrist, Eugen

Bleuler described autism as a schizophrenic psychosis syndrome. Later, in Hinsie and Shatsky's (1948) psychiatric dictionary, autism was defined as a "phantasy thinking; a form of thinking, almost entirely of a subjective character; if objective material enters, it is given subjective meaning and emphasis" (p. 64). Additionally, "autism generally implies that the material is derived from the individual himself or herself, and it is often unconscious, appearing in the nature of daydreams, phantasies, delusions, hallucinations, etc." (Hinsie & Shatsky, 1948, p. 64). Arieti (1950) further noted that, "the concept of thought is largely endogenous. In classical instances of autistic thinking, such as occurs in schizophrenia, the unconscious sphere makes the largest contribution to autism" (p. 288). Historically, the term autism was often used to describe morbid self-admiration by an individual who presents with symptoms of social isolation, including isolation from self (Vatanoglu-Lutz, Ataman, & Biçer, 2014).

In child psychiatry, two important individuals, Leo Kanner and Hans Hasper followed Bleuler's earlier work on autism, now known as ASD. Kanner, an Austrian native and psychiatrist who immigrated to the United States in 1924 after War World I was a pioneer who developed the first child psychiatry services at Johns Hopkins Hospital in Baltimore, Maryland (Vatanoglu-Lutz et al., 2014). In 1943, Kanner studied 11 children who presented with difficulties in adapting to change, memory deficiencies, sensitivity to stimuli, and problems with social interactions. Kanner, in his paper entitled "Autistic Disturbances of Affective Contact" described autism as a more distinct syndrome versus a schizophrenia related syndrome (Vatanoglu-Lutz et al., 2014).

In 1944, Asperger, an Austrian pediatrician and medical professor, was the first to define the term *autistic*. Asperger, who studied medicine at the University Children's Hospital in Vienna identified behavioral patterns and abilities in four children (boys) with ASD as having "a lack of empathy, little ability to form friendships, one-sided conversations, intense absorption in a special interest, and clumsy movements" (Vatanoglu-Lutz et al., 2014, p. 429). Asperger noted that the four boys who were high functioning. As adults, the boys were very successful in their careers and were able to discuss in detail a particular subject they were very interested in.

Another important historic figure was Bruno Bettelheim, an Austrian native, who graduated with his doctorate degree from the University of Vienna in 1938 (Ekstein, 1991). He moved to the United States after War World I where he became a psychology professor at the University of Chicago. His research focused on the treatment of children with major illnesses including psychosis and ASD. Bettelheim wrote several books one of which became well known in 1967, "The Empty Fortress: Infantile Autism and the Birth of the Self," where he described effective treatment outcomes that he infused into his psychoanalytic approach and milieu therapy with three children who were presenting characteristics of ASD. Social and professional networks have since rejected Bettelheim's theory that ASD is caused by a child's over attachment to his or her mother along with other environmental factors (Severson, Aune, & Jodlowski, 2008).

Later in 1954, Bernard Rimland, who earned his doctorate in experimental psychology, conducted research based on his own son's obvious behavioral issues (Edelson, 2009). Rimland noticed that in many research articles mental health practitioners viewed ASD from a psychogenic theoretical point of view, whereas he believed that ASD was associated with biomedical and neurological issues (Edelson, 2009). His research focused on effective alternative treatment approaches for children with ASD. He was the founder of the Autism Research Institute in San Diego, California and the leader of Defeat Autism Now! (DAN!), a therapeutic treatment program, with special emphasis on mercury toxicity (Downing, 2007). In

1964, he published, “Infantile Autism: The Syndrome and Its Implications for a Neural Theory of Behavior” (Edelson, 2009). As a follow up to Rimland’s 1998 research, Wakefield (1999) hypothesized that a correlation existed between the measles-mumps-rubella (MMR) vaccine and ASD. However, in 2004, the linkage between the vaccine and ASD was retracted in Murch et al. (2004) research where they found no relationship between the MMR vaccine and ASD. Following Murch et al.’s (2004) study, in 2014 another study was published in the Vaccine Journal by Taylor, Swerdfeger, and Eslick, where no linkage was found between MMR vaccination, thimerosal, mercury and ASD.

DSM History of Autism

As a medical diagnosis, criteria for ASD began in the Diagnostic and Statistical Manual of Mental Disorders II (DSM-II, APA, 1968), which was coded under the 295.8 criteria, Schizophrenia, childhood type. In the DSM-II, autistic behaviors were described as atypical behaviors that cause schizophrenia and appear during puberty. Later, in the DSM-III (APA, 1980), ASD was defined as Infantile Autism (code 299.0x), with symptoms that lack “responsiveness to other people (autism), gross impairment in communicative skills, and bizarre to various aspects of the environment” where characteristics develop in the first 30 months of a child’s life and “… may be associated with known organic conditions, such as maternal rubella or phenylketonuria” (p. 87).

In the DSM-III-R (APA, 1987), ASD was further clarified as an Autistic Disorder and was listed under the major category of Pervasive Developmental Disorder (PDD), code 299.00. PDD was characterized as a “qualitative impairment in the development of reciprocal social interaction, of verbal and nonverbal communication skills, and in imaginative activity.” The diagnostic criteria for PDD included a “lack of awareness of the existence or feelings of others,

… no or abnormal social play, … difficulties in making friendships, … no or impaired imitation (e.g., does not waive bye-bye), … lack of imaginative activity, … persistent preoccupation with parts of objects, … [and] constant speech (saying the same word or sentence over and over again) (APA, 1987, pp. 38-39).

In APA's 1994 version of the DSM-IV (code 299.00) and the 2000 version of the DSM-IV-TR (code 299.00); ASD was described in the following five categories: 1) Autistic Disorder - characterized by social interaction, communication, and imaginative play impairments; 2) Asperger's Disorder - characterized by social interactions and impairments with no significant delay in language, with average to above average intelligence; 3) Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS), also referred to as Atypical Autism - characterized by not meeting the criteria for a specific diagnosis but with obvious severe or pervasive impairment in specified behaviors; 4) Rhett's Disorder - characterized by continuous hand movement that is progressive, usually beginning at the age of 1 to 4 years old; and 5) Childhood Disintegrative Disorder - characterized as a significant loss of acquired skills in language, social function, and motor skills, which could occur after the first two years of development.

In APA's 2013 current version of the DSM-5, all five ASD categories from the DSM-IV-TR were merged into one single category, code 299.00, titled as Autism Spectrum Disorder (ASD). In the new category, ASD is characterized by constant difficulties with social and behavioral interactions including but not limited to nonverbal communication, as well as forming, sustaining, and understanding relationships in a social context. One of the most common features of ASD is that a child is non-responsive, as well as non-engaged with his or her social surroundings. Additionally, an inability to focus is apparent and usually the child withdraws from his or her social environment (National Institute of Neurological Disorders and Stroke, 2015). Recently, the clinical community is moving towards using the International Statistical Classification of Diseases and Related Health Problems 10th revision (ICD-10) diagnostic coding manual, for both diagnosis and insurance billing purposes. Currently, the DSM-5 is used for diagnoses, while the ICD-10 is used for medical coding and insurance billing. For ASD, one of the differences between the DSM-5 and ICD-10 is that in the DSM-5, ASD is titled as Autism Spectrum Disorder, code 299.00, while in the ICD-10 ASD is titled Childhood autism, code F84.0, under the Pervasive Developmental Disorders (PDD) group, code F84.0 (World Health Organization, 2017).

Societal Perceptions of ASD

While the clarification of ASD has progressed throughout history from Bleuler's first description of ASD in 1910 as a schizophrenic psychosis syndrome, to Kanner's description in 1943 as a more distinct syndrome, to Asperger's term of Autistic in 1944 (Martin, 2012), and finally to the DSM-5 category of ASD in 2013 (APA); ASD also has been characterized by many social misperceptions and given various societal labels. According to Mor and Berkson (2003), societal stereotypes about ASD are based on individuals' perceptions of "…trait impressions that are influenced by physical characteristics and nonverbal behavior of others" (p. 351). Shatayermman (2009) believed that stigmatized people "…possess a quality that others perceive as negative, unfavorable, or in some way unacceptable" (p. 299). Stigmatized individuals present with different characteristics from the dominant social norm and are negatively evaluated by others in society (Jahoda & Markova, 2004). Examples of individuals who may be stigmatized based on others' impressions include someone wearing eye glasses or a person's body size or behavioral actions. Stigmatization can have a huge impact on the lives of individuals with mental health and developmental disabilities, especially when a person's characteristics are visible and troublesome to society (Shatayermman, 2009).

The ways that individuals respond to stigmatization are through verbal and nonverbal communication in their body language, physical distance, or other social interactions (Mor & Berkson, 2003). Lewis (1993, 1995) stated that children at the age of five start to distinguish if someone is disabled or not, which is mainly based on their observations (i.e., they can see if someone can walk or not). At the age of eight, children progress to making social comparisons, along with value judgments based on their experiences and attitudes they have toward others (as cited in Cunningham & Glenn, 2004). As adults, individuals' preconceived attitudes toward others are derived from their knowledge.

Individuals diagnosed with ASD can be stigmatized because their interactions and behaviors may appear unusual to others (Gray, 1993). Militerni, Bravaccio, Falco, Fico, and Parermo (2002) described how children with ASD appear different and have distracting behaviors (e.g., doing things in repetitive sequence), touching (e.g., breaching touch boundaries for animate and inanimate objects), tapping (e.g., repetitive tapping or touching objects), and self-injurious behaviors (e.g., hitting their head repeatedly). Such behaviors can stigmatize children and adults who exhibit these behaviors. Individuals with ASD who are stigmatized can experience difficulties in accepting self, viewing self in a lower position than others, or viewing self as not worthy of acceptance in society (Militerni et al., 2002). In addition, individuals who stigmatize others with ASD may also stigmatize parents of children with ASD because they believe parents SD were not good parents (Martz, 2004). An additional impact of stigmatization, in such instances as ASD, is when families experience "courtesy stigma" because of their relationship with a family member who has a certain disability (Gray, 1993, p. 104).

Characteristics of ASD

Age, Gender, and Ethnicity Characteristics

Age and its relationship with a diagnosis of ASD in children was researched by the Centers for Disease Control and Prevention (CDCP, 2007). In a 2000 assessment, the CDCP reported findings from six communities in six states (i.e., Arizona, Georgia, Maryland, New Jersey, South Carolina and West Virginia) that indicated an average of 6.7 children out of 1,000 had ASD symptoms (CDCP, 2007). In a later study by the CDCP (2002), 14 communities in 14 states (i.e., Alabama, Arizona, Arkansas, Colorado, Georgia, Maryland, Missouri, New Jersey, North Carolina, Pennsylvania, South Carolina, Utah, West Virginia, and Wisconsin) had an average of 6.6 children out of 1,000 with ASD symptoms (CDCP, 2007). Children in the above two studies were 8 years old who were receiving mental health services.

Based on the CDCP's (2007) findings, the Autism and Development Disabilities Monitoring (ADDM) Network was developed to provide consistent, reliable, and detailed data source regarding ASD. In a more recent report by Christensen et al. (2016) that was published on CDCP's website (https://www.cdc.gov/ncbddd/autism/data.html), approximately 1 in 68 children in the United States are diagnosed with ASD. In a comparison with the data between 2004 to 2005 and 2011 to 2012 by the U.S. Department of Education, National Center for Education Statistics (2015a, 2015b), the percentage of individuals whose ages ranged from 3 to 21, diagnosed with ASD, and enrolled in public school systems across the U.S. increased from .4% to .9%. According to Maenner et al. (2013), clinicians can diagnose a child with ASD starting at the age of 2; however, at the age of 3, ASD is more clearly diagnosable.

For gender, male children are 5 times more likely to be diagnosed with ASD when compared to female children (May, Cornish, & Rinehart, 2013). In a recent research study by

May et al. (2013), the authors measured gender differences among male and female children for attention and anxiety with those children who were diagnosed with high-functioning ASD. The results of their study yielded no gender differences except that males were more hyperactive in comparison to females who were more anxious in social settings. For race, White non-Hispanic children were 30% more likely diagnosed with ASD in comparison to non-Hispanic Black children, and 50% more likely in comparison to Hispanic children (The American Academy of Pediatrics, 2014).

Medical and Clinical Characteristics

Approximately 44% of the children who have been diagnosed with ASD have an average to above average intellectual abilities (Christensen et al., 2016). One of the most important characteristics of ASD is the distinction between verbal and non-verbal impairments that range from mild to severe (Frith, 1998). Mild impairment usually entails an individual's speech is almost fluent, though he or she presents with difficulties in syntax. Frith found that children diagnosed with ASD developed speech at a later developmental age than children diagnosed with ASD. Of the children diagnosed with severe ASD, 20% used very few words to communicate or they remained mute. Extreme sensitivity to sounds was another characteristic for children diagnosed with ASD.

Parents who have their first child diagnosed with ASD have a 2% to 18% chance that their second child will be diagnosed with ASD (Ozonoff et al., 2011; Sumi, Taniai, Miyachi, & Tanemura, 2006). Hallmayer et al. (2011), Rosenberg et al. (2009) and Taniai, Nishiyama, Miyahci, Imaeda, and Sumi (2008) found that often times in identical twins, when one of the children have been diagnosed with ASD, then there is a likelihood of 36% to 95% that the other child will present with clinical characteristics of ASD. If the children are not identical twins, the likelihood of the other child presenting with clinical characteristics of ASD is 0% to 31%. Additionally, Schendel and Bhasin (2008) found that children who are born prematurely or with low birth weight are at higher risk for presenting ASD clinical characteristics. DiGuiseppi et al. (2010) and Zecavati and Spence (2009) reported that 10% of the children with an ASD diagnosis have certain genetic or chromosomal conditions [e.g., down syndrome, fragile X syndrome (i.e., learning disabilities and cognitive impairment), tuberous sclerosis (i.e., genetic disease that causes non-cancerous tumorous in various part of the body)].

The characteristics of ASD described by Anckarsäter, Nilson, Saury, Ramstam, and Gillberg (2008) include developmental limitations in a child's social, communication, and behavioral interactions. In the DSM-IV-TR as described by Rodriquez, Thompson, Stocco, and Schlichenmeyer (2013), characteristics of ASD included "restricted and repetitive behavior (RRB)" (p. 242). ASD characteristics were described as constant difficulties in emotional-social and behavioral interactions that includes but not limited to nonverbal communication (e.g., lack of facial expression and/or eye contact and body language expression), as well as forming, sustaining, and understanding relationships in a social context (e.g., inability to form friendships, lack of imaginary play) (APA, 2013).

According to Tsatsanis (2004), individuals with high functioning ASD (HFA) have unique characteristics that include but are not limited to "visual discrimination, visual spatial processing, capacity to focus or sustain attention for static visual information, ability to immediately recall information of a rote nature, recall of discrete information versus more complex or conceptual information, associative learning (stimulus-response learning), and procedural learning (e.g., calculations, drawings)" (pp. 263-264). Challenges reported by individuals diagnosed with HFA included "expressive and receptive language, disengaging and/or shifting attention, making rapid changes to task expectations, [and] recalling information in the absence of contextual or semantic cues" (Huang & Wheeler, 2006, p. 111). Other characteristics of individuals who have HFA are an intelligence quotient (IQ) greater than 70, as well as no specific verbal or intellectual challenges.

Also, ASD is associated with comorbidity issues that are linked to an increase risk of an intellectual disability (Simonoff et al., 2008). In addition, biological issues such as epilepsy can co-occur in approximately 20% of individuals diagnosed with ASD during both early childhood and adolescent (Simonoff et al., 2008). May et al. (2013) stated that in a group of children diagnosed with ASD, 80% received special education services and 46% had an average or above average IQ (i.e., greater than 85). Also, other characteristics with children and adolescents diagnosed with ASD are high levels of anxiety and depression.

In a 2006 study, Ramachandran and Oberman stated that dysfunction of the neural system could explain the major clinical characteristics of ASD (i.e., social isolation and absence of empathy). In a previous study by Rizzolatti and his colleagues, they hypothesized that mirror neurons played an important role in an individual's ability to mentally surmise the intentions of observable actions by others (as cited in Ramachandran & Oberman, 2006). The ability of individuals to reach a level of mental awareness is known as the Theory of Mind (ToM). Mind-blindness is described as a cognitive disorder where individuals have difficulties in understanding or a lack awareness (e.g., emotions and intentions) of self or others (Gallagher & Frith, 2003). ToM provides a framework to conceptualize how individuals diagnosed with ASD are unable to identify and understand the feelings, behaviors, intentions, or thoughts of others. The mind-blindness theory proposes that components of normal cognitive development of mentalizing are not apparent in a child diagnosed with ASD. For example, a child with ASD may fail to point at or show objects that he or she is interested in or fails to comprehend make-believe play (Frith, 2001). Tager-Flusberg (2007) stated that little research has been conducted on whether the major symptoms of ASD are related to ToM.

Mahajnah et al. (2015) suggested that a way to examine a child for ASD characteristics is through clinical observation, testing, and questionnaires. Maenner et al. (2013) said that when diagnosing a child with ASD various screenings should entail observations of a child's behavior and testing of the child's cognition, language, speech, hearing, vision, and motor functions. In addition, parental interviews along with gathering medical and family history are part of the screening process. For a diagnosis of ASD, a referral from a primary care physician or mental health practitioner must be done.

Cognitive Development Theory as a Framework for ASD

Jean Piaget's (1896-1980) cognitive development theory (CDT) is a stage theory that focuses on the development of human intelligence from childhood to adulthood. Piaget believed that children gain knowledge from facts communicated by others (Feldman, 2008). Since its inception, Piaget's theory has been an essential tool for the mental health community and education to understand children's development and more effectively communicate with children (McLeod, 2015).

According to Piaget, a child's stages of cognitive development begin with the sensorimotor stage from birth to 2 years old, when a child differentiates his or her self from others. The main goal of the sensorimotor stage is for a child to reach the object permanence level, by understanding that an object still exists, even if the object is hidden. The second stage, preoperational is from 2 to 7 years old, when a child learns to use language to understand that objects represent images and words. At the preoperational stage, the child starts to think about an object and uses a word that symbolizes the object, symbolism. The third stage, concrete operational, occurs at the age of 7 to 11 years old when a child can think logically about objects and events. The last stage is the formal operational stage, from 11 years old to adulthood, when individuals can think logically about abstract propositions and test hypotheses in a systematic way (Feldman, 2008) (see Figure 1).

Figure 1. Piaget's Cognitive Development Theory

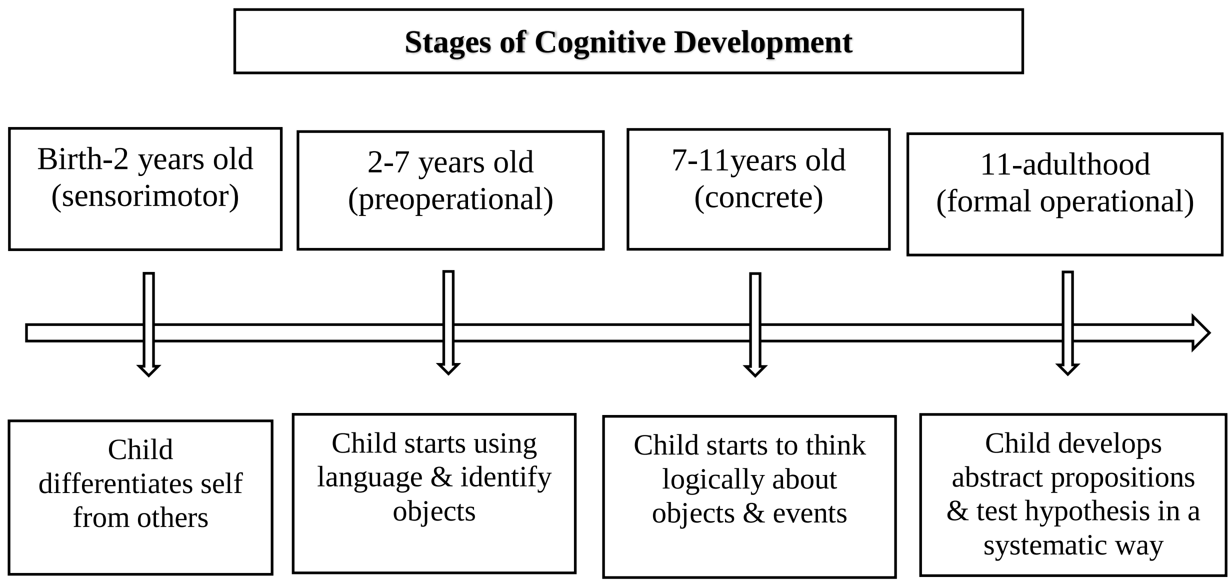

Figure 1. Piaget's cognitive development stages include four stages of a child's development with a description of what occurs in each stage.

A main construct of Piaget's theory is schema, the process by which a child assimilates information and expands on that information as he or she gains life experiences. As a child gets older, schemata tend to be simple during infancy and expand to be more complicated and sophisticated. When existing schemas are organized to adapt with new information, new schemata develop as cognitive development progresses (Feldman, 2008). According to Piaget (1952) a child's intellectual and biological growth are adapted (i.e., adjustment) as they organize the mental and physical stimuli in the world. Piaget believed that for a child to be able to acclimate to an environment, he or she has to first adapt to the mental and physical stimuli. Organization is not treated separately from adaptation but is the "mind's natural tendency to organize information into related, interconnected structures" (Solso, Maclin, & Maclin, 2008, p. 54). As a child experiences cognitive conflict in what he or she is actually experiencing, adaptation occurs (Piaget, 1952). For example, a child adjusts his or her schemata when he or she sees a three-legged dog. The new adaptation is now that dogs can have three or four legs. According to Piaget, during cognitive conflict, a child seeks a state of cognitive balance or equilibrium, which results in adaption to the world. During adaptation, a child uses assimilation and accommodation to restore equilibrium. Assimilation occurs when a child understands and processes a specific experience based on his or her current cognitive stage. When a child is exposed to new concepts and experiences, accommodation occurs, thus his or her way of processing, thinking, understanding, and behaving changes (Feldman, 2008).

CDT is an essential theory for every mental health practitioner to know and understand how to implement in assessment and treatment when working with children diagnosed with ASD. According to Swensen (1980), counselors are encouraged to work with a child based on the child's current mental health needs, and use interventions and techniques specific to the child's current treatment needs to assist a client's overall developmental growth. Swensen cautioned that practicing counselors should be alert to techniques that match a client's cognitive developmental stage. In addition, by using counseling approaches that are not based on a client's current stage of cognitive development can result in a non-effective therapeutic outcome. For example, if a child is in the preoperational stage of development, the counselor is encouraged to use a lot of verbal counseling techniques and insights, as in this stage the child learns to use language to describe objects.

Whitelaw (1982) highlighted the importance that each counselor needs to be knowledgeable in Piaget's theory on how to effectively implement his theory into practice with children. One of the important aspects that the author stressed was that counselors should be aware at all times of each stage of a child's intellectual development, and that a child understands concepts and interacts in his or her environment based on the current stage of his or her intellectual development. For example, if a child is in the sensorimotor stage, the counselor is encouraged to use appropriate interventions that fit the child's cognitive level including exercises and techniques that will keep the child engaged in an activity which will ultimately foster learning. Or, if a child is in the operational stage, the counselor is encouraged to use concrete examples in the counseling process to assist the child in learning and understanding concepts, as well as assisting the child in reaching the formal operational stage.

Moreover, Ivey and Ivey (1988) emphasized integration of Piaget's theory to foster developmental growth in a child. The authors suggested that Piaget's stages should be infused with developmental therapy approaches and assessment techniques of a child's cognitive stage. Developmental therapy, according to Ivey and Ivey (1988), addresses the cognitive level of development that a client is at during the here-and-now of the clinical interview. Knowledge and application of Piaget's theory in treating and meeting the needs of a child client is essential for treatment planning and implementation of effective counseling techniques. In addition, CDT assists a counselor in effective communication with a child (e.g., if a child talks and processes under the concrete stage, the counselor should also be able to approach the child based on the child's current stage of development). For example, during the sensorimotor stage, the counselor should pay attention to the elements of a child's communication and how he or she perceives the world. The counselor is encouraged to employ strong listening skills, closed questions to assist the child with structuring, as well as provide examples that will foster learning to keep the child engaged through role-play and play therapy techniques. The counselor's goal is to identify presenting issues or problems that a child may be experience, and further assist the child to move to the next level of cognitive development.

Myers et al. (2002) discussed the importance of school counselors helping children to construct knowledge and understanding of the world. To assist children, the authors encouraged counselors to implement in their practice an understanding of CDT and provide therapy that meets the needs of each child and include a treatment plan that addresses the child's issues. To achieve this goal, assessing a child's current intellectual growth is an important step, for counselors to infuse techniques that are useful and understandable by the child. The authors also described how Ivey's and Ivey's (1988) developmental therapy can be used as a tool for school counselors to assess a child's growth in cognitive development. For example, if a school counselor is working with a child who is in the sensorimotor stage, the counselor is encouraged to use here-and-now techniques and interventions, as well as infusing play therapy approaches to foster learning. Another scenario would be if a child is in the concrete stage of development. In that situation, the counselor is encouraged to assist the child in understanding and thinking beyond his or her own point of view. The counselor is also encouraged to bring examples and insights of his or her own perspective to assist the child in further understanding and comprehending what is being taught. Building rapport, defining the presenting issue, highlighting goals, providing alternatives, and following up with child client, are essential for school counselors to use at all times in practice to assist the child's progression from one developmental stage to another.

Additionally, in educational settings, Slavin (2005) suggested that Piaget's theory assumes that children progress from one cognitive stage to another at the same sequence; however, children also move through the stages at different rates. The focus needs to be not only on the correctness of a child's answer, but rather on the process of cognitive thinking of a child. Also, by providing an engaging classroom environment were a child can interact and discover is strongly encouraged. As a result, Slavin (2005) suggested that educators should develop classroom activities that address each child's individual cognitive needs, rather than basing classroom activities only on the same age level of all children.

CDT and ASD

In 1978, Cowan supported the compatibility of Piaget's theory to evaluate characteristics of ASD in children. Cowan connected his two factor theory of *operative* (the conceptual aspect of symbols) and *figurative* (the representation of symbols) intelligence to Piaget's theory of symbolism. He proposed that symbolic meaning entails the operative intelligence a child has based on his or her stage of development. Operative intelligence allows a child to transform a presenting situation or an object into something that can be comprehended. Whereas, figurative intelligence is when a child takes what has been learned from the operative aspect of intelligence and applies meaning to what was learned, such as imitation, imagery, language, and perception (Furth, 1977). For example, a child may imitate an action that was previously observed, or reproduce an object previously seen, or even mimic speech that was previously heard. For a child to reach a level of equilibrium through accommodation and assimilation, both operative and figurative intelligence must occur for progression of normal cognitive development. For a child with ASD, the repetition of a behavior (e.g., flapping of hands while holding a toy) indicates that the child is trying through repetitive behavior to assimilate the toy and learn how to speak by imitating or echoing speech.

In a study by Rosenthal, Massie, and Wulff (1980), the authors supported the assumption that ASD begins during what Piaget described as the sensorimotor stage of cognitive development. When comparing 14 children with normal cognitive development to 14 children who were diagnosed with childhood psychosis, and 9 of who were diagnosed with ASD; the children with ASD presented with cognitive deficits during the sensorimotor stage. The authors noted that when they compared children with neurotypical cognitive development, children with ASD seem to understand basic object permanence; however, they had more difficulties when predicting the states of objects.

In a later study using Piaget's theory, Hammes and Langdell (1981) reported that children who exhibited ASD characteristics had difficulties in understanding and manipulating what Trust (2016) referred to as *internal images of external objects*. As a result, the authors reported that children who were unable to understand internal images they had poor social, linguistic, and cognitive development. In a second study by Sigman and Ungerer (1984), with 16 children diagnosed with ASD when compared to 16 other children with intellectual disabilities, and 16 children with neurotypical cognitive development in sensorimotor and play behaviors based on each child's mental age, chronical age, and intelligence quotient; the authors found that the children diagnosed with ASD had deficits in verbal abilities, gesture imitations, symbolic play, and functional play.

Morgan (1986) applied Piaget's theory with ASD characteristics that occur at a child's early infancy stage, the sensorimotor stage and to later stages of cognitive development. He argued that children with ASD above the age of four may experience severe issues of progressing beyond the sensorimotor stage when understanding object constancy, because they are unable to use symbols and language from a conceptual standpoint. He also believed that some children with ASD use practice play or play with rules at the sensorimotor stage and some progress beyond the two kinds of play to a symbolic play at the pre-operational stage. Morgan questioned whether Piaget's theory is compatible with evaluating a child diagnosed with ASD because most children with ASD lack the ability to form images, use words, or write language for symbolic play.

Therapeutic Interventions Used with ASD

Typically, for children with ASD, the most common therapeutic treatments focus on core symptoms that address social, communication, and behavioral issues. Selective serotonin reuptake inhibitors (SSRI's) medications such as fluoxetine, risperidone, and methylphenidate are the most commonly used pharmacological treatments that assist with regulating aggression, self-injurious, and repetitive behaviors. Other psychotropic medications that are used to regulate impulsiveness, aggression, and repetitive behaviors include clonidine, guanfacine, and citalopram (WebMD, 2014). According to Bowers, Lin, and Erickson (2015), no specific stand-alone pharmacological treatments are effective for children with ASD, thus medication management is most effective when used in conjunction with counseling and educational interventions.

Cognitive Behavioral Therapy

The most commonly used therapy approach when working with children, adolescents, and adults who are exhibiting mental health issues, including ASD is cognitive behavior therapy (CBT, Field et al., 2015). From a CBT perspective, dysfunctional thinking is seen as the cause of individuals experiencing negative and disruptive feelings and thoughts about others and social events. A CBT approach focuses on how individuals can confront dysfunctional thinking through a change in their cognitions and perceptions (Field et al., 2015). According to Lindgren and Doobay (2011), the goal of CBT, when used with individuals with ASD, is to provide effective self-management interventions. In addition, CBT assists individuals with ASD to control their behaviors in social settings. The aim of CBT is to assist those diagnosed with ASD to differentiate appropriate versus inappropriate behaviors, effectively monitor their behaviors, and ultimately reward themselves for appropriate behaviors. A major focus of CBT is the development of social and cognitive skills that can effectively assist children with ASD who may lack friends, are lonely, feel rejected, and experience academic problems (Laugeson & Park, 2014). Social skills training is one of the most common treatment methods used by professionals. As individuals with ASD become more aware of how to self-manage their thoughts and behaviors, many of the responsibilities placed on families, teachers, and mental health practitioners can shift to individuals with ASD.

Also, CBT has been shown to be an effective therapy for children with ASD to reduce anxiety and cognitive impairment (Maskey et al., 2014; Shaker-Naeeni, Govender, & Chowdhury, 2014), and regulation of emotions and reduction of anger (Scarpa & Reyes, 2011). For example, CBT can be used in combination with a VRE, a computer based three-dimensional (3-D) world to gradually expose children to their fears and assist them in learning new skills by using reinforcers in a controlled and safe VRE. For example, a VRE and CBT approach can assist children in improving their understanding of social and facial expressions. Scozzari and Gamberini (2011) suggested that when working with children with ASD, the goal is to modify children's provoking thoughts and beliefs by helping them to overcome their fears and anxiety, and gradually expose them to social situations. In previous research, a VRE and CBT has been used with individuals who exhibit social phobias (e.g., anxiety, arachnophobia, acrophobia, and fear of flying), by incorporating exposure therapy (Scozzari & Gamberini, 2011). When using a CBT approach, involvement of third parties in the treatment, such as family members or caregivers, as well as role-plays and visuals are important (Shaker-Naeeni et al., 2014).

A challenge when using CBT is that the majority of previous research has focused on generalized anxiety and social phobias, with no studies that addressed the specific fears of individuals with ASD (i.e., sounds, taste, light, and smell). In one study by McConachie et al. (2014), the authors recruited children, ages 9 to 13, diagnosed with ASD who were exhibiting general and social anxiety. The authors found that the majority of children who reported having a specific baseline fear, such as separation anxiety or social phobia continued to experience that specific phobia following a CBT treatment group, which suggest that interventions should focus on specific fears rather than generalized ones.

Applied Behavior Analysis

A second therapeutic intervention used extensively with children and adolescents diagnosed with ASD is Applied Behavior Analysis (ABA). According to Schoen (2003), ABA was introduced in 1970 when used with animals. The goal of ABA is to modify non-desirable behaviors of individuals with ASD who need constant structure, routine, and concrete examples. After the initial experimental process and continued trials, ABA has continued to be used with children who present with intellectual disabilities and who lack self-help, vocational skills and language deficits. Thus far, ABA techniques have included discrete trial training (DTT), direct instruction, response prompts, and play therapy.

According to Schoen (2003), the first positive outcome using ABA was reported in 1960, when schools began to use ABA techniques to increase desirable behaviors and eliminate non-desirable behaviors in children diagnosed with ASD. In a recent research study, Mohammadzaheri, Koegel, Rezaee, and Rafiee (2014) compared two ABA therapies; Pivotal Response Treatment (PRT) and structured ABA in a school setting based on a one-to-one format (i.e., teacher and student) that included 18 boys and 12 girls (ages 6 to 11) who were diagnosed with ASD, with an intelligence quotient (IQ) of 50 or above and who had well-developed verbal skills. With PRT, a more naturalistic approach was used with reinforcement of attempts, task variation, choice, and direct consequences. Whereas, with structured ABA; repetition, consequences, rewards, and discrete targets chosen by a teacher were used. The researchers found that while structured ABA was effective, the rate of improvement using structured ABA was not as improved as with PRT. Mohammadzaheri et al. attributed the difference in the two approaches to the level of motivation and engagement that PRT promotes using child choice.

Program for Education and Enrichment of Relationship Skills

Social functioning of adolescents diagnosed with ASD has been assessed using the Program for Education and Enrichment of Relationship Skills (PEERS). In research by Laugeson, Ellingsen, Sanderson, Tucci, and Bates (2014) entitled “The ABC’s of Teaching Social Skills to Adolescents with ASD in the Classroom: The UCLA PEERS Program,” the authors examined the impact of PEERS with adolescents who were diagnosed with high functioning ASD (i.e., Asperger’s). A diverse group of 73 teachers, adolescents (ages 12 to 14), and their parents participated in a 14-week study based on the PEERs curriculum that was comprised of a controlled group and an experimental group. The experimental group showed significant improvement in social communication, social awareness, and social cognition abilities along with decreased ASD behaviors in comparison to the control group.

Early Start Denver Model

When working with children diagnosed with ASD during natural play in pre-school, a model framed in a relationship base was developed by two psychologists, Sally Rogers and Geraldine Dawson, the Early Start Denver Model (ESDM, 2010). According to Howlin (2011), children with ASD who received treatment based on the ESDM experienced positive outcomes in behavioral, social, and cognitive skills. In a second study by Vivanti et al. (2014) with 27 children diagnosed with ASD (ages 2 ½ to 6 years), who were enrolled in the Victorian Autism Specific Early Learning and Care Center for 15 to 25 hours a week over a one-year period with a one-to-one format, children who were enrolled in the ESDM program improved significantly in their cognitive and social development in comparison to children who were not enrolled in the ESDM program.

Sensory Integration Program

In therapy with children diagnosed with ASD, the Sensory Integration Program has been frequently used. The Sensory Integration Program was introduced by Ayers in 1972 as a type of occupational therapy (Sams, Fortney, & Willenbring, 2006). The primary focus of the program is to assist children with behavioral and developmental disorders as well as auditory and sensory development; with communication, mood, concentration, and somatosensory issues (Karim-Abdel & Mohammed, 2015). In Karim-Abdel's and Mohammed's study, 34 children with mild to moderate ASD (ages from 3½ to 5½), with an IQ between 69 and 83 and no presenting auditory or visual deficits, participated in the Sensory Integration Program once a week for six months. The focus was for the therapist to help children improve their fine (e.g., tying shoes, drawing, painting, and opening/closing objects) and gross motor skills (e.g., entire body movement such as lifting, pushing, catching the ball) by encouraging them to be continuously active in these areas. Results of this study revealed that children's fine and gross motor skills improved significantly, with significant decrease in their autistic behaviors.

Picture Exchange Communication System

The Picture Exchange Communication System (PECS) was designed for children with ASD who are non-verbal. The PECS is primarily used in clinical or school settings (Flippin et al., 2010). According to Greenberg, Tomaino, and Charlop (2012), the PECS has become a useful and popular intervention tool. In Greenberg et al.'s (2012) study, they investigated the generalizability of the PECS program with four male children diagnosed with ASD (ages 4 to 8) once a week, after school, for two hours, in a room with a one-way observation mirror. The children picked a PECS card that included "I want" and a colored picture then they gave the card and picture to the communication partner, with the ultimate goal of forming sentences by using the phrase "I want" for each preferred picture. The results of their study indicated improvement in social communication for the four children. Also, the parents reported that they were satisfied with their child's overall improvement in communication, and that they would continue to use the PECS program. Additional findings demonstrated that using the PECS cards was generalizable in real world settings for children's communication.

Auditory Integration Therapy

The Auditory Integration Therapy (AIT) approach can be adjusted for children diagnosed with ASD, Attention Deficit Disorder, or Dyslexia, which was based on Alfred Tomatis's research that involved 10 hours of electronically modified music exposure. Berard (1993) developed the AIT approach. The approach involves headphones in a two-and-a-half-hour a day format, for a 10-day period where individuals are exposed to situations where they have shown hypersensitivity or overstimulation (Dawson & Watling, 2000). According to the American-

Speech-Hearing-Language Association (2004), the use of AIT can help individuals increase their attention span, verbalizations, eye contact and auditory understanding; and decrease their hyperacusis. Rimland and Edelson (1995) assessed the effectiveness of AIT during a 3-month period with 17 individuals diagnosed with ASD range in age from 4 to 21 years, and whose parents reported that they had hypersensitivity to sound. The results of their study indicated that individuals who were exposed to AIT showed positive outcomes in reduction to sound sensitivity and overall discomfort. A second study conducted by Abou-Setta, Sadek, Shalaby, and Hazzaa (2006) using AIT, with 17 children diagnosed with ASD, who were exposed to sounds ranging from 125Hz to 8 KHz showed that the children experienced a reduction in hypersensitivity and improvement in their communication and behavioral abilities (e.g., expression of feelings, self-esteem, eye contact, attention and verbalization).

Speech-Language Therapy

Speech-Language therapies have been used with children who exhibit language deficits and who are diagnosed with ASD. Two speech-language therapies are the Functional Communication Training (FCT) program developed by Batool and Ijaz (2015) and an experimental approach that was developed by Hoque, Lane, Kaliouby, Goodwin, and Picard (2009). Batool and Ijaz (2015) designed the FCT program to address behavioral and communication issues in children. The results of their study showed that when using the FCT program over a 6-month period with two children (ages 10 and 12), the children were more responsive to receptive language. In addition, their communication abilities significantly improved along with their vocabulary, and as a result they were able to join two to three words to make sentences. Alternatively, the second approach by Hoque et al. (2009) was an experimental design in which they formed two groups, a group exposed to traditional direct feedback and a group exposed to computerized intervention using interactive games. After four weeks of treatment and assessments, the results of their study revealed that the children enjoyed interacting more with the games than the traditional speech interventions, because the games kept them more engaged and excited.

Verbal Behavior Therapy

Verbal Behavior (VB) therapy is another modality that has been used in treatment for children diagnosed with ASD. VB was first introduced by Skinner in 1957. He defined VB in his 1987 book entitled *Upon Further Reflection* as "a behavior that is reinforced through the mediation of other people, but only when the other people are behaving in ways that have been shaped and maintained by an evolved verbal environment, or language" (p. 90). According to Sundberg and Michael (2001), VB therapy focuses on the needs of a child diagnosed with ASD by altering the frequency of a specific behavior and identifying effective approaches that include reinforcers to reach a desired treatment outcome. The reinforcers include behavioral approaches such as stimulus prompting, following rules, generalization, imitation, and modeling. As further noted by the authors, the major goal is to help children with ASD develop language skills by using reinforcers provided by a therapist. Children follow verbal stimuli (e.g., sit down) or identify stimuli by pointing at or touching an object (e.g., touch the hand). As children learn various language skills, the therapist gradually moves to more complex instructions by asking children to imitate the instructor's vocal requests (e.g., say dog), by naming objects or pictures, and by naming actions performed by the therapist.

Developmental Individual-Differences Relationship-Based Model

The Developmental Individual-Differences Relationship-Based (DIRR-B) model is primarily used to understand the developmental delays children with ASD may encounter by offering an engaging and interactive environment. Greenspan and Weider created the DIRR-B model in 1997, which has three key components: 1) development, which focuses on the developmental tasks that occur from birth to 5 years old; 2) individual differences, which refers to the unique characteristics that human beings experience; and 3) relationship-based, which refers to the communication and relationship that an individual has with his or her mental health practitioner, caregivers or peers (Coulter, 2009). The DIRR-B Floortime model was the first one to be utilized with children who were diagnosed with ASD. It focuses on the importance of the emotional relationship of the child with his or her parents or caregivers, peers, and relatives (The Interdisciplinary Council on Development and Learning, Inc., 2015). Pajareya and Nopmaneejumruslers (2011) used the model with 32 pre-school children who were diagnosed with ASD, ages 2 to 6, to evaluate the addition of a home-based intervention. The model included a one-on-one for an hour-and-a-half training with the parents. An example of how the technique was used included a child with a presenting issue of the inability to keep calm or calm down or to express affection to his or her parents; the parents were encouraged to join the child in an enjoyable activity. When a child had verbal difficulties, the parents were trained to use encouragers to help the child use words to speak. The results of this study showed a significant improvement in children's presenting issues (Pajareya & Nopmaneejumruslers, 2011).

Relationship Development Intervention Program

Similar to the DIRR-B Floortime model, the Relationship Development Intervention (RDI) program is used to assist children with ASD who experience emotional, cognitive, and perceptual challenges. According to Gutstein, Burgess, and Montfort (2007), RDI is a parent-based program were parents or caregivers are trained extensively by a therapist in a 6-day workshop to understand the theory and implementation of RDI, and to ultimately learn how to apply RDI effectively while working with their children. The main goal of the RDI program is for parents to assist their children when responding to various challenges and unpredictable situations in a flexible and thoughtful manner by incorporating what children have learned in their everyday routines. Parents and children meet on a bi-weekly basis with a RDI certified clinician to discuss goals, treatment plans, and review videotapes of the work parents completed with their children. On a 6-month basis, both children and parents are re-evaluated on their overall progress. In Gutstein et al. (2007) study, 16 children were recruited who were diagnosed with ASD and had an IQ score of at least 70. The children were grouped in a classroom as follows: 1) with no specific special education services, 2) partial special education for a specific number of hours during the day, with no behavioral issues (e.g., issues with reading), 3) specific amount of the day in special education because of behavioral and adaptation issues, and 4) full-time special education because of behavioral and adaptation issues. The autism diagnostic observation schedule (DOS) and the autism diagnostic interview-revised (ADI-R) were used as evaluation instruments. Using the two instruments, parents were asked to evaluate how well their children were transitioning based on characteristics such as peer relationships, social and emotional responses, facial expressions, and imagination. Results from this study showed that in approximately 18 months of treatment, the children showed significant improvement in their social and communication skills.

Social Communication/Emotional Regulation/Transactional Support Model

A multidisciplinary approach used with children diagnosed with ASD and their families is the Social Communication/Emotional Regulation/Transactional Support (SCERTS) model. The developmental goals used in the model include the following: a) social communication; b) emotional regulation (i.e., effective coping strategies with stressful situations); and c) transactional support (i.e., resources and support) (Rubin et al., 2013). Additionally, as noted by Rubin et al. (2013), the main focus of the SCERTS model is to assist children in their independence by improving their social communication and emotional regulatory competencies, as well as providing treatment efficient goals that can be implemented at home, school, and community. According to Molteni, Guldberg, and Logan (2013); SCERTS is very helpful for everyone who is actively involved in providing assistance to children in their desired educational goals. Also, it entails regular assessments to assist in the evaluation of a child's overall progress, as well as any further needs to support the child. In Molteni et al.'s (2013) study, three children with ASD from an independent residential school were recruited as participants. One child used limited words to communicate (less than three words), one child used more than three words, and one child used more than 100 words. In addition, 22 adult participants from different disciplines (i.e., therapists, teachers, care staff, and department heads) received the SCERTS training. Some adults were trained in the PECS model and TEACCH approach. A team of the adults was developed for each child where the researchers observed them for 40 hours in each setting (i.e., therapy, school, home). The results of their study showed that the adults felt very comfortable in using the SCERTS model with the children.

A New Treatment Era in Mental Health: Technology

In recent years, the use of technology in every aspect of our personal lives has increased. Also, technology has had a tremendous impact on health care systems and technology has augmented the services that are provided to clients, especially in the mental health field. Technology is being used by mental health practitioners with their clients in various ways. According to Riemer-Reiss (2000), although mental health practitioners "are faced with many challenges that have an impact on the services they provide," technology and its use can be a method of service delivery to supplement traditional mental health services (p. 189). Evans (2012) added that technology is beneficial and can assist counselors in clients' engagement in therapy.

Professional Ethics When Using Technology

Although many technology approaches are beneficial to mental health services for clients, all mental health professions are guided by their professional code of ethics and the laws designed to help professionals when providing services to the public. Thus, mental health practitioners are cautioned that they should seek constant training, knowledge, and supervision in ethical practice with technology and its limitations (Novotney, 2011; Online Therapy Institute, 2015). When mental health services are provided using technology, clients' access to technology and their knowledge and understanding of technology, as well as applicability of certain technology used should be considered by practitioners based on the presenting clinical issues by clients. According to Wilkinson and Reinhardt (2015), the 2009 Health Information Technology for Economic and Clinical Health (HITECH) Act emphasizes that mental health practitioners who practice and deliver counseling services must be familiar with proper utilization of technology in their clinical work. HITECH's main objective is to encourage counselors that they recognize the role that technology has in best practices with diverse client populations. In addition, the Act stresses that counselors should be knowledgeable and compliant at all times with the 1996 Health Insurance and Accountability Act (HIPAA), regarding privacy and security of client records and any related risks; such as intrusion of technology in a person's personal life. Counselors are strongly encouraged to seek continuous professional development related to the utilization of technology in counseling.

According to Harris and Kurpius (2014), mental health professionals (e.g., counselors, psychologists) should always respect their clients' dignity and confidential information when using technology, and abide at all times, their profession's ethical code. For example, mental health professionals should not use social networking engines (e.g., Google, Firefox, Facebook, Twitter) to seek additional information about their clients because of the ethical and legal implications that such actions could entail. Also, Jencius (2011) cautioned the counseling community regarding the use of online social media. Counselors should discuss with their clients' appropriate boundaries that are related to the use of social media and provide clients with an informed consent that includes the purpose of using social media, limits of confidentiality when using technology, and overall expectations in the counseling relationship when using technology. Counselors are responsible for reducing the potential risks of harming clients unintentionally. According to Kolmes (2010), when mental health practitioners are using technology, counselors should be aware that information is password protected, HIPAA compliant, and encrypted. Novotney (2011) cautioned clinicians who deliver services using technology to be aware of the potential online security risks; thus, a detail informed consent and discussion with clients prior to starting the therapeutic relationship is essential when using technology.

Specific to the counseling field, the American Counseling Association (ACA, 2014) *Code of Ethics* includes several sections on the guidance for counselors when using technology. According to ACA's *Code of Ethics* (2014), "counselors [should] understand that the profession of counseling may no longer be limited to in-person, face-to-face interactions. Counselors [should] actively attempt to understand the evolving nature of the profession with regard to distance counseling, technology, and social media and how such resources may be used to better serve their clients" (Section H, p. 17). "Counselors who engage in the use of distance counseling, technology, and/or social media [should] develop knowledge and skills regarding related technical, ethical, and legal considerations (e.g., special certifications, additional course work)" (Section H.1.a, p. 17). Section H provides guidelines regarding knowledge and legal considerations in distance counseling, technology, and social media; informed consent and security; client verification; records and web maintenance; and social media. As technology becomes more advanced, counselor education programs are encouraged to develop training for counselor educators and students that incorporates high level technology platforms in academic practice and mental health settings (Myers & Gibson, 1999). Also, the National Board for Certified Counselors' (NBCC, 2016) *Code of Ethics* includes several guidelines for national certified counselors (NCCs) regarding the proper use of technology in clinical practice. According to NBCC's *Code of Ethics*, "NCCs shall recognize the potential harm of informal uses of social media and other related technology with clients, former clients and their families and personal friends" (para. 19, p. 3). In addition, "NCC's shall develop written practice procedures in regard to social media and digital technology, and these shall be incorporated with the information provided to clients before or during the initial session" (para. 19, p. 3). "NCCs who use digital technology (e.g., social media) for professional purposes shall limit information posted to that which does not create multiple relationships or which may threaten client confidentiality" (para. 21, p. 3). Lastly, "NCC's shall include all electronic communications exchanged with clients and supervisees, including those through digital technology and social media methods, as part of the record, …" and "…All electronic therapeutic communication methods shall use encryption and password security" (para. 54, p. 5).

For the psychology profession, psychologists must “continually assess both their professional and technical competence when providing telepsychology services. Psychologists are encouraged to examine the available evidence to determine whether specific telecommunication technologies are suitable for the client/patient” (American Psychological Association, 2008a, p. 793). “Psychologists understand the need to consider their competence in utilizing telepsychology as well as their client’s/patient’s ability to engage in and fully understand the risks and benefits of the proposed intervention utilizing specific technologies” (p. 794). Whereas, for the social work profession, social workers “should take precautions to ensure and maintain the confidentiality of information transmitted to other parties through the use of computers, electronic mail, facsimile machines, telephones and telephone answering machines, and other electronic or computer technology” (National Association of Social Workers, 2008, Section 1.07.m). And, for the American Psychiatric Association (2015), psychiatrists “should be aware of potential ethical challenges in its use before using the technology in providing patient care. Psychiatrists are responsible for obtaining sufficient knowledge about the technologies they employ to respect patient confidentiality and deliver competent care (Topic 3.4.6, p. 11). “Psychiatrists must be aware of their responsibility to maintain professional boundaries in their internet activities – both in respecting their patients and in establishing separation between personal and professional internet and social media presence” (Topic 3.4.6, p. 11).

Mental Health Practitioners Use of Technology

In mental health, technology approaches are generally used to assist clients by supplementing face-to-face therapy with mobile technologies. According to Novotney (2011), approximately 80 million Americans experience issues when reaching out to mental health professionals that include but are not limited to clients’ disability, costs, or geographical location.

Counselors can be more effective and efficient when utilizing technology to better serve the diverse needs of their clients (Leong, 2008). For example, Ayres, Mechling, and Sansosti (2013) emphasized that technology can be programmed for children with learning disabilities to assist with their life skills. Ayres et al. (2013) described two different delivery methods of technology, instructional and assisted that can be used with children diagnosed with ASD (i.e., moderate or severe intellectual disability – IQ 50 or below). Instructional technology is used by the mental health practitioners and educators to teach children social skills (e.g., grooming, toileting, grocery shopping, and communication), whereas assisted technology is used to support children after a specific social skill was acquired. According to Ayres et al., the 1998 Technology Related Assistance of Individuals with Disabilities Act; IDEA: 20 U.S.C. Part A, Section 602 defined assisted technology as "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (p. 262).

Additionally, using technology has been effective when treating children and adolescents because they are more prone to express their feelings openly when using technology in comparison to adults who use technology. In school counseling settings, technology is also being used in various forms such as: 1) communication with parents; 2) online information to schools, parents, and students on topics such as cyber bullying, internet safety tips; 3) software applications for social and communication skills training; and 4) software programs to collect and analyze data for school counseling research (Edutrendsonline, 2012). According to Casey (1992), counseling at-risk youth (i.e., children who drop-out of school, children with behavioral issues) utilizing technology has been beneficial. Specifically, software technology has been used for developing and maintaining a healthy relationship between counselors and students/clients for assessment, intervention, goal setting, and termination. An additional benefit of using technology with at risk-youth is that technology can offer an interactive educational experience for youth to stay engaged, participate at their developmental level, and learn how to socially, emotionally and behaviorally interact with others.

Infusing technology when providing mental health services to underserved populations because of cost, mobility limitations, and geographical locations is essential (Heinlen, Welfel, Richmond, & O'Donnell, 2003). According to Anthony, Merz-Nagel, and Goss (2010), technology can provide long distance accessibility to counseling treatment at a lower cost and in geographical areas where clinical settings are limited or transportation is a problem for clients to access services. For example, technology is being used in treatment with military personnel during deployment or when military personnel are required to move frequently and they experience issues such as post-traumatic stress disorder (PTSD), anxiety, depression, and sleep. (Wilson, Onorati, Mishkind, Reger, & Gahm, 2008).

Types of Therapy Provided Using Technology

Distance therapy. New approaches to technology are promising in many ways when providing mental health services. In a 2008 survey by APA's (2015b) Center for Workforce Studies, the increased use of telepsychology was noted by the mental health community. Specifically, 85% of clinicians reported using telephones (including mobile devices) to provide treatment services to their clients, making this approach the most common technology used by practitioners, 72% reported using technology to schedule appointments, 47% reported using e-mail to provide direct services to their clients, 13% reported using listservs, 7% reported using videoconferencing, and 1% reported using internet chat rooms. Also, according to Kulman (2015), because children are using interactive technology (e.g., smart tablets and phones, online applications and chatrooms) to entertain themselves or as a communication tool; mental health practitioners have begun to use interactive technology to provide therapy to children.

According to the Pew Research Center (2011), approximately 83% of the American adult population own mobile devices. According to Mallen, Vogel, and Rochlen (2005) approximately 2% of the mental health community in the U.S. are using distance counseling to deliver individual services, and approximately 15% are using facsimiles and e-mails to transmit psychological evaluations. The most common types of technology counseling services provided by mental health practitioners is distance, online, e-counseling, cybercounseling, or e-therapy (Centore & Milacci, 2008; Heinlen et al., 2003; Reamer, 2006). Mental health practitioners who provide distance counseling use telephones, e-mails, instant messaging, and other web-based online services (Wells, Mitchell, Finkelhor, & Becker-Blease, 2007), which can provide benefits to clients in comparison to traditional one-on-one counseling.

According to The National Institute of Mental Health (NIMH, 2017), incorporating technology into mental health services provides therapists and clients convenience and allows mental health practitioners to provide services to more clients. Benefits to distance counseling include: 1) safety, in which clients can express themselves more freely to counselors (Panyametheekul & Herring, 2003), 2) anonymity, in which clients can feel comfortable in sharing their thoughts and feelings with counselor (Worona, 2003), 3) social stigma, in which clients are able to avoid public encounters (Al-Krenawi, Graham, & Fakher-Aldin, 2003), 4) accessibility, in which clients because of their geographical location and/or daily schedule cannot commute to receive services (Childress, 2000), 5) affordability, in which clients can receive counseling services at a lower cost than face-to-face counseling (Boucher, Pronk, & Gahling, 2000), 6) flexibility, low cost, and fast way for clients to receive services, and 7) offer a wide variety of services such as crisis intervention and assessments (Centore & Milacci, 2008).

Although online counseling offers many benefits such as low cost services, convenience, and flexibility for both mental health practitioners and clients online; counseling can also be challenging. In a study by Haberstroh, Duffey, Evans, Gee, and Trepal (2007), counselor interns and students who were acting as clients used a web-based online counseling platform, WebCt. The results from their study revealed that both the counselor interns and students had technological difficulties because of non-familiarity with the software and technology in general, which caused both parties to become overwhelmed. A few students who were acting as clients described differences in the relationship between online and in-person counseling; specifically, participants reported that they were able to disclose more information about themselves to the counselor intern without feeling any psychological pressure as in an in-person counseling session. Other students acting as clients reported the benefits of online counseling especially for those who did not reside in the immediate location.

Mental health practitioners use telephones and e-mails as essential tools when providing distance therapy to clients (Heinlen et al., 2003; Riemer-Reiss, 2000) Videoconferencing is also being used in combination with smartphones (Wilson et al., 2008). A specific example of how phone technology is being implemented in mental health services is the use of smartphone applications for clients. A very popular smartphone application related to anxiety treatment is the *PsychAssist*. Psychassist is a CBT treatment-based application that is primarily used with the adult population, which includes various activities from homework to educational handouts for coping with anxiety (Clough & Casey, 2015). A second example of research using a smartphone was a team composed by Ben-Zeev, Kaiser, and Brenner (2013) who developed the *Focus* program, a smartphone self-management application. The program includes visual and auditory notifications where the user (i.e., the client) check-ins on a daily basis regarding medications, mood, sleep, and social related issues, with the ultimate goal of monitoring progress and further assessment needs.

According to the Pew Research Center (2011), of the 83% of Americans who own mobile devices, 31% prefer text messaging to calling, another form of technology used in counseling. Text messaging therapy apps offer a low cost, convenient, and anonymous (e.g., allows use of a fake/anonymous name) type of counseling therapy. Although text messaging is a technology that mental health practitioners can use to provide services, the use of texting is still emerging (APA Practice Organization, 2015). As noted by Greene (2012), risks surrounding text messaging include HIPAA compliance, as mobile devices run frequent risks of loss, theft, or recycling, which can allow unauthorized users access to text messages and therapy communication. An advanced technology method of providing distance counseling was noted by Shallcross (2011) as a way to reach out to clients is Second Life (SL). She encouraged clinicians to stay abreast of trends in advanced technology such as SL when providing services to clients. Beginning in 2012, SL (2012) provides its user the ability to encrypt data (i.e., voice and text) to prevent unauthorized users access to client confidential information.

Telehealth. According to Novotney (2011), telehealth or telepsychology (i.e., remotely providing services to clients) has been an important technological tool for the last 25 years. Telehealth has been utilized by the Department of Veterans Affairs, as well as other various organizations across the U.S. Telehealth incorporates a variety of technologies (e.g., videoconferencing, e-mail, telephone) as a method to provide services to clients who reside in rural areas, experience limited mobility, or need constant monitoring for specific illnesses. For example, a child with ASD who is struggling with social skills development and who resides in a rural area can be assisted with interventions at school by the incorporation of a timely diagnosis via the use of telehealth services (Novotney, 2011; Shallcross, 2011). Telehealth is also provided by mental health practitioners who conduct remote psychological assessments. According to Luxton, Pruitt, and Osenbach (2014), remote assessments using telehealth provide services to clients who have limited access to services. In addition, it helps with pairing individuals whose native language is non-English with a clinician who speaks a client's native language. Remote assessments can minimize potential errors in language barriers between mental health practitioners and clients.

Pruitt, Luxton, and Shore (2014) described the benefits of home-based telemental health (HTMH) services, specifically the advantages of technology. HBTMH services can be delivered via the use of a computer, tablet, or smartphone telehealth applications. Services that are delivered via the use of HBTMH include a wide range of treatment options for issues such as depression, anxiety, ASD, panic disorder, substance abuse, schizophrenia, and PTSD. Depending on the severity of the symptoms associated with the diagnosis, HBTMH can also be beneficial for clients because of the reduction in cost and travel expenses, along with clients not needing to take off of work. In recent years, with the increase use of telemental health, according to Qyashie (2015), telemental health has significantly decreased the number of psychiatric admissions of those who reside in geographically challenged areas. In a study conducted by Godleski, Darkins, and Peters (2012), clinical outcomes of 98,609 patients from the U.S. Department of Veterans Affairs prior and after enrollment to telemental health services for 2006 to 2010 revealed a 24.4% decrease in admission, as well as a decrease of 26.6% in length of inpatient psychiatric hospitalization.

Virtual reality. A specific type of advanced technology used in mental health is a VRE. According to Turner, Thomas, and Casey (2016), developing mental health based video games and virtual worlds that are engaging therapeutic environments for clients has been beneficial. Video games and virtual worlds that are based in a mental health perspective can be developed and delivered via a mobile device, tablet, or computer using various software platforms (e.g., Clickteam Fusion 2.5, CraftStudio API, Construct 2, SL). Video games and virtual worlds can provide safe environments for clients to learn and process how to deal with issues such as stress and anxiety without physical limitations that they may experience in the real world. Using video games and virtual worlds in a learning environment with children can be beneficial because of the interactive world (e.g., using computers, tablets, smart phones) that encourages children to stay engaged and thus learn.

Over the last 15 years, VREs have increased in popularity in clinical and research settings. The main purpose of a VRE is to create a three-dimensional (3-D) immersive stimulus environment for clinical assessments and interventions (Rizzo et al., 2012). According to Rizzo et al., a VRE is defined as "…. a way for humans to visualize, manipulate, and interact with computers and extremely complex data" (p. 281). In comparison, Gigante (1993) defined a VRE as "the illusion of participation in a synthetic environment rather than external observation of such an environment. VRE relies on 3-D, stereoscopic, head-tracking displays, hand/body tracking and binaural sound. VRE is an immersive, multisensory experience" (p. 3). Strickland et al. (1996) described the differences between a VRE and typical computer programs. In typical computer programs, users are provided with predetermined pictures and choices for observation, whereas in a VRE, users' experiences are more like joining in a scenario depicted within the VRE. VREs offer: a) controllable input stimuli of visual and sound that can be reduced or eliminated), b) modification for generalization, c) safe learning environments, d) primarily a visual and auditory environment, e) adjusted for individualized treatment, f) preferred computer interactions, and g) trackers like HMDs and virtual gloves which are used based on the user's body and head moves (Strickland et al., 1996).

In the mental health field, VREs have been used mainly with individuals who exhibit anxiety, PTSD, phobias, or motor impairments. Phobias specific to ASD include sensitivity to loud noises, sudden changes in light, unexpected motion, claustrophobia, and in general any sudden changes in sensory perceptions. VREs simulate challenges that an individual can experience at any time in a real life environment (Rizzo et al., 2012). One of the major advantages of VREs is that it can safeguard against dangerous situations and resulting humiliation that can occur in real world situations (Scozzari & Gamberini, 2011; Standen & Brown, 2005). Additionally, VREs can promote therapeutic progression of imagination, interaction, and engagement in simulated social situations (Ehrlich & Munger, 2012). VREs offer virtual realism through social opportunities where participants can interact with others. The learning experiences that occur during VREs can be generalized to real world experiences (Stendal et al., 2011).

Research using VREs. Several research studies have contributed to the evolution of VREs. One of the first research inventions occurred in 1962 by the father of virtual reality, Morton Heilig, called sensorama machine, a multi-sensual simulation in which an individual rides a virtual motorcycle through New York City. The simulator provided an individual the illusional experience of reality using 3-D pictures, stereo sound, vibrations on the seat, and smells that occur in a social setting. However, the sensorama VRE limited participants' interaction in the virtual scenario because the route was a pre-recorded format. Following the

1962 system, Sutherland (1968) pioneered what is now known as interactive computer graphics, which allows the user to manipulate an image that is being projected on a screen (e.g., using a video game controller to bounce a soccer ball).

Follow up research for the technological advancement of VREs were flight simulators called Visually Coupled Airborne System Simulator (VCASS). VCASS were used primarily by the U.S. Air Force in medical research conducted by Tom Furness (Gigante, 1993). In 1984, a third type of research related to VRE was conducted by McGreevy (1991), with the assistance of Humphries, Eriksin, and Deardon at the National Aeronautics and Space Administration (NASA). They developed a virtual visual environment display (VVED), a multi-sensory head and hand tracking simulation device, equipped with speech and audio recognition. Later in 1985, the first virtual interactive environment workstation (VIEW) was connected to the VVED device, which consisted of a host computer, interactive computer graphics, and video imaging.

In 1997, the first virtual reality exposure therapy (VRET) was used, with individuals from the general population who were afraid of flying (Rizzo et al., 2012). Thereafter, the VRET, named Virtual Vietnam (Rizzo, 2010) was used with Vietnam veterans, who were diagnosed with PTSD. In the Virtual Vietnam, veterans used a HMD that included scenarios of virtual explosions and bombings. After a 6-month period using the Virtual Vietnam, the results of their study yielded a 34% decrease in PTSD symptoms. In recent research by Scozzari and Gamberini (2011), the authors noted that when treating specific phobias such as fear of flying, arachnophobia, acrophobia, as well as other mental health issues, CBT can be used to expose individuals to their anxiety and fears (i.e., Exposure Therapy) while using a VRE.

In 2003, Linden Research, Inc. (2016) became well-known worldwide for the development of SL. SL is a type of VRE and one of the largest 3-D dimensional VREs available today. It includes small sims (i.e., a physical server machine which simulates one or various regions within the VRE) that offer individuals social opportunities to interact with others in a virtual world. Also, SL provides education and training opportunities for students in a VRE. Other professional situations that SL is used are to host and attend virtual conferences and to conduct research in VREs. A benefit that SL provides is ease of access with populations who are disabled, such as individuals with limited mobility or with ASD, where they can socially interact in a VRE and practice social and communication skills (Stendal et al., 2011). A limitation of SL is the amount of time and training that is required when learning how to navigate within the VRE.

Head-mounted displays. In a VRE such as SL, a head-mounted display (HMD) can enhance the sense of realism where individuals feel that they are immersed (i.e., present) in the VRE (Strickland et al., 1996). In 1968, the term HMD was coined by Ivan Sutherland, a computer scientist, who developed the first HMD. HMDs were first used in the training of pilots in the U.S. Air Force, with flight simulators equipped with graphics. Using a HMD, pilots could encounter in the virtual scenario the threat and target information they might encounter in a real flight (Gigante, 1993). In later research, using a HMD with a VRE, two children (i.e., a 7½ years old girl who had strong visual and spatial skills, but limited verbal and language skills and a 9-year-old boy with good language skills who was a visual learner) were taught how to safely cross a street (Strickland et al., 1996). In this Strickland et al.'s study, the VRE included the following features: 1) an input stimuli that was controllable; 2) a learning environment that was safe, which required minimal human interaction; 3) a visual world that provided a sense of reality; 4) an ability for generalization; and 4) a vestibular stimulation. The results of their study revealed that despite initial hesitation by the two children, they responded similarly in the VRE, however the authors stated that more research was needed regarding how children could generalize what they learned to different settings. Also, the researchers concluded that the potential for using the VRE with a HMD could offer assistance with perceptual processes in children diagnosed with ASD.

Using a HMD with a VRE for their research; Slater, Khanna, Mortensen, and Yu (2009) found that higher realism in a VRE induces greater presence for an individual. In their study, two different types of realism were used; geometric realism-objects that look like a real object and illumination realism, the “fidelity of the lighting model” (p. 2). The authors used a HMD, a hand-held wand, and a 3-D VRE pit room using illumination realism with two graphic levels of flat shading and radiosity (i.e., realistic rendering of shadows and diffuse light). They found that participants who used a HMD and were exposed to the pit room environment with high-level graphic shadows, depth, and light reported significant immersion in the VRE. Similar to Slater et al.’s study, a previous study indicated that the higher the immersion, the more presence users’ experiences were in the VREs (Slater, 2009).

More recently, Ehrlich and Munger (2012) used the 2012 Oculus Rift HMD with a VRE to teach social skills to children with ASD. They assessed children’s sense of presence or telepresence, defined as “a psychological state or subjective perception in which even though part or all of an individual’s current experience is generated by and/or filtered through human-made technology, part or all of the individual’s perception fails to accurately acknowledge the role of the technology in the experience” or “a sense of being there in a virtual environment” (International Society for Presence Research, 2000, Presence defined, para. 4). In their study, the VRE included activities that 19 children, ages 5 to 9 years old, with learning disabilities would easily be able to complete (e.g., a picnic table were a child would move towards or crossing a busy traffic road). Eight participants were diagnosed with ASD (i.e., two were non-verbal and low-functioning, one verbal with low-functioning, four verbal and high-functioning and one had a sotos syndrome) and 11 participants were neurotypical. Of the eight children with ASD, three were unable to complete any of the given tasks based on the required verbal correspondence needed for the survey. Of those three children, two would not wear the HMD and one child was willing to wear the HMD, but did not follow directions. The authors' findings indicated that regardless of the above limitations experienced by the non-verbal ASD children, overall the children with ASD enjoyed the HMD experience and they experienced presence. Additional findings indicated that unlike the children who were neurotypical, children with ASD completed fewer tasks during their virtual experience. Also, Ehrlich and Munger (2012) as well as Strickland et al. (1996) stated that with their research participants with HMDs reported headaches, eyestrain, high latency, and poor viewing angles, thus Ehrlich and Munger concluded that although HMDs hold promise in being used with VREs, more research on effective alternatives was needed. In a recent study by Samur (2016), the author indicated that the new HMD devices that are currently in the market, such as Oculus Rift, HTC Vive, Samsung Gear HMDs offer a higher degree of digital presence in comparison to the older HMD models, by allowing individual to be in the here-and-now.

Virtual Reality and ASD

According to Strickland (1997), VREs are useful learning tools for children diagnosed with ASD and Attention Deficit Hyperactivity Disorder (ADHD). Currently, two VREs are offered for social skills development with individuals who have been diagnosed with ASD. The first one is called immersive VRE, which uses a HMD with 3-D surround graphics and gloves as the input device that allows users to feel like they are in the projected virtual environment. The second one is the most standardized and widely utilized form of technology called the desktop

VRE. The desktop VRE is included in a Windows based software computer that supports graphics with a monitor, mouse, microphone, and keyboard and allows users to participate in a virtual environment looking through a computer screen (Schmidt & Schmidt, 2008).

According to Strickland et al. (1996), the realism that a VRE offers can help with sensory and visual thought patterns that children with ASD experience, and thus improve children's real world generalizations that can also be tailored to a child's specific needs of treatment. Bellani, Fornasari, Chittaro, and Brambilla (2011) discussed the benefits of incorporating VREs into treatment when mental health practitioners work with children with ASD. One of the benefits of a VRE is that it can provide a realistic computer based simulation of real world situations, which can offer a safe learning environment for children to learn new information, enhance their skills, and perform specific tasks related to their treatment needs. As noted by Vera, Campos, Herrera, and Romero (2007), VREs can be a beneficial learning tool for children with ASD because VREs allow children to stay engaged while playing and learning new concepts. Also, VREs eliminate the confusing stimuli from the environment that occurs in a real social context by allowing mental health practitioners or teachers to provide more in-depth interventions, based on each child's treatment needs.

Research using VREs with ASD. In a VRE Kiddie-ride with face processing for social issues experienced by children with ASD, a research study by Trepagnier et al. (2005) showed that children who were more aware of their social surroundings were able to locate given targets in the VRE Kiddie-ride. The authors suggested that training more children with ASD in a computer-based VRE can be an effective modality to assist children in developing social skills. In a second study by Moore, Cheng, and McGrath (2005), the authors discussed the importance of collaborative VREs in assisting children with communication impairment. Using collaborative VREs that offer a non-threatening technology approach to assist children with ASD, the authors' found advantages when using an avatar that had four different facial expressions (i.e., angry, sadness, fear, and happiness). The children were able to learn how to recognize and express feelings. In a similar study using a SL VR platform; Kandalaft, Didehbani, Krawczyk, Allen, and Chapman (2013) investigated VRE's enhancement of emotion recognition as well as social and communication skills of young adults ages 18 to 26, who were diagnosed by a psychiatrist with either Asperger Syndrome or PDD-NOS. The SL VRE included a clinician as an avatar depicting various facial cues (e.g., happy, sad, angry) based on each given social location such as an office, fast food restaurant, apartment, central park, school, or other locations where participants could learn how to respond to each social setting. The researchers concluded that further research with VREs was needed that included more realistic and naturalistic facial tracking and movement of the avatars.

Further research involving various locations and activities in a VRE was conducted by Standen and Brown (2005) for daily living skills, with 19 adolescents, ages 14 to 19, with intellectual disabilities and ASD. The results of their study showed that adolescents exposed to the VRE activities (i.e., grocery shopping, food preparation, and road safety) advanced in their cognitive choices when completing a task. Also, the VRE helped the adolescents to learn new rules, as well as improve their social learning skills. The authors highlighted the need for more VRE applications for individuals with intellectual impairments. In later research that assessed the benefits of a VRE using sensory integration therapy (SIT); Jung, Lee, Lee, and Lee (2006) assisted 12 children, ages 5 to 6 who were diagnosed with ASD (IQ of 64) to develop social skills and improve their overall behaviors based on a VR–Tangible Interaction System (VR-TIS). The children interacted through writing, sketching, manipulating, and navigating in the VR-TIS using a 2-D and 3-D platform. The results showed that the VR-TIS with the SIT program is useful when assessing and treating children with ASD.

In a VR café, Parsons et al. (2004) investigated the benefits of teaching social skills to children in order that they can learn how to make social judgments when choosing a drink and where to sit in a public place. The authors followed their previous research recommendations in their 2002 study which suggested that a VRE offers effective social skills teaching methods when working with children with ASD (as cited in Parsons et al., 2004). In the 2004, seven children diagnosed with ASD had two to four sessions in a VRE followed by watching a video using a laptop computer and the Visualizer software. The results of their study showed that the VR café offered corrective feedback to the children on specific social behaviors. For example, when the children tried to sit at a table occupied entirely by people, they had to select, using a joystick for navigation purposes, to sit at another table where there was space for them.

Herrera et al. (2008) pointed out that one of the major difficulties children with ASD experience is comprehension of symbolism and imaginative abilities. As Feldman (2008) stated in Piaget's second stage of cognitive development, the preoperational stage (i.e., 2 to 7 years old) is where a child starts to think about an object and uses a word that symbolizes it referred to as symbolism. Children who struggle with those abilities could participate in an advanced VRE where they could learn pretend play and ultimately enhance their understanding of the imagination process. In Herrera et al.'s (2008) study, a VR supermarket was used to assist two children (one with higher language development) diagnosed with ASD in their understanding how imagination works and to enhance their functional and symbolic understanding by asking them to select a list of goods in the VR using a touch screen. As suggested by Feldman (2008), in Piaget's theory, adaptation occurs when a child enhances his or her functional and symbolic understanding to new information as his or her cognitive development progresses. The results of the study revealed that the first child performed better symbolic play and generalized his or her learning to real life social contexts versus the second child. The authors attributed the difference in the two children's responses to the difference in their language development.

Grynszpan, Weiss, Perez-Diaz, and Gal (2013) completed a meta-analysis on technology-based training programs which included a VRE and other types of technology (e.g., interactive DVD, touch base tablet devices, robotics) for the treatment of ASD. They found that computerized learning using a VRE was an effective modality for those with ASD. According to their findings, using technology-based programs for facial and emotional processing, language skills, and independent living skills is a very promising treatment modality by promoting an advanced interactive environment were new social skills are learned. The new social skills or information that are learned is one of Piaget's main construct, which he refers to as schema, by which the child assimilates information learned and expands on that information as he or she gains new information (Feldman, 2008). However, Grynszpan et al. (2013) noted that while VRE is a promising treatment modality, it is still considered to be an emerging rather an established one; thus, its clinical application into treatment and its validity is constantly under an atmosphere of debate and more research investigation is needed.

A major limitation when using a SL VRE is the interactive communication and social skill challenges with children diagnosed with ASD (Danilovic, 2009). Wallace et al. (2010) questioned the utility of VREs because of the sensory and cognitive deficits children have with ASD. Also, SL VREs take a significant amount of time and training to learn how to navigate. In Danilovic recommended that SL VREs should be more user-friendly to enable individuals diagnosed with ASD to use these platforms. According to eye movement studies (Norbury et al., 2009; Rommelse, Stigchel, & Sergeant, 2008) and studies (Ehrlich & Munger, 2012; Gigante, 1993; Slater et al., 2009; Strickland et al., 1996) that used HMDs, children with ASD have the tendency to focus on different visuals rather than neurotypically developed children. As a result of the limitations with certain populations like children with ASD, Wallace et al. (2010) developed the Blue Room project. The Blue Room project is a screened space room with specific social scenarios projected on one wall. One of the advantages of the Blue Room was that the 10 participants (nine males and one female diagnosed with high functioning ASD) were not required to wear a HMD, giving participants the freedom to walk around the room, thus providing a more naturalistic experience. The results of their study showed that children reported presence and attending behaviors, however the limitations of their study were that children were solely passive observers in each scenario without the sense of being present in the virtual environment.

Following Wallace et al.'s (2010) research, Maskey et al. (2014) used real world training (i.e., CBT) and a VRE with nine male children (ages 7 to 13) who were verbally fluent, with no learning disabilities, but diagnosed with ASD and anxiety, with specific fears/phobias. The children were taking fluoxetine, an anti-anxiety medication. After the children watched a VRE (i.e., Blue Room) tailored to each child's specific fear over a 16-month period combined with a CBT approach, the children improved significantly in their abilities to handle real life situations involving their fears and phobias. In another study, assessing social skills of children diagnosed with ASD, Porayska-Pomsta et al. (2012) developed the ECHOES project, a technological enhanced learning environment. The project is a 3-D multi-modal learning computer based VRE environment, with various learning activities, virtual characters (i.e., agents) in which children with high functioning ASD between the ages of 5 and 7 are able to interact by touching a computer screen (42” LCD touch screen) where they develop social skills (i.e., help with communication, thematic interests, and literacy skills). Results from their study revealed that children with high functioning ASD who participated in the ECHOES project improved their social and communicative skills.

Summary

Chapter II provided a historic background of ASD, starting from Jean-Marc-Gaspard Itard who wrote the “Wild Boy of Aveyron,” to Eugen Blueler who described ASD as a schizophrenic psychosis syndrome, to Leo Kanner who developed the first child psychiatry service at Johns Hopkins Hospital, and to Hans Asperger who was the first to describe children as autistic. In addition, the history of revisions in the DSM-II through the DSM-5 regarding ASD is provided. The societal perceptions of ASD were also discussed, as well as the demographic information and clinical characteristics. Piaget’s cognitive development theory was described, along with the therapeutic interventions used with ASD. The use of technology in mental health throughout the century was provided including the use of VREs and HMDs and the related research using VREs with children diagnosed with ASD.

Chapter III

Research Design

Introduction

In this chapter, the details of pilot study and the results are provided. Also, the research questions, hypotheses, research design, participants, data collection, equipment, sampling procedures, and data analysis for the main study are described. For the present study, the instruments used were a demographic questionnaire and Lombard et al.'s (2011) Temple Presence Inventory (TPI).

Pilot Study

Purpose

A pilot study was conducted to establish validity of a Second Life (SL) Virtual Reality Therapy Environment (VRTE) video developed by the researcher (Markopoulos, 2016b) by comparing the VRTE to the film, "Can you Make It To the End?" by The National Autistic Society (2016) in the United Kingdom.

Pilot Study: First Part

Participants

For the first part of the pilot study, 7 faculty members and 11 master's and doctoral students were recruited from three departments: 1) Educational Leadership, Counseling and Foundation, 2) Psychology, and 3) Computer Science, at the University of New Orleans.

Equipment and Technology

The VRTE was developed for the pilot study using the SL three-dimensional (3-D) virtual reality platform (Linden Research, Inc., 2016), which was depicted in an online YouTube video and developed by the researcher. The design for the VRTE was based on the National

Autistic Society (2016) film depicting a child diagnosed with ASD who is entering a shopping mall with his mother. The equipment used to develop the VRTE was an Asus Rog gaming desktop computer (model G20CB), with a 17.3-inch monitor screen, keyboard, and mouse powered by an Intel Core i7-6700 H170 processor (see Figure 2). The Asus Rog has a built-in NVIDIA GeForce GTX 970X 4 gigabyte (GB) graphics card, and 16 GB random access memory (RAM) of double data rate fourth-generation synchronous dynamic random-access memory (DDR4) 2133 megahertz (MHz).

Figure 2. VRTE and VRE Computer Equipment

Figure 2. VRTE and VRE Gaming Desktop Computer Asus Rog G20CB.

The VRTE depicted a child with ASD in the form of a child avatar named "ASDchild" (see Figure 3). The ASDchild was depicted experiencing sensory overload conditions as the child with ASD in The National Autistic Society's film. Also, included in the video with the ASDchild was a parent avatar (see Figure 4). For the pilot study, nine check points were developed of visuals and sounds that a child diagnosed with ASD may experience, resembling the nine points in The National Autistic Society's film: 1) shopping mall (see Figure 5), 2) photo booth kiosk constant flashing (see Figure 6), 3) ATM machine with coins dropping was depicted as a cash register with coins dropping on the floor (see Figure 7), 4) individual drinking a beverage was depicted as a beverage area (see Figure 8), 5) balloons rubbing together was depicted as a large group of balloons popping (see Figure 9), 6) televisions playing (see Figure 10), 7) sound of alarm system ringing (see Figure 11), 8) bucket dumping and water splashing (see Figure 12), and 9) people walking in the virtual reality shopping mall depicted as avatar bots (see Figure 13).

Figure 3. VRTE

Figure 3. ASDchild.

Figure 4. VRTE

Figure 4. Child and Parent Avatars.

Figure 5. VRTE

Figure 5.   Shopping Mall.

Figure 6. VRTE

Figure 6. Photo Booth Constant Flashing.

Figure 7. VRTE

Figure 7. Cash Register-Sound of Coins.

Figure 8. VRTE

Figure 8. Beverage Area.

Figure 9. VRTE

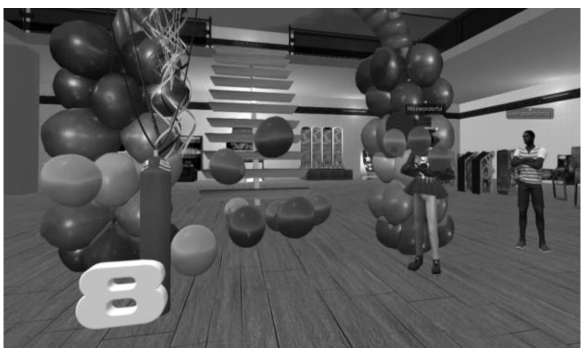

Figure 9. Balloons Popping.

Figure 10. VRTE

Figure 10. Televisions Playing.

Figure 11. VRTE

Figure 11. Sound of Alarm System.

Figure 12. VRTE

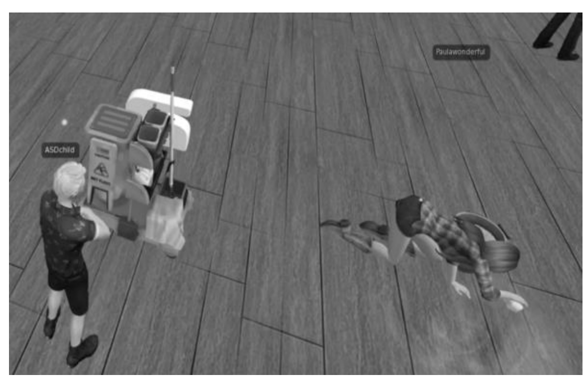

Figure 12. Water Splashing.

Figure 13. VRTE

Figure 13. People Walking in the Virtual Reality Mall.

Instrumentation

A *Pilot Study: Faculty Demographic Questionnaire* was used, which contained two sections with 11 questions (see Appendix A). Section I contained five demographic questions: Question 1 was for gender (i.e., Male, Female, Transgender). Question 2 was for age (drop down tab for 20 years old through 76 years old or over). Question 3 was for ethnicity (i.e., White/Caucasian, Black/African American, Hispanic/Latino, Asian/Pacific Islander, American Indian or Alaskan Native, Other-U.S. Citizen, Non-U.S. Citizen). Question 4 was for type of doctoral degree. Question 5 was for the number of years of experience or knowledge with children diagnosed with autism (drop down tab starting at 0 years of experience through 16 years or over).

Section II contained six questions regarding the faculty's general use of technology. For question 6, participants indicated the types of technology they use in their daily lives; Smart phones, Smart tables, Desktop computers, Laptop computers, Television, Smart television, 3-D Movies, and Other. For question 7, participants indicated the types of computer software programs they use; Word, Excel, PowerPoint, Photoshop, Videoconferencing (e.g., Skype, Google Hangouts, etc.), Internet, Electronic mail, Online chat, Twitter, Facebook, Educational software, and Other. For question 8, participants indicated the number of years of experience they have using technology (drop down tab starting at 0 years of experience through 20 years or over). For question 9, participants indicated the number of hours they spend using technology; 0 hours, Less than 1 hour, 1 to 2 hours, 3 to 4 hours, 5 to 6 hours, 7 to 8 hours, 9 to 10 hours, and More than 10 hours. For question 10, participants indicated the number of years of experience playing online games (drop down tab starting at 0 years of experience through 20 years or over). Lastly, for question 11, participants indicated the number of times they used interactive virtual reality technology (e.g. Second Life); Never, 1 time, 2-4 times, 5-7 times, and 8 or more times.

A *Pilot Study: Student Demographic Questionnaire* that was developed by the researcher was used, which contained two sections with 12 questions (see Appendix B). Section I contained six demographic questions. Questions 1 through 3 were the same as questions 1 through 3 in the *Faculty Demographic Questionnaire*. Question 4 was the degree a student was seeking (i.e., Master's or Doctorate). Question 5 was the degree emphasis area. Question 6 was the number of years of experience or knowledge working with children diagnosed with autism (drop down tab starting at 0 years of experience through 16 years or over). Section II contained the same six questions used in the Faculty Demographic Questionnaire, Section II.

A *Pilot Study: Virtual Reality Therapy Environment Questionnaire (VRTEQ)* that was developed by the researcher was used, containing 13 questions that assessed perceptions of both faculty and students regarding the VRTE (see Appendix C). Questions 1 through 11 were based on a 7-point Likert scale, starting at 1 (*not at all*) to 7 (*very much*). Question 12 was also based on a 7-point Likert scale, with 1 (*not likely*) to 7 (*very likely*). Scores on the 7-point Likert scale greater than or equal to 4, were considered within a moderate to above moderate level. All 12 questions asked participants their perceptions of the extent that the VRTE resembled the film. The first question asked participants their overall perceptions of the VRTE. The second question was about the shopping mall. The third question was about the photo booth kiosk constant flashing. The fourth question was about the sound of coins dropping on the floor. The fifth question was about the beverage area. The sixth question was about the balloons. The seventh question was about the televisions playing. The eighth question was about the sound of the alarm system. The ninth question was about the water bucket splashing. The tenth question was about the people. The eleventh question was about how engaging the VRTE was. The twelfth question was about the extent that the VRTE could be used in therapy with children diagnosed with autism. The thirteenth question was qualitative in nature, which asked participants to provide comments or feedback regarding the VRTE video.

Sampling Procedures

The sampling methods used for the selection of participants were convenience and purposeful. For the first part of the pilot study and prior to the data collection, an Institutional Review Board (IRB) approval was obtained from The University of New Orleans (UNO) (see Appendix D). After obtaining IRB approval, the researcher contacted UNO faculty members by e-mail requesting that they evaluate a film by The National Autistic Society (2016), “Can you Make It To the End?” and a “Virtual Reality Therapy Environment (VRTE)” video developed by the researcher using the SL virtual reality platform (Markopoulos, 2016). The e-mail requesting faculty participation included the informed consent, *Pilot Study: Faculty Informed Consent* (see Appendix E). Second, the researcher e-mailed UNO faculty members who taught summer classes requesting they disseminate an e-mail to students in their classes (master’s or doctoral level), which included the informed consent, *Pilot Study: E-mail to Faculty and Student Informed Consent* (see Appendix F). The informed consent included the following IRB guidelines: a) purpose of the study, b) procedures, c) voluntary nature of participation, d) possible risks and benefits, e) confidentiality, and f) contact information of the researcher.

The e-mail informed consents asked participants to watch two online videos: 1) a 1 minute and 25 second film by The National Autistic Society (2016) entitled "Can You Make It To the End?" and 2) a 1 minute and 47 second video of a "Virtual Reality Therapy Environment (VRTE)" of a child (avatar) diagnosed with ASD (Markopoulos, 2016a). After completion of both viewings, faculty completed the electronic Qualtrics-secure *Pilot Study: Faculty Demographic Questionnaire* and the graduate students completed the *Pilot Study: Student Demographic Questionnaire*. All participants completed the online *Pilot Study: Virtual Reality Therapy Environment Questionnaire (VRTEQ)*. The approximate time of completion for both videos and the online questionnaires was approximately 15 minutes.

Results

Once the data were collected, the variables, for both faculty members and graduate students, were coded using IBM SPSS Statistics version 24. Data were analyzed for any missing information. Eighteen participants responded, seven were faculty members and 11 were graduate students. For faculty's gender, the majority (n = 6, 85.7%) of participants identified as female, and one (14.3%) identified as male. For graduate students, the majority (n = 8, 72.7%) of participants identified as female, and three (27.3%) identified as male. Faculty's ages ranged from 47 to 74, with an average age of 61.33 (SD = 9.93), and graduate students' ages ranged from 25 to 58, with an average age of 39 (SD = 11.42) (see Table 1).

Table 1

Descriptives for Gender, Age, and Ethnicity of Faculty and Graduate Students (N =18)

	Faculty (*n* = 7)				Graduate Students (*n* = 11)			
	Male	Female			Male	Female		
Questions	%	%	*M*	*SD*	%	%	*M*	*SD*
Gender	14.30	85.70			27.30	72.70		
Age			61.33	9.93			39.00	11.42

For faculty's ethnicity, the majority (*n* = 5, 71.4%) identified as White/Caucasian and one (14.3%) for each of the following ethnicities: Hispanic/Latino and Black/African American. For graduate students, the majority (*n* = 8, 72.7%) identified as White/Caucasian and one (9.1%) for each of the following ethnicities respectively: Hispanic/Latino, Asian/Pacific Islander, American Indian or Alaskan Native (see Table 2).

Table 2

Frequencies of Ethnicity for Faculty and Graduate Students (N =18)

	Faculty (*n* = 7)		Graduate Students (*n* = 11)	
Ethnicity	*f*	%	*f*	%
White Caucasian	5	71.4	8	72.7
Black/African American	1	14.3	0	0.0
Hispanic/Latino	1	14.3	1	9.1
Asian/Pacific Islander	0	0.0	1	9.1
American Indian or Alaskan Native	0	0.0	1	9.1

For degree, faculty identified the following: two (28.6%) a doctoral degree in Educational Leadership, two (28.6%) as Ph.D. with no discipline indicated and one (14.3%) for each of the following disciplines: applied biological psychology, clinical child psychology, public health (see Table 3).

Table 3

Frequencies of Degree for Faculty (N = 7)

Degree	*f*	%
Education Leadership	2	28.6
Ph.D.	2	28.6
Applied Biological Psychology	1	14.3
Clinical Child Psychology	1	14.3
Public Health	1	14.3

For graduate students regarding the degree they were seeking, the majority (*n* = 8, 72.7%) reported a doctorate degree and three (27.3%) reported a master's degree. Regarding graduate students' discipline, the majority (*n* = 4, 36.4%) reported curriculum and instruction, three (27.3%) special education, and one (9.1%) for each of the following disciplines; school, curriculum and instruction-LGBT children's literature, special education-high incidence disabilities including gifted students with disabilities and developmental psychology (see Table 4).

Table 4

Frequencies of Degree and Discipline for Graduate Students (N = 11)

	Doctoral		Master's	
	n = 8	72.7%	*n* = 3	27.3%
Degree Discipline	*f*	%	*f*	%
Curriculum & Instruction	2	18.1	2	18.1
Special Education	3	27.3	0	0
School	0	0	1	9.1
Curriculum & Instruction-LGBT	1	9.1	0	0
Special Education-high incidence disabilities	1	9.1	0	0
Developmental Psychology	1	9.1	0	0

For the number of years of experience working with children diagnosed with autism, the mean for faculty was 6.71 (*SD* = 6.02) and for graduate students 9.27 (*SD* = 5.92) (see Table 5).

Table 5

Descriptives for Years of Autism Experience of Faculty and Graduate Students (N = 18)

	Faculty (*n* = 7)		Graduate Students (*n* = 11)	
Question	*M*	*SD*	*M*	*SD*
Years of Autism Experience	6.71	6.02	9.27	5.92

For types of technology that faculty use in their daily lives, the majority (*n* = 7, 85.7%) reported using smart phones and televisions, respectively, five (71.4%) desktop computers, four (57.1%) laptop computers, three (42.9%) smart tablets, two (28.6%) smart television, and no 3-D movies. For graduate students, the majority (*n* = 11, 100%) reported using laptop computers, ten (90.9%) smart phones and televisions, respectively, eight (72.7%) desktop computers, seven (63.6%) smart tablets, five (45.5%) smart television, two (18.2%) reported Other (no data input), and no 3-D movies (see Table 6).

For types of computer software programs that faculty use, the majority (*n* = 6, 85.7%) reported using Word, Excel, internet, and electronic mail, respectively, five (71.4%) PowerPoint and Facebook, respectively, four (57.1%) Photoshop, two (28.6%) online chat, and Twitter respectively, one (14.3%) videoconferencing, no educational software, and no other responses. For graduate students, the majority (*n* = 11, 100%) reported using Word, Excel, internet, and electronic mail, respectively; 10 (90.0%) PowerPoint and Facebook, respectively, 8 (72.7%) videoconferencing, 7 (63.6%) online chat, 4 (36.4%) Photoshop, 3 (27.3%) educational software (e.g., Starry Night, The Layered Earth), and 2 (18.2%) twitter and Other (no data input), respectively (see Table 6).

Table 6

Frequencies of Technology and Computer Software Used by Faculty and Graduate Students (N=18)

	Faculty (*n* = 7)		Graduate Students (*n* = 11)	
Questions	*f*	%	*f*	%
Types of Technology Used				
Smart phones	6	85.7	10	90.9
Smart tablets	3	42.9	7	63.6
Desktop computers	5	71.4	8	72.7
Laptop computers	4	57.1	11	100.0
Television	6	85.7	10	90.9
Smart television	2	28.6	5	45.5
3-D Movies	0	0.0	0	0.0
Other	0	0.0	2	18.2
Types of Computer Software Used				
Word	6	85.7	11	100.0
Excel	6	85.7	11	100.0
PowerPoint	5	71.4	10	90.0
Photoshop	4	57.1	4	36.4
Videoconferencing	1	14.3	8	72.7
Internet	6	85.7	11	100.0
Electronic mail	6	85.7	11	100.0
Online chat	2	28.6	7	63.6
Twitter	2	28.6	2	18.2
Facebook	5	71.4	10	90.0
Educational software	0	0.0	3	27.3
Other	0	0.0	2	18.2

Note. Percentages for each of the questions does not equal 100% for answers because participants could choose multiple options for a question.

For number of years of experience using technology, the mean for faculty was 16.57 (*SD* = 6.78) and students was 17.18 (*SD* = 4.02). For number of hours spent using technology, the mean for faculty was 5.29 (*SD* = 1.98) and students was 5.27 (*SD* = 1.62). For the number of years of experience playing video games, the mean for faculty was 6.00 (*SD* = 3.96) and students was 6.27 (*SD* = 5.64). In contrast, participants reported a low number of times they used interactive virtual reality technology (VRT); the mean for faculty was 1.86 (*SD* = 1.57) and students was 2.27 (*SD* = 1.35) (see Table 7).

Table 7

Descriptives of Amount of Time Technology Used by Faculty and Graduate Students (N = 18)

	Faculty (*n* = 7)		Graduate Students (*n* = 11)	
Questions	*M*	*SD*	*M*	*SD*
Years of Experience	16.57	6.78	17.18	4.02
Hours in a Typical Day	5.29	1.98	5.27	1.62
Years Playing Online Games	6.00	3.96	6.27	5.64
Times Interactive VRT	1.86	1.57	2.27	1.35

For the data analysis, responses from faculty members and graduate students for the *Pilot Study: Virtual Reality Therapy Environment Questionnaire (VRTEQ)* were combined (see Table 8). For question 1, the overall resemblance of the VRTE to the film, had a mean of 3.61 (*SD* = 1.54). For question 2, the resemblance of the shopping mall in the VRTE to the mall in the film revealed a mean of 3.72 (*SD* = 1.56). For question 3, the photo booth kiosk constant flashing in the VRTE to the photo booth kiosk constant flashing in the film revealed a mean of 3.83 (*SD* = 1.85). For question 4, the cash register with coins dropping on the floor in the VRTE to the ATM machine with coins dropping revealed a mean of 3.17 (*SD* = 1.58). For question 5, the beverage area in the VRTE to the person drinking a beverage in the film revealed a mean of 3.28

(*SD* = 1.74). For question 6, the large group of balloons popping in the VRTE to the balloons rubbing together in the film revealed a mean of 4.17 (*SD* = 1.91). For question 7, the televisions playing in the VRTE to the televisions playing in the film revealed a mean of 4.17 (*SD* = 1.89). For question 8, the sound of alarm system in the VRTE to the sound of the alarm system in the film revealed a mean of 4.00 (*SD* = 1.75). For question 9, the water bucket splashing in the VRTE to the water bucket splashing in the film revealed a mean of 3.83 (*SD* = 1.42). For question 10, the people walking in the shopping mall in the VRTE to the people walking in the shopping mall in the film revealed a mean of 3.17 (*SD* = 1.50). For question 11, the level of participants' engagement in the VRTE revealed a mean of 3.11 (*SD* = 1.78). For question 12, participants' ratings how likely the VRTE could be used in therapy with children diagnosed with autism revealed a mean of 3.61 (*SD* = 1.82).

Table 8

Descriptives of the VRTE Resemblance to the Film by Faculty and Graduate Students (N = 18)

Questions	*M*	*SD*
Overall Resemblance	3.61	1.54
Shopping Mall	3.72	1.56
Photo Booth Kiosk Constant Flashing	3.83	1.85
Coins Dropping on the Floor	3.17	1.58
Beverage Area	3.28	1.74
Balloons Rubbing Together	4.17	1.91
Televisions Playing	4.17	1.89
Alarm System	4.00	1.75
Water Bucket Splashing	3.83	1.42
People Walking in VRTE	3.17	1.50
VRTE Engagement	3.11	1.78
Use of VRTE with Autism	3.61	1.82

Using Evans (1996) suggested values (i.e., .00 - .19 = very weak, .20 - .39 = weak, .40 - .59 = moderate, .60 - .79 = strong, and .80 - 1.0 = very strong) as a basis to interpret the Pearson's correlations at an alpha level of less than or equal to .05 between participants' years of experience using technology and the nine checkpoints in the VRTE video; very weak, non-significant positive correlations were found for three checkpoints; beverage area, balloons rubbing together, and televisions playing (*r* = .195, .188, .118; respectively, see Table 9). In addition, a very weak, non-significant negative correlation was found for one checkpoint (i.e., shopping mall) (*r* = -.069). Weak, non-significant positive correlations were found for three checkpoints; coins dropping on the floor, water bucket splashing, and people walking in VRTE (*r* = .397, .340, .340; respectively). Moderate, non-significant positive correlations were found for two checkpoints; photo booth kiosk constant flashing and alarm system (*r* = .043, .470; respectively). Lastly, a moderate, non-significant positive correlation was found for overall resemblance (*r* = .426).

Very weak, non-significant negative correlations were found between hours' participants spent using technology and five checkpoints; shopping mall, photo booth kiosk constant flashing, balloons rubbing together, and televisions playing, (*r* = -.035, -.040, -.033, -.106; respectively). In addition, very weak positive, non-significant positive correlations were found for two checkpoints; beverage area and people walking in the VRTE (*r* = .091, .187; respectively). Weak, non-significant positive correlations were found for three checkpoints; coins dropping on the floor, alarm system, and water bucket splashing (*r* = .200, .236, .214; respectively). Lastly, a weak, non-significant positive correlation was found for overall resemblance (*r* = .357).

Very weak, non-significant positive correlations were found between years of experience participants have playing online games and five checkpoints; balloons rubbing together, coins dropping on the floor, beverage area, televisions playing, and water bucket splashing (*r* = .106, .079, .172, .085, .071; respectively). Weak, non-significant positive correlations were found for two checkpoints; shopping mall and people walking in the VRTE (*r* = .373, .266; respectively). Moderate, non-significant positive correlations were found for two checkpoints; balloons rubbing together and alarm system (*r* = .445, .430; respectively). Lastly, a moderate, non-significant positive correlation was found for overall resemblance (*r* = .467).

Very weak, non-significant positive correlations were found between number of times participants use interactive virtual reality and four checkpoints; shopping mall, coins dropping on the floor, beverage area, and televisions playing (*r* = .122, .044, .011, .037; respectively). In addition, a very weak, non-significant negative correlation was found for one checkpoint; photo booth kiosk constant flashing (*r* = -.015). Weak, non-significant positive correlations were found two checkpoints; balloons rubbing together and water bucket splashing (*r* = .254, .215; respectively). A moderate, non-significant positive correlation was found for one checkpoint; alarm system (*r* = .406). Lastly, a very weak, non-significant positive correlation was found for overall resemblance (*r* = .130).

Table 9

Correlations for Technology Use to Overall Resemblance and Nine Checkpoints in VRTEQ (N = 18)

Questions	OR	SM	PB	CD	BEV	BLN	TV	AS	WB	PVRE
Years Using Technology	.426	-.069	.043	.397	.195	.188	.118	.470	.340	.340
Hours Using Technology	.357	-.035	-.040	.200	.091	-.033	-.106	.236	.214	.187
Years Playing Online Games	.467	.373	.106	.079	.172	.445	.085	.430	.071	.266
Interactive VRT	.130	.122	-.015	.044	.011	.254	.037	.406	.215	.296

Note. Interactive VRT = Number of Times Used Interactive Virtual Reality Technology, OR = Overall Resemblance, SM = Shopping Mall, PB = Photo Booth Kiosk Constant Flashing, CD = Coins Dropping on the Floor, BEV = Beverage Area, BLN = Balloons Rubbing Together, TV = Televisions Playing, AS = Alarm System, WB = Water Bucket Splashing, PVRE = People Walking in VRTE.

Question 13 of the *Pilot Study: Virtual Reality Therapy Environment Questionnaire (VRTEQ)* was a qualitative question for comments or feedback. Out of the seven faculty members, two provided comments. For example, one faculty wrote, “This is a very good start. I believe that it could become a therapy for certain individuals, not all.” Out of the 11 graduate students, four provided comments. One student wrote, “I'm not sure the cartoon look of VR will mimic real life scenarios well enough to be beneficial as therapy. However, I think the sounds of VR could closely mimic real life, and that may be beneficial as therapy.” A second student wrote, “If the virtual reality film was enhanced: the people, sounds and situational environment it could be valuable. As it is this virtual film was not comparative to real life environments unless its purpose is before beginners.”

Pilot Study: Second Part

Due to the results of the first part of the pilot study and the small number of participants (i.e., 18), a second part of the pilot study was conducted. Based on the first part, edits were made to the VRTE.

Participants

For the second part of the pilot study, 42 undergraduate student participants were recruited from the fall, 2016 semester who were enrolled in EDHS 1110-Personal Health and Wellness in the College of Liberal Arts, Education and Human Development at the University of New Orleans.

Equipment and Technology

Based on the means from the *Pilot Study: Virtual Reality Therapy Environment (VRTE),* edits were made to the VRTE video. Overall, the sounds and visuals were enhanced providing more consistency with The National Autistic Society’s (2016) film. Also, seven visual scripts in the VRTE video were edited for more consistency with the film. First, the ASDchild’s appearance was edited to look more like a child (see Figure 14). Second, edits were made to the mall door entrance, which also included an entrance sign (see Figure 15). Third, the woman in the evening gown was eliminated from the VRTE video due to the irrelevance to the film. Fourth, the riding mechanical whale was replaced with a riding mechanical dog (see Figure 16). Fifth, a cash register with coins dropping on the floor was replaced with an ATM machine and coins dropping on floor (see Figure 17). Sixth, an avatar drinking a beverage was added to the beverage area (see Figure 18). Seventh, the people walking in the shopping mall were eliminated because that was not a check point used in the pilot study.

Based on the above edits to the VRTE, the video was renamed to the Virtual Reality Environment (VRE), which included the following nine check points: 1) shopping mall entrance with door opening (see Figure 15), 2) riding mechanical dog (see Figure 16), 3) photo booth kiosk constant flashing (see Figure 6), 4) ATM machine and coins dropping on the floor (see Figure 17), 5) person drinking a beverage (see Figure 18), 6) balloons popping (see Figure 10), 7) televisions playing (see Figure 11), 8) bucket dumping and water splashing (see Figure 13), and 9) alarm system (see Figure 12).

Figure 14. VRE

Figure 14. ASDchild.

Figure 15. VRE

Figure 15. Shopping Mall Entrance.

Figure 16. VRE

Figure 16. Riding Mechanical Dog.

Figure 17. VRE

Figure 17. ATM Machine and Coins.

Figure 18. VRE

Figure 18. Person Drinking a Beverage.

Edited Instrumentation

Revisions were made to the *Pilot Study: Student Demographic Questionnaire*, which contained two sections with nine questions (see Appendix G). In section I, for question three, the Other-U.S. Citizen and Non U.S. Citizen options were eliminated. Questions 4, Degree working towards and question; 5, Degree emphasis area; and 6, Years of experience or knowledge working with children with autism were eliminated because of the irrelevance to the purpose of the pilot study. All other content of questions remained the same. The numbering of the questions were corrected based on the eliminations of the three questions. The name of the questionnaire was changed to the *Pilot Study: Student Demographic Questionnaire-Revised,* which contained nine questions (see Appendix G).

The *Pilot Study: Virtual Reality Therapy Environment Questionnaire (VRETQ)* was revised and used to assess undergraduate students' perceptions of the edited VRE (see Appendix H). The word "Therapy" from the title of the VRTEQ was eliminated, *Pilot Study: Virtual Reality Environment Questionnaire-Revised* (*VREQ-R*). For all of the questions in the *VREQ-R*, the word *resemblance* was replaced with the word *similar*. Question 2 was edited for phrasing of the *shopping mall entrance*. A question was added asking participants to rate a *riding mechanical dog*. The question regarding coins was edited to reflect the following, *ATM machine and the sound of the coins dropping on the floor*. Questions 10 and 11 were eliminated due to the irrelevant content to the pilot study. Lastly, the numbering of the questions was corrected based on the eliminations and additions of questions. The *VREQ-R* contained 11 questions.

Scoring of all questions were based on a 7-point Likert scale system, from 1 (*not at all*), to 7 (*very much*). Scores on the 7-point Likert scale greater than or equal to 4, were considered within a moderate to above moderate level. For question 1, participants were asked to rate the overall similarity of the VRE video to the film. For question 2, participants were asked to rate the similarity of the *shopping mall entrance*. For question 3, participants were asked to rate the similarity of the *riding mechanical dog*. For question 4, participants were asked to rate the similarity of the *photo booth kiosk with constant flashing*. For question 5, participants were asked to rate the similarity of the *ATM machine and the coins dropping on the floor*. For question 6, participants were asked to rate the similarity of the *person drinking a beverage*. For question 7, participants were asked to rate the similarity of the *balloons popping*. For question 8, participants were asked to rate the similarity of the *televisions playing*. For question 9, participants were asked to rate the similarity of the *water bucket splashing*. For question 10, participants were asked to rate the similarity of the *sound of the alarm system*. For question 11, participants provided comments or feedback (see Appendix H).

Sampling Procedures

The sampling methods used for the selection of participants were convenience and purposeful. For the second part of the pilot study, the same IRB approval was used from the first pilot study (see Appendix D). Verbal permission was obtained by the instructor to attend the class to recruit students enrolled in an introductory undergraduate health class. The researcher used a verbal script for the informed consent, *Pilot Study: Student Verbal Informed Consent* (see Appendix I), with directions for participants to assess the similarity of a Second Life "Virtual Reality Environment (VRE)" video developed by the researcher (Markopoulos, 2016) to The National Autistic Society (2016), "Can you Make It To the End?" film. In addition, according the IRB guidelines, the researcher informed potential participants of the following: (a) purpose of the study, (b) procedures, (c) voluntary nature of participation, (d) possible risks and benefits, (e) confidentiality, and (f) contact information of the researcher.

Participants' completion of the anonymous survey indicated voluntary consent to participate. Participation included the following: 1) watching a 1 minute and 25 second film by The National Autistic Society (2016), "Can You Make It To the End?", 2) watching a 1 minute and 37 second VRE. "Virtual Reality Environment (VRE)" (Markopoulos, 2016b), 3) completion of the *Pilot Study: Student Demographic Questionnaire-Revised* (see Appendix G), 4) completion of the *Pilot Study: Virtual Reality Environment Questionnaire-Revised (VREQ-R)* (see Appendix H). The approximate time of completion for both videos and the questionnaires was 15 minutes.

Data Analysis

To ensure participants' anonymity and before data analysis, all participants' questionnaires were given an anonymous code. For data analysis, variables were coded using IBM SPSS Statistics version 24. Data were analyzed for any missing information. Of the 46 undergraduate students, 42 completed the pilot study, for a completion rate of 91.3%. For participants' gender, the majority (*n* = 26, 56.5%) were female and 16 (34.8%) male. Participants' ages ranged from was 17 to 55, with an average age of 22.21 (*SD* = 7.06). For ethnicity, the majority of participants (*n* = 30, 65.2%) were White/Caucasian, 7 (15.2%) Black/African American, 3 (6.5%) Hispanic/Latino, 1 (2.2%) Asian/Pacific Islander, and 1 (2.2%) did not respond (see Table 10).

Table 10

Descriptives for Gender, Age and Ethnicity of Undergraduate Students (N = 42)

	Male		Female				Total	
Questions	*f*	%	*f*	%	*M*	*SD*	*f*	%
Gender	16	38.1	26	61.9				
Age					22.21	7.06		
Ethnicity								
White/Caucasian							30	71.4
Black/African American							7	16.7
Hispanic/Latino							3	7.1
Asian/Pacific Islander							1	2.4
No response							1	2.4

For the types of technology used in their daily lives where participants could indicate more than one option, the majority (*n* = 42, 100%) reported using smart phones, 39 (92.9%) laptops, 34 (81%) televisions, 14 (33.3%) smart tablets, 13 (31%) desktop computers and smart televisions, respectively, 4 (9.5%) 3-D movies, and 2 (4.8%) Other (no data) (see Table 11). For types of computer software programs where participants could indicate more than one option, the majority (n = 39, 92.9%) reported using internet, 37 (88.1%) e-mail, 34 (81%) Word, 33 (78.6%) Facebook, 27 (64.3%) PowerPoint, 15 (35.7%) Twitter, 13 (31%) online chat, 10 (23.8%) Excel, 9 (21.4%) videoconferencing, 8 (19%) educational software (e.g., Moodle), 4 (9.5%) Other (e.g., Google Docs), and 3 (7.1%) Photoshop (see Table 11).

Table 11

Frequencies of Technology and Computer Software Used by Undergraduate Students (N = 42)

Questions	*f*	%
Types of Technology Used		
Smart phones	42	100.0
Smart tablets	14	33.3
Desktop computers	13	31.0
Laptop computers	39	92.9
Television	34	81.0
Smart television	13	31.0
3-D Movies	4	9.5
Other	2	4.8
Types of Software Used		
Word	34	81.0
Excel	10	23.8
PowerPoint	27	64.3
Photoshop	3	7.1
Videoconferencing	9	21.4
Internet	39	92.9
Electronic mail	37	88.1
Online chat	13	31.0
Twitter	15	35.7
Facebook	33	78.6
Educational software	8	19.0
Other	4	9.5

Note. Percentages for each of the questions does not equal 100% for answers because participants could choose multiple options for a question.

For the number of years of experience participants use technology, the mean was 12.36 (*SD* = 3.13). For the number of hours spent using technology, the mean was 4.90 (*SD* = 1.21). For the number of years of experience playing online games, the mean was 7.17 (*SD* = 5.47). For the number of times participants' used interactive VRT, the mean was 1.88 (*SD* = 1.29) (see Table 12).

Table 12

Descriptives of Amount of Time Technology Used by Undergraduate Students (N = 42)

Questions	*M*	*SD*
Years Using Technology Daily	12.36	3.13
Hours Using Technology	4.90	1.21
Years Playing Online Games	7.17	5.47
Number of Times Used Interactive Virtual Reality	1.88	1.29

For the data analysis, the responses from the undergraduate students for the *Virtual Reality Environment Questionnaire-Revised (VREQ-R)* were analyzed (see Table 13). For question 1, the overall similarity of the VRE to the film, had a mean of 4.02 (*SD* = 1.66). For question 2, the similarity of the shopping mall entrance door in the VRE to mall entrance door in the film revealed a mean of 4.26 (*SD* = 1.65). For question 3, the similarity of the mechanical riding dog in the VRE to the mechanical dog in the film revealed a mean of 3.83 (*SD* = 1.54). For question 4, the similarity of the photo booth kiosk constant flashing in the VRE to the photo booth kiosk flashing in the film revealed a mean of 4.36 (*SD* = 2.13). For question 5, the similarity of the ATM machine with coins dropping in the VRE to the ATM machine with coins dropping in the film revealed a mean of 4.07 (*SD* = 1.84). For question 6, the similarity of a person drinking a beverage in the VRE to a person drinking a beverage in the film revealed a mean 3.98 (*SD* = 1.88). For question 7, the similarity of a large group of balloons popping in the

VRE to the sound of the balloons rubbing together in the film revealed a mean of 3.93 (*SD* = 1.49). For question 8, the similarity of the televisions playing in the VRE to the televisions playing in the film revealed a mean of 4.52 (*SD* = 1.67). For question 9, the similarity of the water bucket splashing in the VRTE to the water bucket splashing in the film revealed a mean of 3.88 (*SD* = 1.35). For question 10, the similarity of the alarm system ringing in the VRE to the alarm system ringing in the film revealed a mean of 4.14 (*SD* = 1.66).

Table 13

Descriptives of VRE Similarity to the Film by Undergraduate Students (N = 42)

Questions	*M*	*SD*
Overall Similarity	4.02	1.66
Shopping Mall Entrance Door Opening	4.26	1.65
Riding Mechanical Dog	3.83	1.54
Photo Booth Kiosk Constant Flashing	4.36	2.13
ATM Machine and Coins Dropping	4.07	1.84
Person Drinking a Beverage	3.98	1.88
Balloons Rubbing Together	3.93	1.49
Televisions Playing	4.52	1.67
Water Bucket Splashing	3.88	1.35
Alarm System	4.14	1.66

Using Evans (1996) suggested values as a basis to interpret the Pearson's correlations and an alpha level of less than or equal to .05 between participants' years of experience using technology and the nine checkpoints; very weak, non-significant positive correlations were found for five checkpoints; photo booth kiosk constant flashing, person drinking a beverage, televisions playing, alarm system, and the water bucket splashing (*r* = .142, .014, .001, .103, .184; respectively, see Table 14). In addition, very weak, non-significant negative correlations were found for four checkpoints; shopping mall door opening, ATM machine and coins dropping, balloons rubbing together, and the riding mechanical dog (r = -.037, -.030, -.005, -.038; respectively). Lastly, a very weak, non-significant positive correlation was found for overall similarity (r = .022).

Moderate, significant positive correlations at an alpha level of less than or equal to .01 were found between hours' participants spent using technology and all nine checkpoints; shopping mall door opening, photo booth kiosk constant flashing, ATM machine and coins dropping, person drinking a beverage, balloons rubbing together, televisions playing, alarm system, water bucket splashing, and riding mechanical dog (r = .490, .451, .498, .494, .526, .449, .543, .413, .502; respectively). Lastly, a moderate, significant positive correlation was found for overall similarity (r = .452).

Very weak, non-significant positive correlations at an alpha level of less than or equal to .05 were found between years of experience participants have playing online games and five checkpoints; shopping mall door opening, ATM machine and coins dropping, person drinking a beverage, balloons rubbing together, and riding mechanical dog (r = .133, .176, .100, .118, .168; respectively). In addition, a weak non-significant positive correlation was found for the photo booth kiosk constant flashing (r = .231) and a weak significant positive correlation was found for the televisions playing (r = .310). A very strong non-significant positive correlation was found for one checkpoint (i.e., bucket splashing) (r = .854). Lastly, a very weak, non-significant positive correlation was found for overall similarity (r = .083).

Very weak, non-significant positive correlations at an alpha level of less than or equal to .05 were found between number of times participants using interactive virtual reality and five checkpoints; shopping mall door opening, ATM machine and coins dropping, balloons rubbing together, alarm system, and water bucket splashing (r = .061, .158, .122, .065, .062; respectively). Weak, non-significant positive correlations were found for three checkpoints; person drinking a beverage, televisions playing, and riding mechanical dog (r = .290, .222, .222; respectively). In addition, a weak positive correlation was found for one checkpoint; photo booth kiosk constant flashing (r = .309). Lastly, a very weak, non-significant positive correlation was found for overall similarity (r = .149).

Table 14

Correlations for Technology Use to Overall Similarity and Nine Checkpoints (N = 42)

Questions	OS	SM	PB	ATM	BEV	BLN	TV	AS	WB	MD
Years Using Technology	.022	-.037	.142	-.030	.014	-.005	.001	.103	.184	-.038
Hours Using Technology	.452**	.490**	451**	.498**	.494**	.526**	.449**	.543**	.413**	.502**
Years Playing Online Games	.083	.133	.231	.176	.100	.118	.310*	-.030	.854	.168
Interactive VRT	.149	.061	.309*	.158	.290	.122	.222	.065	.062	.222

Note. $*p < .05$, $**p < .01$
Note. Interactive VRT = Number of Times Used Interactive Virtual Reality Technology, OS = Overall Similarity, SM = Shopping Mall Door Opening, PB = Photo Booth Kiosk Constant Flashing, ATM = ATM Machine and Coins Dropping, BEV = Person Drinking a Beverage, BLN = Balloons Rubbing Together, TV = Televisions Playing, AS = Alarm System, WB = Water Bucket Splashing, MD = Riding Mechanical Dog.

A qualitative portion of the survey (Question 11) asked participants to provide comments or feedback regarding the VRE video. Out of the 42 student participants, only 11 provided comments. For example, one participant reported, “They were similar and the first was better than the second” and another one reported, “Very good … both portrayed thru the eyes/sense of a child with autism. Gave me chills/had my heart racing.” A few other participants expressed concerns. For example, one participant comment that “The VR did not have the same feel as the real one.” A second example was that the “Virtual reality cannot compare with real life, there is not enough memory available to program all the excessive stimuli in the first autism film.” Also, “…. everything seems more cartoonish and not very serious.”

Summary of Pilot Study

A comparison summary of both parts of the pilot study for six of the nine check points indicated an increase in the means. Specifically, for the VRTE overall *resemblance* in comparison to the VRE overall s*imilarity*, the mean for the VRE increased to 4.02 from 3.61. Out of the 10 questions, 6 had a mean of 4.00 or above. Additionally, out of the nine checkpoints, seven had an increase in means as follows: (1) shopping mall, mean increased to 4.26 from 3.72, (2) photo booth kiosk with constant flashing, increased to 4.36 from 3.83, (3) ATM Machine and coins dropping, increased to 4.07 from 3.17, (4) person drinking a beverage, increased to 3.98 from 3.28, (5) televisions playing, increased to 4.52 from 4.17, (6) water bucket splashing, slightly increased to 3.88 from 3.83, and (7) the alarm system, increased to 4.17 from 4.00. For the balloons rubbing together, slightly decreased to 3.93 from 4.17. All mean scores fell within the moderate level of the 7-point Likert scale (see Table 15).

Lastly, Cohen's d was calculated for the nine above check points to examine the effect size of the overall means for the VRTEQ (M = 3.75, SD = .35) and the VREQ-R (M = 4.13, SD = .21). The effect size (d = 1.32) exceeded Cohen's (1992) convention for a large effect (d = .80), thus the results indicated that participants in the second pilot study experienced a higher level of similarity of the VRE video to the society's film than the participants in the first pilot study.

Table 15

VRTEQ and VREQ-R Mean Comparison Table

Pilot Study Part I *Faculty and Graduate Students (N = 18)* Questions	*M*	*SD*	*Pilot Study Part II* *Undergraduate Students (N = 42)*	*M*	*SD*
Overall Resemblance	3.61	1.54	Overall Similarity	4.02	1.66
Shopping Mall	3.72	1.56	Shopping Mall Door Opening	4.26	1.65
Photo Booth Kiosk Constant Flashing	3.83	1.85	Photo Booth Kiosk Constant Flashing	4.36	2.13
Coins Dropping on the Floor	3.17	1.58	ATM Machine and Coins Dropping	4.07	1.84
Beverage Area	3.28	1.74	Person Drinking a Beverage	3.98	1.88
Balloons Rubbing Together	4.17	1.91	Balloons Rubbing Together	3.93	1.49
Televisions Playing	4.17	1.89	Television Playing	4.52	1.67
Alarm System	4.00	1.75	Alarm System	4.14	1.66
Water Bucket Splashing	3.83	1.42	Water Bucket Splashing	3.88	1.35
People walking in VRTE	3.17	1.50	Riding Mechanical Dog	3.83	1.54

Main Study: Research Questions and Hypotheses

In the present study, the following four research questions including four hypotheses were investigated.

Research Question 1

Is there a significant difference in mental health practitioners' likelihood of using VRTE with children diagnosed with ASD and their perceptions of presence in the VRTE using two conditions (i.e., Condition A, first experiencing the VRTE using the Laptop, then the HMD or Condition B, first experiencing the VRTE using the HMD first, then Laptop)?

Null Hypothesis

No significant difference exists in mental health practitioners' likelihood of using the VRTE with children diagnosed with ASD and their perceptions of presence in the VRTE when using a Laptop and the Oculus Rift HMD.

Research Question 2

Do mental health practitioners' demographic factors (i.e., age and years of experience and/or knowledge working with children diagnosed with ASD) correlate with their perceptions of presence in the VRTE when using the Laptop and the Oculus Rift HMD [i.e., TPI total scores and four subscales for spatial presence, social presence-actor within medium (i.e., parasocial interaction), engagement (i.e., mental immersion), and social realism]?

Null Hypothesis

No significant correlations exist with mental health practitioners' demographic factors and their perceptions of presence in the VRTE when using the Laptop and the Oculus Rift HMD (i.e., TPI total and four subscales scores).

Research Question 3

Is there a significant relationship between mental health practitioners use of technology (i.e., number of years using technology, hours spent using technology, and years of experience playing online games) and their perceptions of presence in the VRTE when using the Laptop and the Oculus Rift HMD [i.e., TPI total scores and four subscale scores for spatial presence, social presence-actor within medium (i.e., parasocial interaction), engagement (i.e., mental immersion), and social realism]?

Null Hypothesis

No significant relationships exist in mental health practitioners' use of technology and their perceptions of presence in the VRTE when using the Laptop and the Oculus Rift HMD (i.e., TPI total and four subscales scores).

Research Question 4

Is there a significant relationship between mental health practitioners' number of times they used interactive virtual technology and years of experience using technology in therapy with children diagnosed with ASD and their perceptions of presence in the VRTE when using the Laptop and the Oculus Rift HMD [i.e., TPI total scores and four subscales: spatial presence, social presence-actor within medium (i.e., parasocial interaction), engagement (i.e., mental immersion), and social realism]?

Null Hypothesis

No significant relationships exist in mental health practitioners' number of times they used interactive virtual technology and years of experience using technology in therapy with children diagnosed with ASD to their perceptions of presence in the VRTE when using the Laptop and the Oculus Rift HMD (i.e., TPI total and four subscales scores).

Research Design

A quasi-experimental, within-subjects repeated-measures MANOVA research design was used where all 28 participants experienced one of two random order conditions; Condition A required participation in SL VRTE first using a Laptop computer and then the 2016 Oculus Rift HMD, and Condition B required participation in a SL VRTE first using the 2016 Oculus Rift HMD and then a Laptop computer. In both conditions participants (i.e., mental health practitioners) completed the TPI, which includes four subscales [i.e., spatial presence, social presence-actor within medium (parasocial interaction), engagement (mental immersion), and social realism]. For the first research question, the independent variables included mental health practitioners' likelihood of using the Laptop or the Oculus Rift HMD with children diagnosed with ASD. The independent variables for the second research questions included mental health practitioners' demographic factors (i.e., age and years of experience and/or knowledge of working with children diagnosed with ASD). The independent variables for the third research question included number of years using technology, hours spent using technology, and years of experience playing online games. The independent variables for the fourth research question included the number of times participants used interactive virtual technology and years of experience using technology in therapy with children with ASD. The dependent variables for research questions one, two, three and four were mental health practitioners' perceptions of presence of the VRTE (i.e., Temple Presence Inventory (TPI) using four subscales).

Participants

A convenience and purposeful sampling was used for participant selection. Based on a G*Power calculation (Heinrich-Heine-Universität Düsseldorf, 2014), a minimum of 27 mental health practitioners were needed for the main research study. In the present study, a total of 30 participants were recruited, from which 28 responses were used. Two participants' responses were eliminated based on environmental factors that impacted their results and they did not meet the research criteria for the study. The criteria for participation included: (1) licensed in a mental health field in Louisiana (i.e., provisional licensed professional counselor, PLPC; licensed professional counselor, LPC; licensed psychologist; psychiatric doctor, MD; licensed clinical social worker, LCSW; licensed clinical social worker-BACS, LCSW-BACS; licensed master social worker, LMSW; registered social worker, RSW; or licensed applied behavior analyst, ABA) and (2) experience and/or knowledge providing therapy to children diagnosed with ASD.

Data Collection Methods

Instruments

Demographic questionnaire. A Demographic Questionnaire was used which contain two sections, with 13 questions (see Appendix J). Section I, contain eight demographic questions: 1) Gender (i.e., Male, Female, Transgender); 2) Age (drop down tab for each year starting at 20 years old through 76 years old or over); 3) Ethnicity (i.e., White/Caucasian, Black/African American, Hispanic/Latino, Asian/Pacific Islander, American Indian, Alaskan Native or Other); 4) Degree (i.e., Master's, Doctorate, Medical); 5) Professional licensure (i.e., provisional licensed professional counselor (PLPC), licensed professional counselor (LPC), licensed psychologist, psychiatric doctor (MD), licensed clinical social worker (LCSW), licensed clinical social worker-BACS (LCSW-BACS), licensed master social worker (LMSW), registered social worker (RSW), licensed applied behavior analyst (ABA), and Other); 6) Credentials (i.e., National Certified Counselor (NCC), Certified Clinical Mental Health Counselor (CCMHC), Applied Behavior Analysis (ABA), Cognitive Behavioral Therapy (CBT), and Other; 7) Work setting (i.e., Private Practice, School, Mental Health Agency, Hospital, and Other); and 8) Years of experience or knowledge working with children diagnosed with autism (drop down tab starting at 0 years of experience through 16 years or over).

Section II, contains five questions, regarding participants' use of technology. For question 9, participants were asked to indicate the number of years of experience using technology in therapy with children with autism (i.e., drop down tab starting at 0 years of experience through 15 years or over). For question 10, participants were asked to indicate the number of years they have used technology (i.e., drop down tab starting at 0 years through 20 years or over). For question 11, participants were asked to indicate the hours they spend using technology in a typical day (i.e., 0 hours, less than 1 hour, 1 to 2 hours, 3 to 4 hours, 5 to 6 hours, 7 to 8 hours, 9 to 10 hours, and more than 10 hours). For question 12, participants were asked to indicate the years of experience they have played online games (i.e., drop down tab starting at 0 years of experience through 20 years or more). For question 13, participants were asked to indicate the number of times they have used interactive virtual reality technology (e.g. Second Life) (i.e., never, 1 time, 2-4 times, 5-7 times, and 8 or more times).

Temple Presence Inventory. The Temple Presence Inventory (TPI) is a new instrument validated for its internal consistency and reliability (Lombard et al., 2011). In 1997 Lombard and Ditton, developed the TPI, based on 114 potential items from different questionnaires (i.e., Slater Usoh Steed Questionnaire (SUS), Presence Questionnaire (PQ), Igroup Presence Questionnaire (IPQ), MEC Spatial Presence Questionnaire (MEC-SPQ), and ITC Sense of Presence Inventory (ITC-SOPI)). In addition to the five questionnaires, new items were added to the TPI so each of the five concepts of presence were represented: 1) social richness, 2) realism, 3) transportation, 4) immersion, and 5) social actor with a medium (Lombard & Ditton, 1997).

After a series of pilot studies, the TPI was refined to include 72 items (Lombard & Ditton, 1997). A total of 307 participants were exposed to a high presence condition that consisted of a large, high resolution, three dimensional (3-D), with color images, and surround audio system 45-minute film named *T-Rex: Back to the Cretaceous*. Additionally, 162 participants were exposed to a low presence condition, which consisted of a small, black and white image, with monophonic sound old comedy episode named *Three's Company*. After the exposure, participants completed the TPI. Based on a series of factor analyses, eight factors were found across 42 items, with Cronbach alphas for: 1) spatial presence, .91; 2) social presence-actor within medium, .90; 3) passive social presence, .88; 4) active social presence, .77; 5) presence as engagement, .90; 6) presence as a social richness, .93; 7) presence as a social realism, .75; and 8) presence as a perceptual realism, .78. The results indicated high ratings for engagement (M = 5.19), social richness (M = 4.87), social realism (M = 3.41) and perceptual realism (M = 3.79) subscales versus low means for the low presence condition. For the spatial presence subscale, the results indicated a high presence rating (M = 5.05) compared to the low presence condition.

In 2011, Lombard et al. tested the TPI for its validity with 46 participants who were exposed to three different short interactive media environments: *Lord of the Rings* (science fantasy), *The Daily Show with Jon Stewart* (comedy), and a *Civil War* (documentary). After exposure to the movies, participants completed the TPI. The results indicated high ratings of passive social presence (*M* = 6.02), presence as engagement (*M* = 4.88), and presence as social richness (*M* = 4.83) for the *Lord of the Rings*, while low presence was rated for social realism (*M* = 1.32). For *The Daily Show*, high ratings were found for all eight subscales, with the highest subscale ratings for passive social presence (*M* = 5.62), presence as social richness (*M* = 5.05), and presence as social realism (*M = 5.06*), while low presence was rated for spatial presence (*M* = 2.86). Lastly, the *Civil War* documentary revealed high ratings for presence as a social realism (*M* = 4.10), but low ratings were found in the remaining seven subscales.

In addition, the authors found that the TPI was valid and reliable when used in a gaming environment, with 85 participants who were recruited from Temple University (average age of 20). Participants were exposed to a 10-minute low presence stimulus environment (i.e., *SimCity Classic* - gaming virtual cities building simulation) or a high presence stimulus environment (i.e., *The Sims 3* - gaming virtual building simulation in an immersive, social environment and interaction with others in the virtual environment). Then, they completed a questionnaire that contained 113 items from six different presence questionnaires, including the TPI. Controlling for possible order effects, two versions of the questionnaire were created and were administered randomly to the participants. The main goal was to provide convergent validity for the TPI based on all eight subscales of the TPI. The results indicated a significant mean difference for high presence versus low presence conditions, with higher presence having higher means. The highest means were for presence as social richness (*M* = 4.34) and passive social presence (*M* = 3.82) subscales, versus low means for the low presence condition. For the spatial presence subscale, the results indicated a high presence mean (*M* = 2.69) compared to a low presence mean (*M* = 2.22), however no significant difference was found.

For the purpose of convergent validity, Lombard et al. study (2011) conducted an intercorrelational analysis of the subscales from four different presence questionnaires measuring spatial presence, presence as engagement, and presence as perceptual realism with the TPI subscales. According to their findings, the TPI's spatial presence subscale was intercorrelated with the Igroup Presence Questionnaire (IPQ), Slater Usoh Steed (SUS), MEC Spatial Presence Questionnaire (MEC-SPQ), and the ITC Sense of Presence Inventory (ITC-SOPI) (i.e., r =.584 to .861). For the TPI's presence as engagement subscale, intercorrelations were found with the Igroup Presence Questionnaire (IPQ), MEC Spatial Presence Questionnaire (MEC-SPQ) attention allocation subscale, Presence Questionnaire (PQ) involvement subscale, and the ITC Sense of Presence Inventory (ITC-SOPI) engagement subscale (i.e., r = .334 to .774). Lastly, for the TPI's presence as perceptual realism subscale, intercorrelations were found with the Igroup Presence Questionnaire (IPQ) experience realism subscale, Presence Questionnaire (PQ) natural subscale, and the ITC Sense of Presence Inventory (ITC-SOPI) ecological validity subscale (i.e., r =*.563* to *.786*).

Based on further analysis for the TPI's internal consistency and reliability, Lombard et al. (2011) reported that Cronbach's alphas showed that the TPI subscales were reliable (i.e., highest was for presence as social richness, r = .919 followed by social presence-actor within medium, r = .910, and the lowest was the active social presence subscale, r = .86). The authors concluded that the TPI has good validity and reliability not only in a media context, but also in a gaming interactive environment. The TPI has been validated using two forms (i.e., media and gaming interactive environment), however, the TPI also needs to validated in a fully immersive virtual reality environment.

Temple Presence Inventory scoring. Four out of eight subscales from the TPI were used in this study, which included a total of 23 questions (see Appendix K). A fifth area entitled "Evaluation of Your Overall Equipment Experience" included seven questions. For the present study, a total of 30 questions were included. Permission for the use of the TPI was granted by the authors Lombard et al. as stated at Matthew Lombard's website http://matthewlombard.com/research/p2_ab.html (Lombard, 2013) (see Appendix L).

Subscale I contains seven questions assessing spatial presence experience. Spatial presence, also referred to as *physical presence*, *sense of physical space*, *perceptual immersion*, *transportation*, and *sense of being there*, is defined as "when part or all of a person's perception fails to accurately acknowledge the role of technology that makes it appear that s/he is in a physical location and environment different from her/his actual location and environment in the physical world" (International Society for Presence Research, 2000, Presence defined, para. 7a). Participants were asked the following six questions based on a 7-point Likert scale (1 = *not at all* or *never* to 7 = *very much* or *always*); Scores on the 7-point Likert scale greater than or equal to 4, were considered within a moderate to above moderate level: 1) how much the objects and people they saw/heard came to the place they were, 2) how much it seemed they could reach out and touch the objects or people they saw/heard, 3) how often an object seemed to be headed towards them did they want to move to get out of its way, 4) extent participants experience a sense of being inside the environment they saw/heard, 5) extent that it seemed that sounds came from specific different locations, 6) how often did participants wanted to or try to touch something they saw/hear. Ranges for the overall means for all six questions were scored as follows: 1) 1 to 3 = *low presence*, 2) a greater than 3 to 5 = *moderate presence*, and 3) greater than 5 to 7 = *high presence*. For question 7, participants were asked if the experience seemed more like looking at the events/people on a computer screen or more like looking through a window. The overall mean was scored based on the following ranges: 1) 1 to 4 = *like a computer screen* and 2) greater than 4 to 7 = *like a window*.

Subscale II contains seven questions assessing social presence-actor within medium (parasocial interaction) presence experience. Social presence, distinct from social realism, is defined as "when part or all of a person's perception fails to accurately acknowledge the role of technology that makes it appear that s/he is communicating with one or more other people or entities." Additionally, social actor within the medium and parasocial interaction, is defined as "when part or all of a person's perception fails to accurately acknowledge the role of technology in her/his perception that s/he is engaged in two-way communication with another person or people, or with an artificial entity (e.g., a computer "agent"), when the communication is in fact one-way, from the technology to the person without feedback from the person to the other entity(ies)" (International Society for Presence Research, 2000, Presence defined, para. 7e). Social presence and social actor within the medium are inter connected. Participants were asked the following questions based on a 7-point Likert scale (1 = *not at all* or *none* to 7 = *very much* or *always*); Scores on the 7-point Likert scale greater than or equal to 4, were considered within a moderate to above moderate level: 1) how often did they have the sensation that people they saw/heard could also see/hear them, 2) to what extent did they feel they could interact with the person or people saw/heard, 3) how much did it seem as if they and they people they saw/heard both left the places where they were and went to a new place, 4) how much did it seemed as if they and the people they saw/heard were together in the same place, 5) how often did it feel as if someone they saw/heard in the environment was talking directly to them, 6) how often did the participants wanted to or did they make eye-contact with someone they saw/heard, and 7) how much control over the interaction with the person or people they saw/heard did they feel they had. The overall mean for all questions was scored based on the following ranges: 1) 1 to 3 = *low presence*, 2) greater than 3 to 5 = *moderate presence*, and 3) greater than 5 to 7 = *high presence*.

Subscale III contains six questions assessing engagement (mental immersion) presence experience. Engagement, also referred to as *involvement*, and *psychological immersion*, is defined as “when part or all of a person’s perception is directed towards objects, events, and/or people created by the technology, and away from objects, events, and/or people in the physical world. Note that the person’s perception is not directed toward the technology itself but the objects, events and/or people the technology creates” (International Society for Presence Research, 2000, Presence defined, para. 7d). Participants were asked the following questions based on a 7-point Likert scale (1 = *not at all* to 7 *very much*); Scores on the 7-point Likert scale greater than or equal to 4, were considered within a moderate to above moderate level: 1) to what extent did they feel mentally immersed in the experience, 2) how involving the experience was, 3) how completely were their senses engaged, 4) to what extent did they experience a sensation of reality, 5) how relaxing or exciting the experience was, and 6) how engaging the scenario was. The overall mean for all questions was scored based on the following ranges: 1) 1 to 3 = *low presence*, 2) greater than 3 to 5 = *moderate presence*, and 3) greater than 5 to 7 = *high presence*.

Subscale IV contains three questions assessing social realism experience. Social realism is defined as “when part or all of a person’s perception fails to accurately acknowledge the role of technology that makes it appear that s/he is in a physical location and environment in which the social characteristic correspond to those of the physical world, i.e., s/he perceives that the objects, events, and/or people s/he encounters do or could exist in the physical world. Note that although technology-generated environments in which objects, people, and events act as they do in the physical world are more likely to evoke this, and perhaps other, type(s) of presence, it is the *perception* that the social characteristics of the technology-generated environment and those of the physical world correspond that defines this type of presence rather than the *actual* correspondence of the characteristics" (International Society for Presence Research, 2000, Presence defined, para. 7c). Participants were asked the following questions based on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*); Scores on the 7-point Likert scale greater than or equal to 4, were considered within a moderate to above moderate level: 1) if the events they saw/heard would occur in the real world, 2) if the events they saw/heard could occur in the real world, and 3) if the way in which the events they saw/heard occurred is a lot like the way they occur in real world. The overall mean for all of questions was scored based on the follow ranges: 1) 1 to 2 = *mostly disagree*, 2) greater than 2 to 4 = *somewhat agree*, 3) greater than 4 to 6 = *agree*, and 4) greater than 6 to 7 = *strongly agree*.

The remaining seven items were included in a section entitled "Evaluation of Your Overall Equipment Experience." For question 24 using a 4-point Likert scale (1 = *absent*, 2 = *slight*, 3 = *moderate*, 4 = *severe*), participants were asked to rate the degree to which they experienced each of the following conditions based on their overall experience: 1) increased salivation, 2) sweating, 3) nausea, 4) difficulty concentrating, 5) stomach awareness, 6) fatigue, 7) headache, 8) eyestrain, 9) difficulty focusing, 10) blurred vision, 11) fullness of head, 12) dizzy (while your eyes were open), 13) dizzy (while your eyes were closed), 14) vertigo (sensation of loss of balance), 15) general discomfort, 16) stress tension, and 17) adrenaline rush.

For question 25 using a 7-point Likert scale (1 = *not at all* to 7 = *very much*), participants were asked to rate how comfortable they were with their viewing position. Scores on the 7-point Likert scale greater than or equal to 4, were considered within a moderate to above moderate level. The mean was scored based on the follow ranges: 1) 1 to 2 = *not comfortable*, 2) greater than 2 to 4 = *somewhat comfortable*, 3) greater than 4 to 5 = *moderately comfortable*, and 4) greater than 5 to 6 = *comfortable*, and 4) greater than 6 to 7 = *very comfortable*.

For question 26 using a 7-point Likert scale (1 = *not at all* to 7 = *very much*), participants were asked to rate the likelihood after their exposure to the VRTE, would they use this technology in therapy with children diagnosed with autism. Scores on the 7-point Likert scale greater than or equal to 4, were considered within a moderate to above moderate level. The mean was scored based on the follow range: 1) 1 to 2 = *not likely*, 2) greater than 2 to 4 = *possibly likely*, 3) greater than 4 to 6 = l*ikely*, and 4) greater than 6 to 7 = *very likely*.

For question 27, participants were asked to indicate what parts of the technology they found to be most challenging (i.e., VRTE, Oculus Rift HMD, Xbox one controller, Other, or Non-applicable). For question 28, participants were asked to indicate the age group they would use VRTE with in therapy (i.e., drop down tab starting at 3 years of age through 20 years or over).

Questions 29 and 30 were qualitative in nature. For question 29, participants were asked to provide feedback regarding any challenges that were inherent in the use of the VRTE. For question 30, participants were asked to provide any additional comments or feedback regarding their overall experience with the VRTE.

Equipment

The MSI Apache Pro laptop computer (model GE72VR), with a 17.3-inch monitor screen, powered by a 6th-generation Intel Core i7-6700 HQ processor was used in the main study (see Figure 19). The MSI Apache Pro has a built-in NVIDIA GeForce GTX 1060 Pascal 6 gigabyte (GB) graphics card, a 12 GB random access memory (RAM) of double data rate fourth-generation synchronous dynamic random-access memory (DDR4) 2133 megahertz (MHz), and a 128 GB Solid State Drive (SSD) with 1 terabyte (TB) 7200 revolutions per minute (rpm) hard disk drive. In addition to the MSI laptop computer, the 2016 Oculus Rift HMD (Oculus VR, LLC, 2016) was used (see Figure 20). The Oculus Rift comes with a camera sensor and built-in stand, remote, universal serial bus (USB) wireless receiver, and Xbox One wireless gamepad controller. The Oculus Rift was connected to the MSI Apache Pro GE72VR laptop computer.

Figure 19. VRTE Computer Equipment

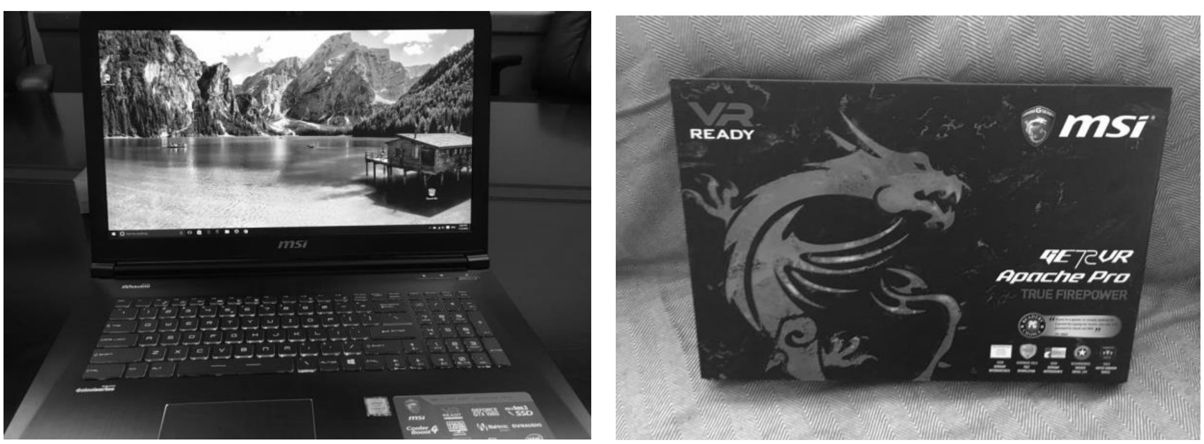

Figure 19. VRTE Gaming Laptop Computer MSI Apache Pro GE72VR.

Figure 20. VRTE HMD Equipment

Figure 20. 2016 Oculus Rift HMD.

Sampling Procedures

Prior to the data collection, IRB approval was obtained from the University of New Orleans Institutional Review Board (IRB) (see Appendix M). After obtaining IRB approval, e-mails were sent participants individually or distributed through professional Listservs (i.e., CESNET Listserv, UNO Counsgrads, and CounsDoc), or phoned mental health practitioners who were 1) licensed in a mental health field in Louisiana (i.e., provisional licensed professional counselor, PLPC; licensed professional counselor, LPC; licensed psychologist; psychiatric doctor, MD; licensed clinical social worker, LCSW; licensed clinical social worker-BACS, LCSW-BACS; licensed master social worker, LMSW; registered social worker, RSW; or licensed applied behavior analyst, ABA) and 2) who have experience and/or knowledge providing therapy to children diagnosed with autism (see Appendix N).

Once participants confirmed that they were interested in participating, an appointment was schedule to meet with each participant. The research took place at the practitioner's preferred setting. In addition, an e-mail was sent to interested participants with an electronic copy of the informed consent, which included the following: a) purpose of the study, b) procedures, c) voluntary nature of participation, d) possible risks and benefits, e) confidentiality, and f) contact information of the researcher (see Appendix O).

During the scheduled meeting, the informed consent and instructions were provided to each participant. Based on each participant's gender, he or she was depicted in the form of an avatar named, *TherapistM* (see Figure 21) or *TherapistF* (see Figure 22). Each therapist avatar (see Figures 23 and 24) assisted a child avatar named *ASDchild* (see Figures 23 and 24) walk through the VRTE mall to nine sequential checkpoints depicted by the numerals one through nine (see Figures 5, 8, 9, 10, 11, 14, 15, 16, and 17). Each participant participated in one of the two random order conditions. Condition A required participation in viewing the VRTE for approximately 5 minutes by first using the Laptop only, then using the Oculus Rift HMD. Condition B required participants to experience the VRTE using the Oculus Rift HMD first, then using the Laptop for approximately also 5 minutes. Controlling for possible order effects, each participant was randomly assigned to either of the two conditions. For example, the first participant received Condition A, the Laptop first, then the Oculus Rift HMD whereas the second participant received Condition B, the Oculus Rift HMD first, then the Laptop.

Figure 21. VRTE

Figure 21. TherapistM.

Figure 22. VRTE

Figure 22. TherapistF.

Figure 23. VRTE

Figure 23. TherapistM & ASDchild.

Figure 24. VRTE

Figure 24. TherapistF & ASDchild.

After completion of the first VRTE experience, participants completed the Demographic Questionnaire (see Appendix J) and the TPI, (see Appendix K), then when they experienced the VRTE for the second time they completed the TPI for a second time. The time to complete both viewings of the VRTE, one demographic questionnaire, and two TPIs was 45 minutes to 1 hour.

Data Analysis

Once the data were collected, the variables were coded using IBM SPSS Statistics version 24. Data were analyzed for outliers and any missing information. In the present study, the four main research questions and data analysis were included.

Research Question 1

Is there a significant difference in mental health practitioners' likelihood of using VRTE with children diagnosed with ASD and their perceptions of presence in the VRTE using two conditions (i.e., Condition A, first experiencing the VRTE using the Laptop, then the HMD or Condition B, first experiencing the VRTE using the HMD first, then Laptop)?

Data Analysis

A repeated-measures MANOVA was used to test mental health practitioners' likelihood of using a VRTE with children diagnosed with ASD using two conditions (i.e., first experiencing the VRTE using the Laptop, then the HMD - Condition A or using the HMD first, then the Laptop - Condition B. In addition, a preliminary data analysis using a repeated-measures multivariate analysis of variance (MANOVA) was conducted on the TPI scores for order of effect for Conditions A and B.

Research Question 2

Do mental health practitioners' demographic factors (i.e., age and years of experience and/or knowledge working with children diagnosed with ASD) correlate with their perceptions of presence in the VRTE when using the Laptop and the Oculus Rift HMD [i.e., TPI total scores and four subscales for spatial presence, social presence-actor within medium (i.e., parasocial interaction), engagement (i.e., mental immersion), and social realism]?

Data Analysis

Pearson's correlation coefficients were conducted to examine the relationship between mental health practitioners' responses on the TPI with the two predictor variables for Conditions A and B.

Research Question 3

Is there a significant relationship between mental health practitioners use of technology (i.e., number of years using technology, hours spent using technology, and years of experience playing online games) and their perceptions of presence in the VRTE when using the Laptop and the Oculus Rift HMD [i.e., TPI total scores and four subscale scores for spatial presence, social presence-actor within medium (i.e., parasocial interaction), engagement (i.e., mental immersion), and social realism]?

Data Analysis

Pearson's correlation coefficients were conducted to examine the relationship between mental health practitioners' responses on the TPI with the three predictor variables for Conditions A and B.

Research Question 4

Is there a significant relationship between mental health practitioners' number of times they used interactive virtual technology and years of experience using technology in therapy with children diagnosed with ASD and their perceptions of presence in the VRTE when using the Laptop and the Oculus Rift HMD [i.e., TPI total scores and four subscales: spatial presence, social presence-actor within medium (i.e., parasocial interaction), engagement (i.e., mental immersion), and social realism]?

Data Analysis

Pearson's correlation coefficients were conducted to examine the relationship between mental health practitioners' responses on the TPI and the two predictor variables for Conditions A and B.

Chapter IV

Main Study Results

The purpose of this research study was to assess mental health practitioners' perceptions of a virtual reality therapy environment (VRTE) developed by the researcher, using two Conditions. To test whether order of presentation, Laptop or HMD, had an effect on TPI total and subscale scores, participants were randomly assigned to one of the two Conditions. Condition A required mental health practitioners' participation in a VRTE via the use of a Laptop first, then using the 2016 Oculus Rift HMD. Condition B required mental health practitioners' participation in a VRTE using the 2016 Oculus Rift HMD first, then using the Laptop. In this chapter, participants' demographic characteristics are presented and descriptive statistics are delineated. In addition, the research questions are explored and results of advanced statistical analyses are provided. Data were analyzed using IBM SPSS Statistics version 24.

Demographic Questionnaire Descriptives and Frequencies

For participants' gender, the majority (n = 21, 75%) identified as female and seven (25%) as male. Participants' ages ranged from 25 to 68 (M = 37.53, SD = 11.04). For ethnicity, the majority (n = 17, 60.7%) identified as White/Caucasian, 10 (35.7%) Black/African American, and 1 (3.6%) Other (German/African America) (see Table 16).

Table 16

Frequencies, Means, and Standard Deviations for Gender, Age, and Ethnicity (N = 28)

Question	Male		Female				Total	
	f	*%*	*f*	*%*	*M*	*SD*	*f*	*%*
Gender	7	25.0	21	75.0				
Age					37.53	11.04		
Ethnicity								
White/Caucasian							17	60.7
Black/African American							10	35.7
Other (German/African American)							1	3.6

For educational degree, the majority (*n* = 24, 85.7%) of participants identified as having earned a master's degree and four (14.3%) a doctorate degree. For professional licensure, the majority (*n* = 13, 46.4%) identified as licensed applied behavior analysts (ABA), 11 (39.3%) as licensed professional counselors (LPC), 2 (7.1%) as licensed clinical social workers (LCSW), 2 (7.1%) as Other (i.e., registered play therapist and LAC), and 1 (3.6%) as licensed master social worker (see Table 17). For participants' credentials, the majority (*n* = 15, 53.6%) identified as ABA, 10 (35.7%) as national certified counselors (NCC), two (7.1%) as Other (advanced integrative therapy, and BACS), and one (3.6%) as cognitive behavioral therapy (CBT). For work setting, the majority (*n* = 11, 39.3%) identified to be working at a private practice, 11 as Other (*n* = 11, 39.3%, clinic, therapy center, autism center, ABA therapy center), 7 (25%) at a mental health agency, and 4 (14.3%) at a school (see Table 17).

Table 17

Frequencies for Degree, Professional Licensure, Work Setting, and Credentials (N = 28)

Questions	*f*	*%*
Degree		
Master's	24	85.7
Doctorate	4	14.3

Table 17 (continued)

Frequencies for Degree, Professional Licensure, Work Setting, and Credentials (N = 28)

Questions	*f*	%
Professional Licensure		
ABA	13	46.4
LPC	11	39.3
LCSW	2	7.1
Other	2	7.1
Credentials		
ABA	15	53.6
NCC	10	35.7
Other	2	7.1
CBT	1	3.6
Work Setting		
Private Practice	11	39.3
Other (1 each for ABA Center, Center for Autism, ABA Therapy Center, Contact Worker, and Therapy Center; and 2 each for Autism Center, Clinic, and Center)	11	39.3
Mental Health Agency	7	25
School	4	14.3

Note. Percentages for each of the last three questions do not equal 100% because participants could choose multiple options for a question.

For participants' years of experience and/or knowledge working with children with autism, the mean was 5.57 (*SD* = 4.24). For years of experience using technology in the therapy with children with autism, the mean was 4.36 (*SD* = 4.31). For years of experience using technology in daily life, the mean was 15.61 (*SD* = 4.65). For hours spent using technology in a typical day, the mean was 5.29 (*SD* = 1.41). For years of experience playing online games, the mean was 8.36 (*SD* = 6.82). For the number of times participants used interactive virtual reality technology, the mean was 2.04 (*SD* = 1.43) (see Table 18).

Table 18

Descriptives of Mental Health Practicioners' Experience with Children with Autism and Technology (N = 28)

Questions	*Range*	*M*	*SD*
Years Working with Autism	1-16	5.57	4.24
Years Using Technology with Autism	1-16	4.36	4.31
Years Using Technology Daily	9-21	15.61	4.65
Hours Using Technology	3-8	5.29	1.41
Years Playing Online Games	1-21	8.36	6.82
Number of Times Used Interactive Technology	1-5	2.04	1.43

Temple Presence Inventory Descriptives and Frequencies

Internal consistency. For internal consistency of the four TPI subscales, Cronbach's alphas showed that all four subscales had high reliability ($\alpha \geq .800$), with the highest Cronbach's alpha noted for subscale III – engagement (*a* = .930), and the lowest noted for subscale II – social presence-actor within medium (*a* = .840) (see Table 19).

Table 19

Cronbach's Alphas for TPI Subscales

TPI Subscales	*Cronbach's Alpha*
Subscale I – Spatial Presence	.871
Subscale II – Social Presence-actor Within Medium	.840
Subscale III – Engagement (mental immersion)	.930
Subscale IV – Social Realism	.880

Condition A: Exposure Laptop first, then Oculus Rift HMD. Descriptive data analysis for participants' TPI total scores when they were exposed to Condition A (*n* = 14) were calculated. When participants were exposed to the Laptop first, the mean was 88.93 (*SD* = 26.25) then when exposed to the Oculus Rift HMD, the mean was 135.36 (*SD* = 17.79) (see Table 20).

Condition A: Exposure to Laptop first – spatial presence. When exposed to the Laptop first for subscale I, the mean was 27.71 (*SD* = 6.86, see Table 20). Means and standard deviations for each of the seven questions ranged from the highest mean for question 1, "how much the objects and people the participants saw/heard came to the place they were" (*M* = 4.93, *SD* = 1.21) to the lowest for question 7, "if the experience seemed more like looking at the events/people on a computer screen or more like looking through a window" (*M* = 1.64, *SD* = .84).

Condition A: Exposure to HMD second – spatial presence. When exposed to the HMD second for subscale I, the mean was 42.14 (*SD* = 4.36, see Table 20). Means and standard deviations for the seven individual questions ranged from the highest mean for question 4, "the extent participants experience a sense of being inside the environment they saw/heard" (*M* = 6.64, *SD* = .63) to the lowest for question 3, "how often an object seemed to be headed towards them did they want to move to get out of its way" (*M* = 5.14, *SD* = 1.03).

Condition A: Exposure to Laptop first – social presence-actor within medium (parasocial interaction). When exposed to the Laptop first for subscale II, the mean was 27.71 (*SD* = 6.86, see Table 20). Means and standard deviations for each of the seven questions ranged from the highest mean for question 11, "how much did it seemed as if they and the people they saw/heard were together in the same place" (*M* = 5.07, *SD* = 1.21) to the lowest for question 13, "how often did the participants wanted to or did they make eye-contact with someone they saw/heard" (*M* = 2.79, *SD* = 1.88).

Condition A: Exposure to HMD second – social presence-actor within medium (parasocial interaction). When exposed to the HMD second for subscale II, the mean was 39.21 (*SD* = 6.78, see Table 20). For the seven individual questions, the means and standard deviations ranged from the highest mean for question 11, "how much did it seemed as if they and the people they saw/heard were together in the same place" (*M* = 6.29, *SD* = 1.14) to the lowest for question 13, "how often did the participants wanted to or did they make eye-contact with someone they saw/heard" (*M* = 5.36, *SD* = 1.28).

Condition A: Exposure to Laptop first– engagement (mental immersion). When exposed to the Laptop first for subscale III, the mean was 23.21 (*SD* = 9.74, see Table 20). Means and standard deviations for each of the six questions ranged from the highest mean question 16, "how involving the experience was" (*M* = 4.36, *SD* = 2.10) to the lowest for question 18, "to what extent did they experience a sensation of reality" (*M* = 2.93, *SD* = 1.64).

Condition A: Exposure to HMD second – engagement (mental immersion). When exposed to the HMD second for subscale III, the mean was 36.00 (*SD* = 5.66, see Table 20). For the six individual questions, the means and standard deviations ranged from the highest mean for question 15, "to what extent did the participants feel mentally immersed in the experience" (*M* = 6.07, *SD* = 1.07) to the lowest for question 20, "how engaging the scenario was" (*M* = 5.71, *SD* = 1.27).

Condition A: Exposure to Laptop first – social realism. When exposed to the Laptop first for subscale IV, the mean was 14.14 (*SD* = 4.64, see Table 20). The means and standard deviations for each of the three questions ranged from the highest mean for question 22, "if the events they saw/heard could occur in the real world" (*M* = 5.21, *SD* = 1.85) to the lowest for question 23, “if the way in which the events they saw/heard occurred is a lot like the way they occur in real world” (*M* = 4.21, *SD* = 1.85).

Condition A: Exposure to HMD second – social realism. When exposed to the HMD second for subscale IV, the mean was 18.00 (*SD* = 2.85, see Table 20). For the three individual questions, the means and standard deviations ranged from the highest mean for question 22, “if the events they saw/heard could occur in the real world” (*M* = 6.21, *SD* = .97) to the lowest for question 23, “if the way in which the events they saw/heard occurred is a lot like the way they occur in real world” (*M* = 5.86, *SD* = 1.03).

Condition A: Exposure to Laptop first – evaluation of equipment experience. When exposed to the Laptop first for question 24, the “degree experiencing” 17 physical conditions, the means and standard deviations ranged from the highest mean for “adrenaline rush” (*M* = 1.64, *SD* = 1.08) to the lowest mean for “headache” (*M* = 1.00, *SD* = .00) (see Table 20). For questions 25 and 26, participants rated how comfortable they were with their viewing position (*M* = 6.00, *SD* = 1.11) and how likely after their exposure to the VRTE would they see this technology being used in therapy with children diagnosed with ASD (*M* = 4.14, *SD* = 2.07). For question 27, regarding parts of the technology (i.e., VRTE, Oculus Rift HMD, Xbox one Controller, Other, and Non-applicable), the majority (*n* = 8, 57.1%) of participants identified the Xbox as challenging, four (28.6%) indicated non-applicable, and three (21.4%) the VRTE. For question 28, for the age group participants would use the technology, the mean was 8.43 (*SD* = 3.55).

Condition A: Exposure to HMD second – TPI evaluation of equipment experience. When exposed to the HMD second for question 24, the “degree experiencing” 17 physical conditions, the means and standards deviations ranged from the highest mean for “dizzy (while eyes open)" (M = 1.71, SD = .91) to the lowest mean for "fatigue" (M = 1.07, SD = .27) (see Table 20). For questions 25 and 26, participants rated how comfortable they were with their viewing position (M = 5.79, SD = 1.05) and how likely after their exposure to the VRTE would they see this technology being used in therapy with children diagnosed with ASD (M = 5.93, SD = 1.21). For question 27, regarding parts of the technology (i.e., VRTE, Oculus Rift HMD, Xbox one Controller, Other, and Non-applicable), the majority (n = 4, 28.6%) of participants identified the Xbox and Non-applicable, respectively as challenging, three (21.4%) the Oculus Rift HMD, two (14.3%) the VRTE, and one (7.1%) other (moving and turning). For question 28, the mean was 7.79 (SD = 2.94) for the age group participants would use the technology with.

Table 20

Descriptives and Frequencies for TPI Scores: Condition A (N = 14)

	Laptop				HMD			
	M	*SD*	*f*	%	*M*	*SD*	*f*	%
TPI Total Scores	88.93	26.25			135.36	17.79		
Subscale I – Spatial Presence	27.71	6.86			42.14	4.36		
Q1. Objects & People Participants Saw or Heard	4.93	1.21			6.29	.73		
Q2. Reaching out/Touching Objects	3.79	1.58			6.14	1.10		
Q3. Object Heading Towards Participant	4.50	1.51			5.14	1.03		
Q4. Sense of Being Inside the Environment	4.00	2.00			6.64	.63		
Q5. Sounds Coming from Different Locations	4.71	1.64			5.64	1.21		
Q6. Wanted to Touch an Object	4.14	2.38			6.00	1.17		
Q7. Computer Screen or Window	1.64	.84			6.29	.91		
Subscale II – Social Presence	23.86	9.38			39.21	6.78		
Q8. Sensation that People Could See/Hear	2.86	1.79			5.43	1.22		
Q9. Feelings of Interaction	3.00	1.66			5.64	1.39		
Q10. People Left Places & Moved to a New Place	3.21	1.85			5.50	1.22		
Q11. People were Together in the Same Place	5.07	1.21			6.29	1.14		
Q12. People Talking Directly to Participants	3.21	2.26			5.57	1.22		
Q13. Eye-Contact	2.79	1.88			5.36	1.28		

Table 20 (continued)

Descriptives and Frequencies for TPI Scores: Condition A (N = 14)

	Laptop				HMD			
	M	*SD*	*f*	*%*	*M*	*SD*	*f*	*%*
Q14. Control Over the Interaction	3.71	2.27			5.43	1.22		
Subscale III – Engagement	23.21	9.74			36.00	5.66		
Q15. Mentally Immersed	3.79	1.63			6.07	1.07		
Q16. Involving Experience	4.36	2.10			6.07	.99		
Q17. Senses Engaged	4.07	1.86			6.29	1.14		
Q18. Sensation of Reality	2.93	1.64			6.00	1.11		
Q19. Relaxing or Exciting	3.71	2.10			5.86	1.17		
Q20. Scenario Engagement	4.36	1.95			5.71	1.27		
Subscale IV – Social Realism	14.14	4.64			18.00	2.85		
Q21. Real World Would Occurrence	4.71	1.44			5.93	1.07		
Q22. Real World Could Occurrence	5.21	1.85			6.21	.97		
Q23. Likelihood of Events Occurrence in Real World	4.21	1.85			5.86	1.03		
Q24. Degree Experiencing the Following:								
Increased Salivation	1.36	.74			1.14	.36		
Sweating	1.14	.53			1.21	.58		
Nausea	1.07	.27			1.36	.63		
Difficulty Concentrating	1.57	1.01			1.36	.63		
Stomach Awareness	1.07	.27			1.57	.85		
Fatigue	1.29	.61			1.07	.27		
Headache	1.00	.00			1.43	.51		
Eyestrain	1.21	.43			1.71	.73		
Difficulty Focusing	1.43	.51			1.29	.61		
Blurred Vision	1.07	.27			1.14	.36		
Fullness of Head	1.14	.53			1.36	.74		
Dizzy (while eyes open)	1.21	.58			1.71	.91		
Dizzy (while eyes closed)	1.07	.27			1.43	.76		
Vertigo	1.07	.27			1.43	.51		
General Discomfort	1.29	.61			1.43	.51		
Stress Tension	1.43	.65			1.21	.43		
Adrenaline Rush	1.64	1.08			1.50	.76		
Q25. Comfortable with Viewing Position	6.00	1.11			5.79	1.05		

Table 20 (continued)

Descriptives and Frequencies for TPI Scores: Condition A (N = 14)

	Laptop				HMD			
	M	*SD*	*f*	%	*M*	*SD*	*f*	%
Q26. Likelihood of Using Technology in Therapy	4.14	2.07			5.93	1.21		
Q27. Challenging Parts of Technology:								
VRTE			3	21.40			2	14.30
Oculus Rift HMD							3	21.40
Xbox one Controller			8	57.10			4	28.60
Other							1	7.10
Non-applicable			4	28.60			4	28.60
Q28. Age Group Technology Use	8.43	3.55			7.79	2.94		

Note. Percentages for question 27 do not equal 100% because participants could choose multiple options.

Condition A: Qualitative responses. For question 29, participants described challenges inherent in the use of the VRTE such as “Familiarity with the joystick controls,” “Overstimulation with noise; concentration with goals of the video game,” “Focusing on the screen,” and “Cost.” A few others reported, “The sensation of the head set on their heads may be difficult to keep on,” “Keeping goggles on child's head,” and “May cause dizziness in clients which may affect their working ability during other trials.”

For question 30, comments included; “I loved my experience,” “Noise distraction was overcoming senses as it would for a child with autism, realistic environmental factors,” “The experience with the Xbox controller was somewhat interesting,” and “Great idea, very engaging for children, helps to keep children focused. Appealing to children. Great possibilities for ads and other socially impaired children.” Other responses included; “Liked the realistic feel of the headset verses the video game aspect; both beneficial but the headset was simulating an actual environment,” “It was intriguing despite dizziness and eye strain,” and “Excellent experience. Children will probably enjoy it. Possibilities are incredible for customizing the experience to the needs of the individual child. Allows the adult to gain a better understanding of the child's world."

Condition B: Exposure to Oculus Rift HMD first, then Laptop. Descriptive data analysis for participants' TPI total scores when they were exposed to Condition B (*n* = 14) were calculated. When participants were exposed to the Oculus Rift HMD first, the mean was 128.00 (*SD* = 17.33) then when exposed to the Laptop, the mean was 61.79 (*SD* = 37.70) (see Table 21).

Condition B: Exposure to HMD first – spatial presence. When exposed to the HMD first for subscale I, the mean was 40.64 (*SD* = 17.33, see Table 21). The means and standard deviations for each of the seven questions ranged from the highest mean for question 2, "how much it seemed they could reach out and touch the objects or people they saw/heard" (*M* = 6.21, *SD* = .97) to the lowest for question 1, "how much the objects and people the participants saw/heard came to the place they were" (*M* = 5.36, *SD* = 1.22).

Condition B: Exposure to Laptop second – spatial presence. When exposed to the Laptop second for subscale I, the mean was 16.86 (*SD* = 11.75, see Table 21). For the seven individual questions, the means and standard deviations ranged from the highest mean for question 5, "the extent that it seemed that sounds came from specific different locations" (*M* = 3.29, *SD* = 2.33) to the lowest for question 7, "if the experience seemed more like looking at the events/people on a computer screen or more like looking through a window" (*M* = 1.43, *SD* = 1.09).

Condition B: Exposure to HMD first – social presence-actor within medium (parasocial interaction). When exposed to the HMD first for subscale II, the mean was 34.14 (*SD* = 5.39, see Table 21). The means and standard deviations for each of the seven questions ranged from the highest mean for question 11, "how much did it seemed as if they and the people they saw/heard were together in the same place" (*M* = 5.64, *SD* = 1.09) to the lowest mean for question 10, "how much did it seem as if they and the people they saw/heard both left the places where they were and went to a new place" (*M* = 4.43, *SD* = 1.09).

Condition B: Exposure to Laptop second – social presence-actor within medium (parasocial interaction). When exposed to the Laptop second for subscale II, the mean was 16.79 (*SD* = 12.33, see Table 21). For the seven individual questions, the means and standard deviations ranged from the highest mean for question 11, "how much did it seemed as if they and the people they saw/heard were together in the same place" (*M* = 3.14, *SD* = 2.28) to the lowest for question 12, "how often did it feel as if someone they saw/heard in the environment was talking directly to them" (*M* = 1.93, *SD* = 1.82).

Condition B: Exposure to HMD first – engagement (mental immersion). When exposed to the HMD first for subscale III, the mean was 35.71 (*SD* = 5.86, see Table 21). The means and standard deviations for each of the six questions ranged from the highest mean for question 17, "how completely were their senses engaged" (*M* = 6.36, *SD* = .93) to the lowest for question 18, "to what extent did they experience a sensation of reality" (*M* = 5.43, *SD* = 1.22).

Condition B: Exposure to Laptop second – engagement (mental immersion). For subscale III, the mean was 17.71 (*SD* = 9.94, see Table 21). When exposed to the Laptop second for the six individual questions, the means and standard deviations from the highest mean for question 17, "how completely were their senses engaged" (*M* = 3.21, *SD* = 1.63) to the lowest for question 18, "to what extent did they experience a sensation of reality" (*M* = 2.36, *SD* = 2.06).

Condition B: Exposure to HMD first – social realism. When exposed to the HMD first for subscale IV, the mean was 17.50 (*SD* = 3.32, see Table 21). The means and standard deviations for each of the three questions ranged from the highest mean for question 22, "if the events they saw/heard could occur in the real world" (*M* = 6.43, *SD* = .76) to the lowest for question 21, "if the events participants saw/heard would occur in the real world" (*M* = 5.50, *SD* = 1.51).

Condition B: Exposure to Laptop second – social realism. When exposed to the Laptop second for subscale IV, the mean was 10.43 (*SD* = 5.40, see Table 21). For the three individual questions, the means and standard deviations ranged from the highest mean for question 22, "if the events they saw/heard could occur in the real world" (*M* = 3.93, *SD* = 2.02) to the lowest for question 21, "if the events participants saw/heard would occur in the real world" (*M* = 3.21, *SD* = 1.76).

Condition B: Exposure to HMD first – TPI evaluation of equipment experience. When exposed to the HMD for question 24, the "degree experiencing" 17 physical conditions, the means and standards deviations ranged from the highest mean for "nausea" (*M* = 2.21, *SD* = 1.12) to the lowest for "increased salivation" (*M* = 1.07, *SD* = .27) (see Table 21). For questions 25 and 26, participants rated how comfortable they were with their viewing position (*M* = 5.86, *SD* = 1.23) and how likely after their exposure to the VRTE would they see this technology being used in therapy with children diagnosed with ASD (*M* = 5.43, *SD* = 1.45) (see Table 21). For question 27, regarding parts of the technology (i.e., VRTE, Oculus Rift HMD, Xbox one Controller, Other, and Non-applicable), the majority (*n* = 7, 50%) of participants indicated non-applicable as challenging, four (28.6%) the Xbox, three (21.4%) the virtual reality therapy environment (VRTE) and the Oculus Rift, respectively, and one (7.1%) other (learning the technology). For question 28, for the age group participants would use the technology with, the mean was 8.79 (*SD* = 3.56) (see Table 21).

***Condition B: Exposure to Laptop second – TPI evaluation of equipment experience*.** When exposed to the Laptop second for question 24, the "degree experiencing" 17 physical conditions, the means and standards deviations ranged from the highest mean for "difficulty concentrating" (*M* = 1.43, *SD* = .65) to the lowest for "blurred vision," "fullness of head," "dizzy (while eyes closed) (*M* = 1.07, *SD* = .27, respectively) (see Table 21). For questions 25 and 26, participants rated how comfortable they were with their viewing position (*M* = 5.43, *SD* = 1.78) and how likely after their exposure to the VRTE would they see this technology being used in therapy with children diagnosed with ASD (*M* = 4.43, *SD* = 1.78). For question 27, regarding what parts of the technology (i.e., VRTE, Oculus Rift HMD, Xbox one Controller, Other, and Non-applicable) the majority (*n* = 7, 50%) of participants indicated non-applicable as challenging, six (42.9%) the Xbox, and two (14.3%) the virtual reality therapy environment (VRTE). For question 28, for the age group participants would use the technology with, the mean was 7.79 (*SD* = 4.17).

Table 21

Descriptives and Frequencies for TPI Scores: Condition B (N = 14)

	HMD				Laptop			
	M	*SD*	*f*	%	*M*	*SD*	*f*	%
TPI Total Scores	128.00	17.33			61.79	37.70		
Subscale I – Spatial Presence	40.64	4.60			16.86	11.75		
Q1. Objects & People Participants Saw or Heard	5.36	1.22			2.71	1.73		
Q2. Reaching out/Touching Objects	6.21	.97			2.36	1.95		
Q3. Object Heading Towards Participant	5.57	1.34			2.43	2.06		
Q4. Sense of Being Inside the Environment	6.21	1.05			2.36	1.91		
Q5. Sounds Coming from Different Locations	5.71	1.14			3.29	2.33		
Q6. Wanted to Touch an Object	5.43	1.55			2.29	2.02		
Q7. Computer Screen or Window	6.14	.86			1.43	1.09		

Table 21 (continued)

Descriptives and Frequencies for TPI Scores: Condition B (N = 14)

	HMD				Laptop			
	M	*SD*	*f*	*%*	*M*	*SD*	*f*	*%*
Subscale II – Social Presence	34.14	5.39			16.79	12.33		
Q8. Sensation that People Could See/Hear	4.50	1.56			2.14	1.92		
Q9. Feelings of Interaction	5.36	1.28			2.29	2.02		
Q10. People Left Places & Moved to a New Place	4.43	1.09			2.43	1.87		
Q11. People were Together in the Same Place	5.64	1.09			3.14	2.28		
Q12. People Talking Directly to Participants	4.93	.99			1.93	1.82		
Q13. Eye-Contact	4.29	1.20			2.21	1.85		
Q14. Control Over the Interaction	5.00	1.24			2.64	1.86		
Subscale III – Engagement	35.71	5.86			17.71	9.94		
Q15. Mentally Immersed	5.93	1.07			2.93	1.73		
Q16. Involving Experience	6.07	1.07			2.86	1.75		
Q17. Senses Engaged	6.36	.93			3.21	1.63		
Q18. Sensation of Reality	5.43	1.22			2.36	2.06		
Q19. Relaxing or Exciting	6.29	.91			3.14	1.75		
Q20. Scenario Engagement	5.64	1.45			3.21	1.85		
Subscale IV – Social Realism	17.50	3.32			10.43	5.40		
Q21. Real World Would Occurrence	5.50	1.51			3.21	1.76		
Q22. Real World Could Occurrence	6.43	.76			3.93	2.02		
Q23. Likelihood of Events Occurrence in Real World	5.57	1.45			3.29	2.02		
Q24. Degree Experiencing the Following:								
Increased Salivation	1.07	.27			1.14	.53		
Sweating	1.71	.99			1.14	.36		
Nausea	2.21	1.12			1.21	.43		
Difficulty Concentrating	2.00	.78			1.43	.65		
Stomach Awareness	2.14	1.03			1.14	.36		
Fatigue	1.57	.85			1.14	.36		
Headache	1.50	.65			1.21	.43		
Eyestrain	1.86	.77			1.21	.43		
Difficulty Focusing	1.86	.95			1.14	.36		
Blurred Vision	1.64	.63			1.07	.27		

Table 21 (continued)

Descriptives and Frequencies for TPI Scores: Condition B (N = 14)

	HMD				Laptop			
	M	*SD*	*f*	%	*M*	*SD*	*f*	%
Fullness of Head	1.57	.85			1.07	.27		
Dizzy (whiles eyes open)	1.79	.89			1.14	.36		
Dizzy (while eyes closed)	1.64	.74			1.07	.27		
Vertigo	1.79	.89			1.21	.58		
General Discomfort	1.79	.89			1.36	.63		
Stress Tension	1.64	.93			1.29	.61		
Adrenaline Rush	1.86	.77			1.21	.58		
Q25. Comfortable with Viewing Position	5.86	1.23			5.43	1.78		
Q26. Likelihood of Using Technology in Therapy	5.43	1.45			4.43	1.78		
Q27. Challenging Parts of Technology:								
VRTE			3	21.40			2	14.30
Oculus Rift HMD			3	21.40				
Xbox one Controller			4	28.60			6	42.90
Other			1	7.10				
Non-applicable			7	50.00			7	50.00
Q28. Age Group Technology Use	8.79	3.56			7.79	4.17		

Note. Percentages for question 27 do not equal 100% because participants could choose multiple options.

Condition B: Qualitative responses. For question 29, participants described challenges inherent in the use of the VRTE such as “Cost effectiveness,” “Overstimulating,” “I think some children would be more likely to self-stimulate with some visual repetition,” and “Very helpful.” A few others reported, “Potential loss of reality if children are inclined to use escapism,” “Adequate sense of reality in order to generalize to real world experiences,” “Children would probably be more comfortable and able to use it. I think autistic children would be better off with real experience in nature,” “They don't really like things they aren't familiar with to touch them. It would be better to gradually introduce the equipment to them,” “I would be concerned with the sensory side effects caused like dizziness and nausea,” and “Appears beneficial.”

For question 30, comments included; “Didn't feel I had enough experience to use it well,” “This initial experience created a heightened sense of my physicality and how my move my body,” “Could be particularly effective with ASD kids due to their familiarity with video games.” Other responses included; “It was physically uncomfortable for me,” “Real fun,” “Excellent,” “Motion sickness but have used VR before,” and “Difficult for me to adjust to but very interesting.”

Summary table of descriptives for conditions a and b. The means and standard deviations were calculated for the TPI total and subscale scores for Conditions A and B and are included in Table 22.

Table 22

Summary of Means and Standard Deviations for TPI Total and Subscale Scores for Conditions A and B (N = 28)

	Laptop (*n* = 14)		HMD (*n* = 14)	
	M	*SD*	*M*	*SD*
Condition A – Laptop first, then HMD				
TPI Total Scores	88.93	26.25	135.36	17.79
Subscale I-Spatial Presence	27.71	6.86	42.14	4.36
Subscale II-Social Presence	23.86	9.38	39.21	6.78
Subscale III-Engagement	23.21	9.74	36.00	5.66
Subscale IV-Social Realism	14.14	4.64	18.00	2.85
Condition B – HMD first, then Laptop				
TPI Total Scores	61.79	37.70	128.00	17.33
Subscale I-Spatial Presence	16.86	11.75	40.64	4.60
Subscale II-Social Presence	16.79	12.33	34.14	5.39
Subscale III-Engagement	17.71	9.94	35.71	5.86
Subscale IV-Social Realism	10.43	5.40	17.50	3.32
Condition A & B – Total Scores	75.36	34.74	131.68	17.35

Results of Research Questions

Research question 1. Is there a significant difference in mental health practitioners' likelihood of using VRTE with children diagnosed with ASD and their perceptions of presence in the VRTE using two conditions (i.e., Condition A, first experiencing the VRTE using the Laptop, then the HMD or Condition B, first experiencing the VRTE using the HMD first, then Laptop)?

Preliminary data analysis. Preliminary data analysis was conducted on the TPI scores. As suggested by Field (2013), tests for normality were conducted for both of the conditions on TPI total scores.

Testing for normality. For Condition A (i.e., Laptop first, then HMD), the Shapiro-Wilk's test (SW = .918, df = 28, p = .03) indicated the distribution was not normal for TPI total scores, with a skew of .551 and Kurtosis of -.639. Although a normal distribution was not indicated by the Shapiro-Wild's test; Oztuna, Elhan, and Tuccar (2006) noted that small sample sizes can effect data distributions. Additionally, a Q-Q plot and histogram was conducted (see Figures 25 and 26; respectively).

Figure 25. Normal Q-Q Plot - Condition A

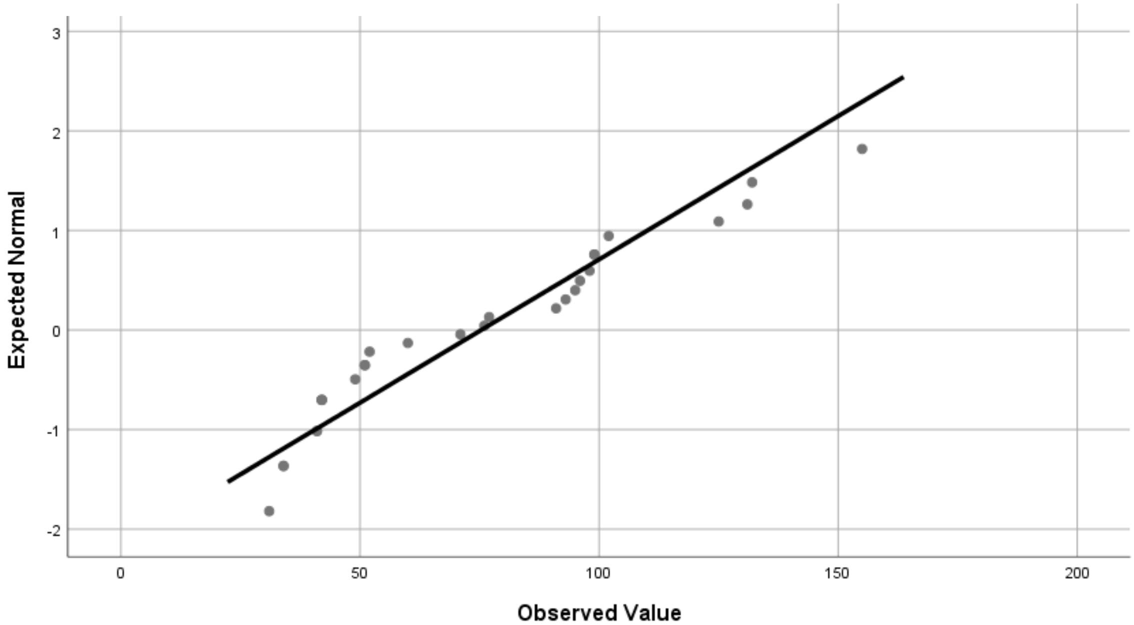

Figure 25. Normal Q-Q Plot for TPI total scores on Condition A - Laptop, then HMD.

Figure 26. Histogram - Condition A

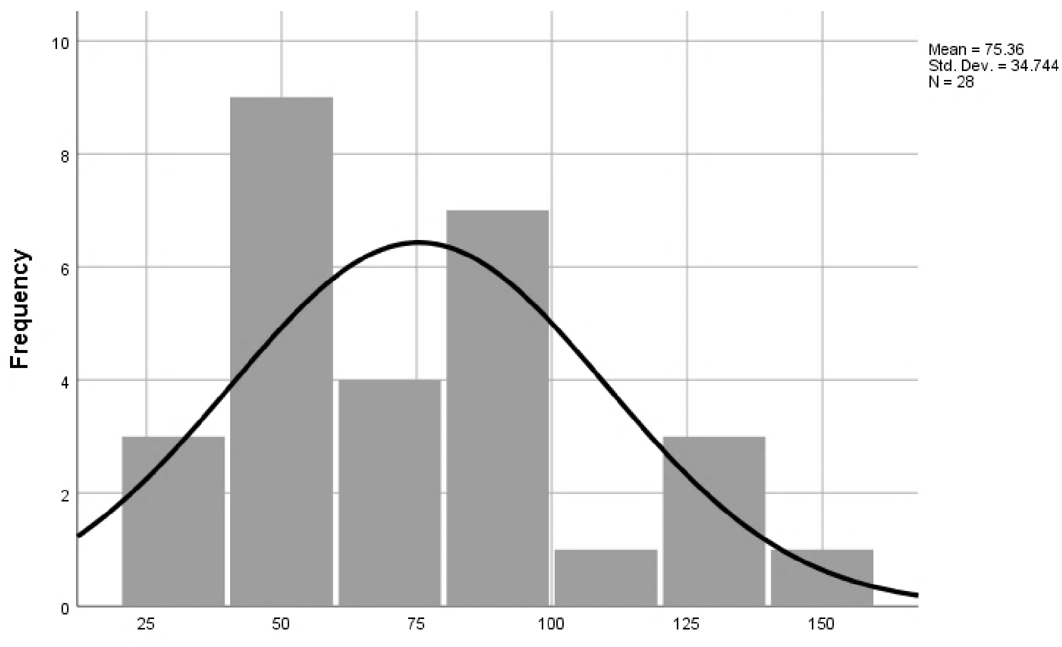

Figure 26. Histogram for TPI total scores on Condition A - Laptop first, then HMD.

For Condition B (i.e., HMD first, then Laptop), the Shapiro-Wilk's test (*SW* = .949, *df* = 28, *p* = .19) indicated that the distribution was normal for TPI total scores, with a skew of -527 and Kurtosis of -.396. Additionally, a Q-Q plot and histogram was conducted (see Figures 27 and 28; respectively).

Figure 27. Normal Q-Q Plot - Condition B

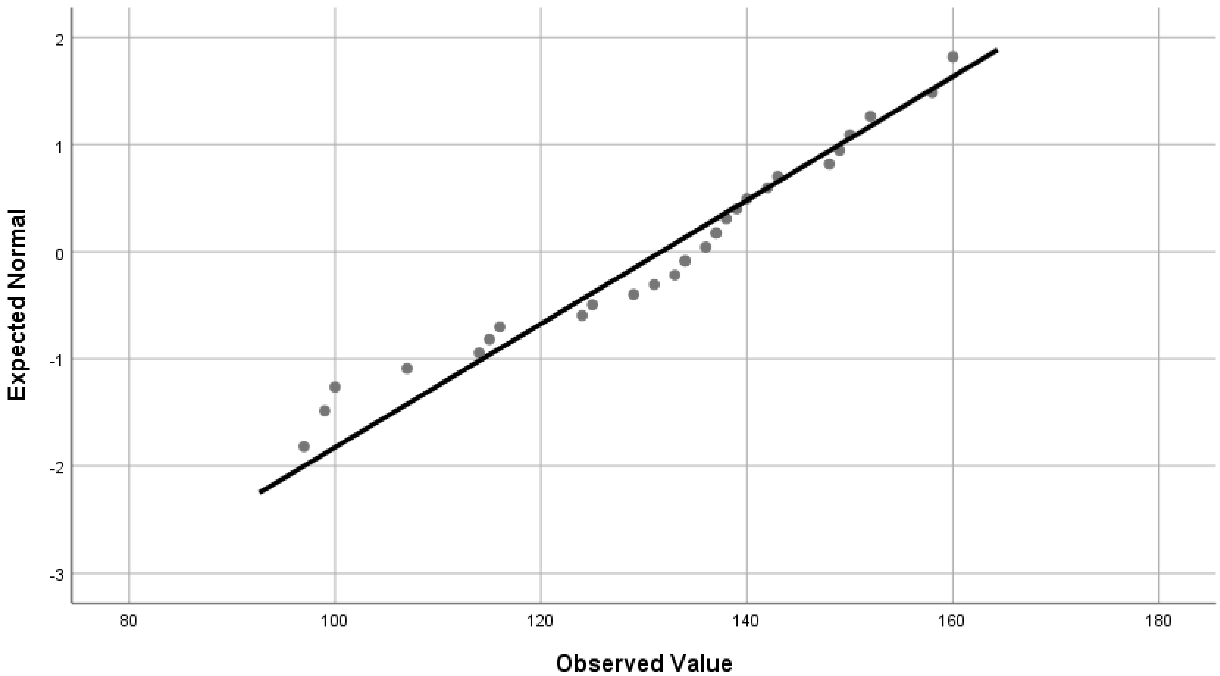

Figure 27. Q-Q Plot for TPI total scores on Condition B – HMD first, then Laptop.

Figure 28. Histogram - Condition B

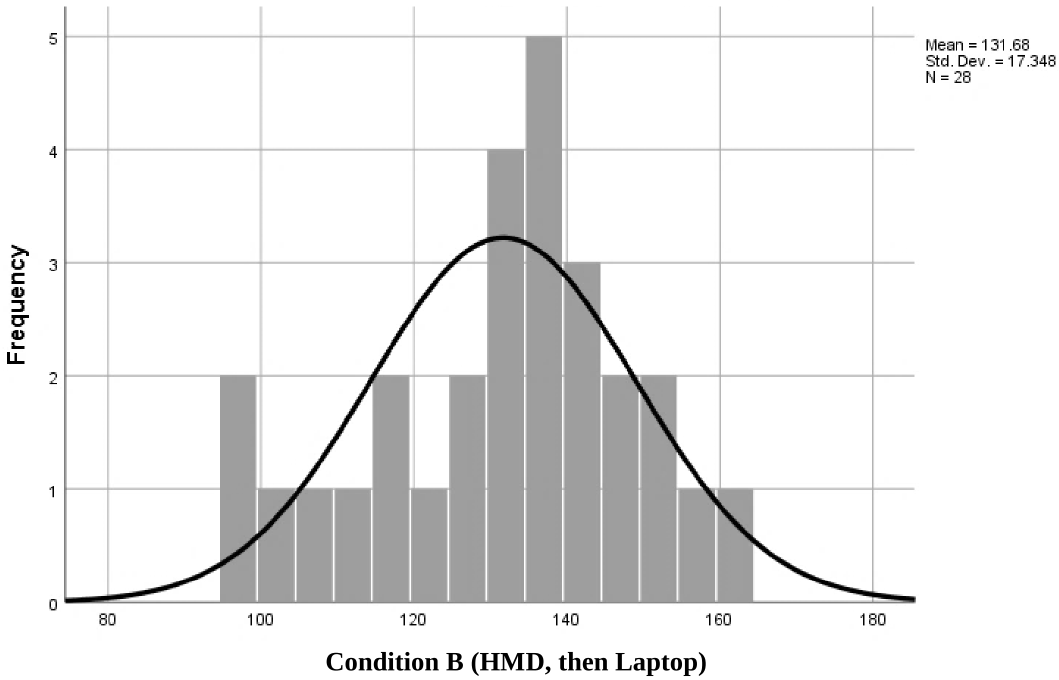

Figure 28. Histogram for TPI total scores on Condition B – HMD first, then Laptop.

Differences in the Laptop and HMD and order of conditions for TPI total scores. The results of the repeated-measures multivariate analysis of variance (MANOVA) for the TPI total scores between the difference in the Laptop and the HMD was significant (Wilk's λ = .226, $F(1, 27) = 89.218$, $p = .000$, $\eta_p^2 = .774$, power = 1.000) (see Table 23 and Figure 29). When testing the order of the two conditions (i.e., Condition A – Laptop first, then HMD or Condition B – HMD first, then Laptop) a non-significant interaction was found (Wilk's λ = .904, $F(1, 27) = 2.753$, $p = .109$, $\eta_p^2 = .096$, power = .359).

For Condition A, when the Laptop was first, the mean was of 88.93 (*SD* = 26.25) and when the HMD was second, the mean was 135.36 (*SD* = 17.39). For Condition B, when the HMD was first, the mean was 128.00 (*SD* = 17.33) and when the Laptop was first the mean was

61.79 (*SD* = 37.70) (see Table 22). The results indicated that participants had higher TPI total scores for the HMD regardless of order of presentation.

Table 23

Repeated-Measures MANOVA for Differences and Order for Laptop and HMD: TPI Total Scores (N = 28)

		Value	*F*	*df*	*Significance*	*Partial Eta Squared*	*Observed Power*
Laptop vs. HMD	WL	.226	89.218	1.000	.000	.774	1.000
Order of Conditions	WL	.904	2.753	1.000	.109	.096	.359

Figure 29. Estimated Marginal Means for TPI Total Scores

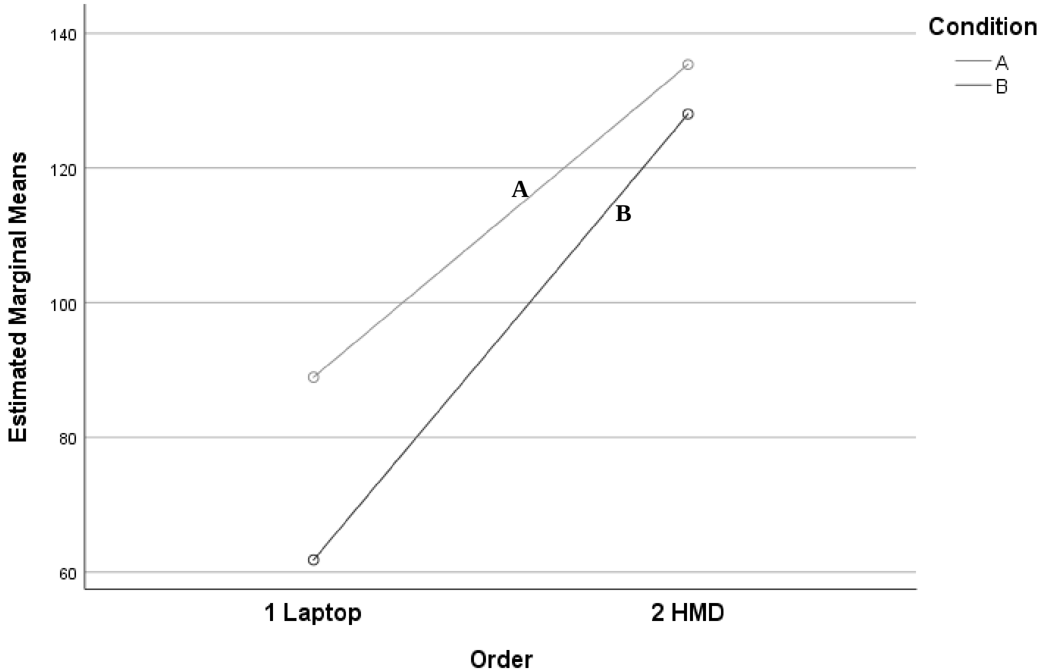

Figure 29. Estimated marginal means for TPI total scores on both conditions.

Differences in the Laptop and HMD and order of conditions for TPI subscale scores. The results of the repeated-measures MANOVA for the four TPI subscale scores between the difference in the Laptop and the HMD was significant (Wilk's λ = .179, $F(4, 24) = 26.447$, p = .000, η_p^2 = .821, power = 1.000) (see Table 24 and Figures 30 through 33). When testing the order of the two conditions (i.e., Condition A – Laptop first, then HMD or Condition B – HMD first, then Laptop) a non-significant interaction was found (Wilk's λ = .694, $F(4, 24) = 2.541$, $p = .067$, $\eta_p^2 = .306$, power = .623). Additionally, results of the repeated-measures MANOVA for the differences between the Laptop and HMD within the subscale scores indicated the following: 1) subscale I (spatial presence) was significant ($F(1,27) = 8.353$, $p = .008$, $\eta_p^2 = .243$, power = .794), 2) subscale II (social presence) was significant ($F(1, 27) = 4.834$, $p = .037$, $\eta_p^2 = .157$, power = .562), 3) subscale III (engagement) was not significant ($F(1, 27) = 1.474$, $p = .236$, $\eta_p^2 = .054$, power = .215), and subscale IV (social realism) not significant ($F(1, 27) = 2.560$, $p = .122$, $\eta_p^2 = .090$, power = .338) (see Table 25).

For Condition A on subscale I (spatial presence), when the Laptop was first, the mean was 27.71 (*SD* = 6.86) and when the HMD was second, the mean was 42.14 (*SD* = 4.36); whereas for Condition B, when the HMD was first, the mean was 40.64 (*SD* = 4.60) and when the Laptop was second, the mean was 16.86 (*SD* = 11.75). For Condition A, on subscale II (social presence), when the Laptop was first, the mean was 23.86 (*SD* = 9.38) and when the HMD was second, the mean was 39.21 (*SD* = 6.78); whereas for Condition B, when the HMD was first, the mean was 34.14 (*SD* = 5.39) and when the Laptop was second, the mean was 16.79 (*SD* = 12.33). For Condition A on subscale III (engagement), when the Laptop was first, the mean was 23.21 (*SD* = 9.74) and when the HMD was second, the mean was 36.00 (*SD* = 5.66); whereas for Condition B, when the HMD was first, the mean was 35.71 (*SD* = 5.86) and when the Laptop was second, the mean was 17.71 (SD = 9.94). Lastly, for Condition A on subscale IV (social realism), when the Laptop was first, the mean was 14.14 (*SD* = 4.64) and when the HMD was second, the mean was 18.00 (*SD* = 2.85); whereas for Condition B, when the HMD was first, the mean was 17.50 (*SD* = 3.32) and when the Laptop was second, the mean was 10.43 (*SD*

= 5.40) (see Table 22). The results indicated that participants had higher TPI subscale scores for the HMD regardless of order of presentation.

Table 24

Repeated-Measures MANOVA of Differences and Order for Laptop and HMD: TPI Subscale Scores (N = 28)

		Value	*F*	*df*	*Significance*	*Partial Eta Squared*	*Observed Power*
Laptop vs. HMD	WL	.179	26.447	4.000	.000	.821	1.000
Order of Conditions	WL	.694	2.541	4.000	.067	.306	.623

Table 25

Repeated-Measures MANOVA of Differences in Laptop and HMD: TPI Subscale Scores (N = 28)

Laptop vs. HMD	*F*	*df*	*Mean Square*	*Significance*	*Partial Eta Squared*	*Observed Power*
Subscale I – Spatial Presence	8.353	1.000	267.223	.008	.243	.794
Subscale II – Social Presence	4.834	1.000	258.036	.037	.157	.562
Subscale III - Engagement	1.474	1.000	58.580	.236	.054	.215
Subscale IV – Social Realism	2.560	1.000	31.080	.122	.090	.338

Figure 30. Estimated Marginal Means for Subscale I – Spatial Presence

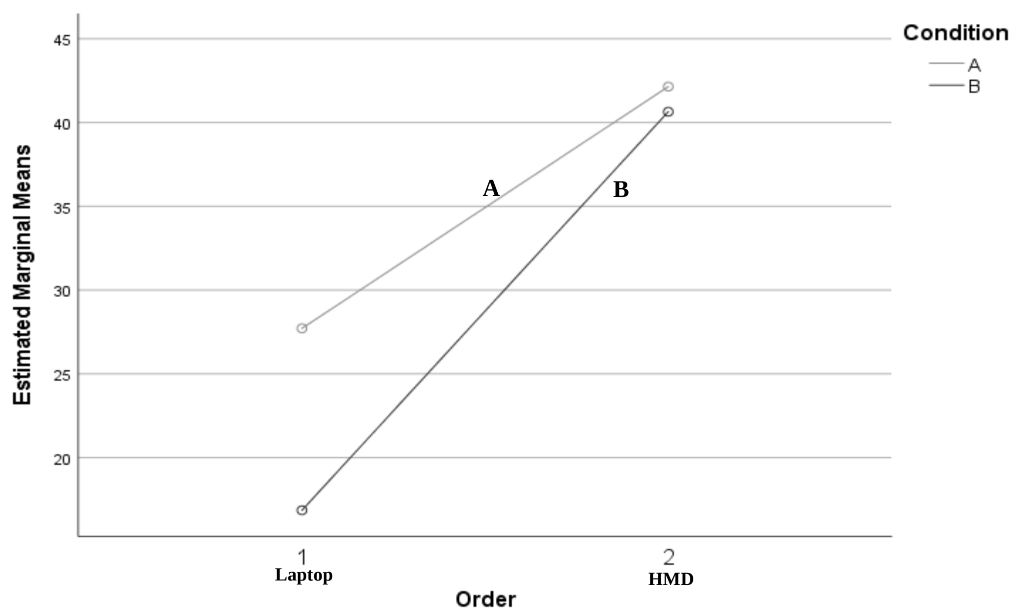

Figure 30. Estimated marginal means for Subscale I – Spatial Presence on both conditions

Figure 31. Estimated Marginal Means for Subscale II – Social Presence

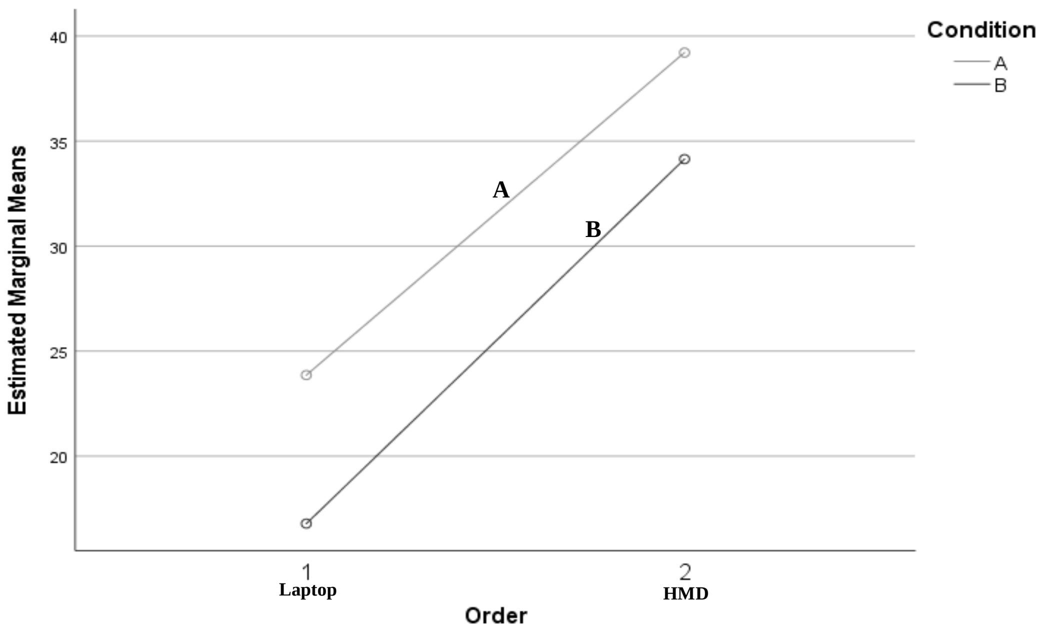

Figure 31. Estimated marginal means for Subscale II – Social Presence on both conditions

Figure 32. Estimated Marginal Means for Subscale III – Engagement

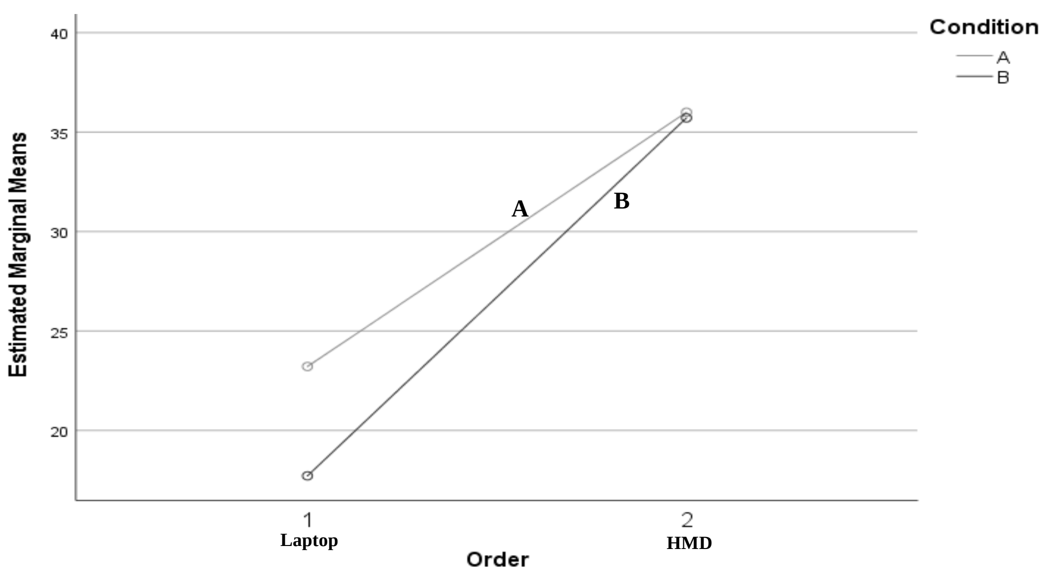

Figure 32. Estimated marginal means for Subscale III – Engagement on both conditions

Figure 33. Estimated Marginal Means for Subscale IV – Social Realism

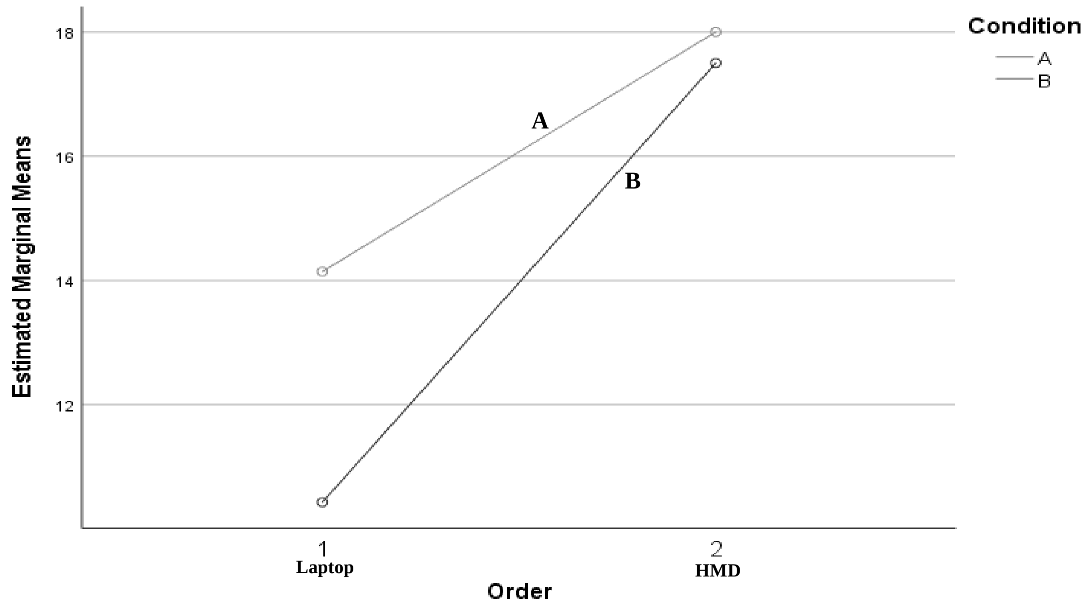

Figure 33. Estimated marginal means for Subscale IV – Social Realism on both conditions

Data analysis for research question 1. For the repeated-measures MANOVA on mental health practitioners' likelihood of using the VRTE with children diagnosed with ASD, the difference between the Laptop and the HMD was significant (Wilk's λ = .715, $F(1, 27) = 10.358$, $p = .003$, $\eta_p^2 = .285$, power = .872) (see Table 26 and Figure 34). When testing the order of the two conditions [i.e., the Laptop first, then the HMD (Condition A) or the HMD first, then the Laptop (Condition B)] a non-significant interaction was found (Wilk's λ = .969, $F(1, 27) = .824$, $p = .372$, $\eta_p^2 = .031$, power = .141).

For Condition A, when the Laptop was first, the mean was 4.14 (*SD* = 2.07) then when the HMD was second, the mean was 5.93 (*SD* = 1.21); whereas for Condition B, when the HMD was first, the mean was 5.43 (*SD* = 1.45) then when the Laptop was second, the mean was 4.43 (*SD* = 1.78) (see Table 27 and Figure 34). The results indicated that participants had higher scores for the HMD regardless of order of presentation.

Table 26

Repeated-Measures MANOVA of Differences and Order for Laptop and HMD of Mental Health Practitioners' Ratings of the Likelihood of Using VRTE with Children Diagnosed with ASD (N = 28)

		Value	*F*	*df*	*Significance*	*Partial Eta Squared*	*Observed Power*
Laptop vs. HMD	WL	.715	10.358	1.000	.003	.285	.872
Order by Conditions	WL	.969	.824	1.000	.372	.031	.141

Table 27

Descriptives for Mental Health Practitioners' Likelihood of Using Technology with Children Diagnosed with ASD for Conditions A and B (N = 28)

	Laptop (*n* = 14)		HMD (*n* = 14)	
Conditions	*M*	*SD*	*M*	*SD*
Condition A – Laptop first, then HMD	4.14	2.07	5.93	1.21
Condition B – HMD first, then Laptop	4.43	1.78	5.43	1.45

Figure 34. Estimated Marginal Means for Likelihood of Use of Technology with Children with ASD

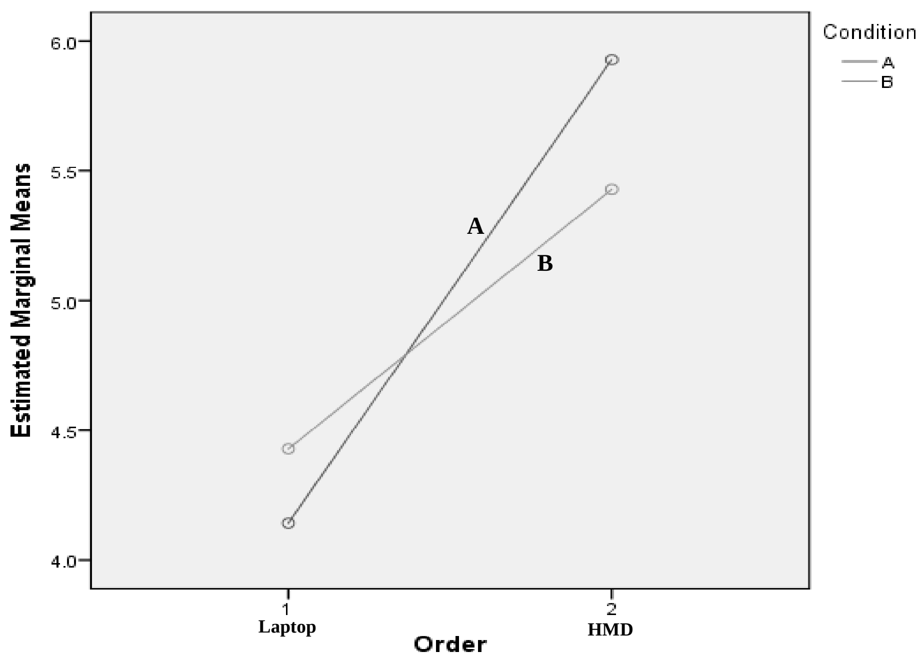

Figure 34. Estimated marginal means for the likelihood of mental health practitioners using the VRTE with children diagnosed with ASD for both conditions (Condition A – Laptop first, then HMD and Condition B – HMD first, then Laptop).

Research question 2. Do mental health practitioners' demographic factors (i.e., age and years of experience and/or knowledge working with children diagnosed with ASD) correlate with their perceptions of presence in the VRTE when using the Laptop and the Oculus Rift HMD [i.e., TPI total scores and four subscales for spatial presence, social presence-actor within medium (i.e., parasocial interaction), engagement (i.e., mental immersion), and social realism]?

Data analysis. Pearson's correlation coefficients were examined for the relationships between mental health practitioners' TPI scores for Conditions A and B and the two predictors (i.e., age and years of experience and/or knowledge working with children diagnosed with ASD). Evans (1996) suggested values (i.e., .00 - .19 = very weak, .20 - .39 = weak, .40 - .59 = moderate, .60 - .79 = strong, and .80 - 1.0 = very strong) were used as a basis to interpret the correlations at an alpha level of less than or equal to .05. For participants' age and TPI subscale scores for Conditions A and B for the Laptop; very weak, non-significant negative and positive correlations were found on subscales I, II, and IV (r = -.018, .152, .160; respectively, see Table 28). On subscale III, a weak, non-significant positive correlation was found (r = .285). For Conditions A and B for the HMD; weak, non-significant positive correlations were found for subscales I, II, IV (r = .310, .211, .276; respectively) and on subscale III, a weak significant positive correlation was found (r = .383, p < .05). Lastly, on total TPI scores for Conditions A and B for the Laptop; a very weak, non-significant positive correlation was found (r = .151) and for Conditions A and B for the HMD; a weak, non-significant positive correlation was found (r = .333).

For participants' years of experience working with children with ASD and TPI subscale scores; very weak, non-significant positive correlations were on subscales I, II, III, and IV (r = .067, .031, .187, .077; respectively, see Table 28). For Condition A and B for the HMD; very weak, non-significant positive correlations were found on subscales; I, II, III, and IV (*r* = .117, .199, .175, .040; respectively). Lastly, on total TPI scores for Conditions A and B for the Laptop; very weak, non-significant positive correlation was found (*r* = .097) and for Conditions A and B for the HMD; a very weak, non-significant negative correlation was found (*r* = .169).

Table 28

Correlations of Mental Health Practitioners' Age and Years of ASD Experience to TPI Subscale and Total Scores for Conditions A and B (N = 28)

Questions	LP I	LP II	LP III	LP IV	HMD I	HMD II	HMD III	HMD IV	LP TPI Total	HMD TPI Total
Age	-.018	.152	.285	.160	.310	.211	.383*	.276	.151	.333
Years ASD Experience	.067	.031	.187	.077	.117	.199	.175	.040	.097	.169

Note. *$p < .05$
Note. LP = Laptop, HMD = Head-Mounted Display, Years ASD Experience = Years of Experience Working with Children with ASD

Research question 3. Is there a significant relationship between mental health practitioners use of technology (i.e., number of years using technology, hours spent using technology, and years of experience playing online games) and their perceptions of presence in the VRTE when using the Laptop and the Oculus Rift HMD [i.e., TPI total scores and four subscale scores for spatial presence, social presence-actor within medium (i.e., parasocial interaction), engagement (i.e., mental immersion), and social realism]?

Data analysis. Pearson's correlation coefficients were examined for the relationship between mental health practitioners' TPI scores for Conditions A and B and the three predictors. Evans (1996) suggested values (i.e., .00 - .19 = very weak, .20 - .39 = weak, .40 - .59 = moderate, .60 - .79 = strong, and .80 - 1.0 = very strong) were used as a basis to interpret the correlations at an alpha level of less than or equal to .05. For participants' number of years using technology and TPI subscale scores for Conditions A and B for the Laptop; very weak, non-significant positive correlations were found on subscales I, II, III, and IV (*r* = .070, .049, .097, .060; respectively) (see Table 29). For Conditions A and B for the HMD; very weak, non-significant positive and negative correlations were found on subscales I, II, III, and IV (*r* = .027, .119, .108, -.148; respectively). Lastly, on total TPI scores for Conditions A and B for the Laptop; a very weak, non-significant positive correlation was found (*r* = .075) and for Conditions A and B for the HMD; a very weak, non-significant positive correlation was found (*r* = .061).

For participants' hours' spent using technology and Conditions A and B for the Laptop; a very weak, non-significant positive correlation was found (*r* = .113) and on subscales I, II, and IV; weak, non-significant positive correlations were found (*r* = .227, .334, .227; respectively) (see Table 29). For Conditions A and B for the HMD; very weak, non-significant positive and negative correlations were found on subscales I, III, and IV (*r* = .076, .005, -.060; respectively) and on subscale II; a weak, non-significant positive correlation was found on (*r* = .323). Lastly, a weak, on total TPI scores for Conditions A and B for the Laptop; a non-significant positive correlation was found (*r* = .248) and for Conditions A and B for the HMD; a very weak, non-significant positive correlation was found (*r* = .133).

For years of experience playing online games for Conditions A and B for the Laptop; very weak, non-significant positive correlations were found for subscales II and III (*r* = .165, .152; respectively) (see Table 29) and on subscales I and IV; weak, non-significant positive correlations were found (*r* = .283, .310; respectively). For Conditions A and B for the HMD; very weak, non-significant positive and negative correlations were found on subscales I, II, III, and IV (*r* = .066, .138, .099, -.004; respectively). Lastly, on total TPI scores for Conditions A and B for the Laptop; a weak, non-significant positive correlation was found scores (*r* = .234) and for Conditions A and B for the HMD; a very weak, non-significant positive correlation was found (r = .101).

Table 29

Correlations of Mental Health Practitioners' Number of Years and Hours Using Technology, and Years of Experience Playing Online Games to TPI Subscale and Total Scores for Conditions A and B (N = 28)

Questions	LP I	LP II	LP III	LP IV	HMD I	HMD II	HMD III	HMD IV	LP TPI Total	HMD TPI Total
Years Using Technology	.070	.049	.097	.060	.027	.119	.108	-.148	.075	.061
Hours Using Technology	.227	.334	.113	.227	.076	.323	.005	-.060	.248	.133
Years Online Gaming	.283	.165	.152	.310	.066	.138	.099	-.004	.234	.101

Note. LP = Laptop, HMD = Head-Mounted Display.

Research question 4. Is there a significant relationship between mental health practitioners' number of times they used interactive virtual technology and years of experience using technology in therapy with children diagnosed with ASD and their perceptions of presence in the VRTE when using the Laptop and the Oculus Rift HMD [i.e., TPI total scores and four subscales: spatial presence, social presence-actor within medium (i.e., parasocial interaction), engagement (i.e., mental immersion), and social realism]?

Data analysis. Pearson's correlation coefficients examined the relationship between mental health practitioners' TPI scores and the two predictors for Conditions A and B. Evans (1996) suggested values (i.e., .00 - .19 = very weak, .20 - .39 = weak, .40 - .59 = moderate, .60 - .79 = strong, and .80 - 1.0 = very strong) were used to interpret the Pearson's correlations at an alpha level of less than or equal to .05. For participants' number of times they used interactive virtual technology and TPI subscale scores for Conditions A and B for the Laptop; very weak, non-significant positive correlations were found on subscales I, II, and III (r = .161, .123, .105; respectively) (see Table 30) and on subscale IV; a weak, non-significant positive correlation was found (r = .264). For Conditions A and B for the HMD; weak, non-significant positive correlations were found on subscales I, II, and III (*r* = .207, .235, .230; respectively) and on subscale IV; a very weak, non-significant positive correlation was found (*r* = .198). Lastly, on total TPI scores for Conditions A and B for the Laptop; a very weak, non-significant positive correlation was found (*r* = .161) and for Conditions A and B for the HMD; a weak, non-significant positive correlation was found (*r* = .252).

For years of experience using technology in the therapy with children with ASD for Conditions A and B for the Laptop A; very weak, non-significant positive and negative correlations were found on subscales I, II, III, and IV (*r* = .077, -.019, .068, .051; respectively) (see Table 30). For Conditions A and B for the HMD; very weak, non-significant negative and positive correlations were found on subscales I, III, and IV (*r* = -.036, .133, .001; respectively) and on subscale II; a weak, non-significant positive correlation was found (*r* = .307). Lastly, on total TPI scores for Conditions A and B for the Laptop; a very weak, non-significant positive correlation was found (*r* = .045) and for Condition A and B for the HMD; a very weak, non-significant positive correlation was found (*r* = .150).

Table 30

Correlations of Mental Health Practitioners' Years of Experience Using Technology with Children with ASD and Times Used Interactive Virtual Technology to TPI Subscale and Total Scores for Condition A and B (N = 28)

Questions	LP I	LP II	LP III	LP IV	HMD I	HMD II	HMD III	HMD IV	LP TPI Total	HMD TPI Total
Times Used Virtual Technology	.161	.123	.105	.264	.207	.235	.230	.198	.161	.252
Years Using Technology with ASD Children	.077	-.019	.068	.051	-.036	.307	.133	.001	.045	.150

Note. LP = Laptop, HMD = Head-Mounted Display.

Summary

In this chapter the descriptive and frequencies for gender, age, ethnicity, level of degree, professional licensure, work setting, use of technology for 28 mental health practitioners in

Louisiana, as well as the descriptive statistics for the TPI individual questions, total and subscale scores were provided. For research question one, order effects using a repeated MANOVA for both Conditions A and B for TPI total and subscale scores were not significant. For the Laptop and the HMD for both TPI total and subscale scores significance was found between the two conditions with HMD having a higher impact than the Laptop. Additionally, a significant difference was found for the two conditions in participants' perceptions of the likelihood that they would use a VRTE with children diagnosed with ASD, with participants more likely would use the HMD in comparison to the Laptop. For research question two, age and the HMD was significant and in the moderate range for the TPI subscale score III, engagement. The remaining correlations for age and years of experience with working with children with ASD were either weak or in the moderate range with no significance for the TPI total and subscale scores on both conditions. For research three, no correlations were significant and the correlations were either in the weak or moderate range on the TPI total and subscale scores for number of years and hours using technology and years of experience playing online games on both conditions. For research question four, no correlations were significant and the correlations were either in the weak or moderate range on the TPI total and subscale scores for any of the variables years of experience using technology with children with ASD and times used interactive virtual technology on both conditions.

Chapter V

Introduction

Since 2012, VREs with HMDs have not been used in research with children diagnosed with ASD, as well as no research has been conducted from mental health practitioners' perspectives regarding the use of a VRTE with children diagnosed with ASD. The present research was conducted with 28 mental health practitioners in Louisiana. Practitioners' perceptions of presence while participating in the VRTE using a Laptop computer and the Laptop with the Oculus Rift HMD were assessed. In this chapter, the results of the research are summarized and discussed related to existing research. Additionally, implications and future research suggestions are presented. Lastly, limitations and conclusions are summarized.

Discussion of Research Findings

The purpose of the present study was to assess mental health practitioners' perceptions of using a VRTE with children diagnosed with ASD. Mental health practitioners were exposed to two Conditions; Condition A required participation in the VRTE using a Laptop first, then the Laptop with the 2016 Oculus Rift HMD and Condition B required participation in the VRTE using the 2016 Oculus Rift HMD with the Laptop first then, only using the Laptop. Practitioners' perceptions of presence in their VRTE experiences were assessed using Lombard et al.'s (2011) Temple Presence Inventory (TPI).

Physical Conditions Experienced

In the present study, mental health practitioners rated the physical conditions they experienced when viewing the VRTE; such as fatigue, eye strain, and nausea. They reported very low levels of discomfort when using the Laptop and HMD in Condition A for all 17 areas of physical symptoms and in Condition B only *slight* levels of nausea, difficulty concentrating, and stomach awareness with the HMD. Also, mental health practitioners provided qualitative responses indicating dizziness when using the HMD, problems keeping the HMD on their heads, and they speculated that children may have problems keeping the HMD on their heads. The overall results in the present study indicated that the majority of mental health practitioners had minimal side effects when using the Laptop and the Oculus Rift HMD. Similar to the present research, Ehrlich and Munger (2012) and Strickland et al. (1996) reported that while observing children diagnosed with ASD who were using a VRE, the children appeared to experience physical discomfort and a few of the children had trouble keeping the HMD on their head when completing the given VRE tasks. According to Oculus VR, LLC (2016) their latest version of the 2016 Oculus Rift HMD was improved including a 360-degree tracking system, low latency effects, better visual and virtual experience, and less motion sickness. In comparison to previous research by Ehrlich and Munger (2012) and Strickland et al. (2016) as well as the proposed improvement by Oculus VR, LLD, for the present research, mental health practitioners were able to keep the Oculus Rift on their head with minimal side effects and successfully complete both conditions of their VRTE experience.

Experience with ASD and Technology

Experience with ASD. The results from the present study indicated that mental health practitioners reported a limited number of years of experience working with children with ASD, approximately 5½ years and approximately 4 years using technology with children with ASD, with a range for both from 1 to 16 years. Data from the Centers for Disease Control and Prevention (2016) on ASD indicated that in the 1980s, 1 in 10,000 children were diagnosed with ASD, while in the 1990s, 1 in 2,500 children were diagnosed with ASD, and in the early 2000s, 1 in 150 children were diagnosed with ASD. In recent years, such as 2012, 1 in 88 children were diagnosed with ASD, and in the latest 2014 data, 1 in 68 children were diagnosed with ASD across the United States. Thus, in the last decade, ASD has recently become prevalent as a diagnosis for children, which could explain the limited years (5½) of experience practitioners reported.

Although practitioners had limited years (4) using technology in treatment with children with ASD, in the present research, mental health practitioners' ratings indicated they were significantly more likely after experiencing the VRTE to use a HMD with a Laptop than a Laptop alone in therapy with children diagnosed with ASD. Previous research indicated that the majority of therapeutic approaches have had a traditional approach to counseling, although in the last decade with the advancement in technology (e.g., tablets, smartphones, computers, online games for social skills training) integrated treatment approaches have increased. Examples of traditional approaches that have incorporated technology include: ABA (Schoen, 2003), PEERS (Laugeson et al., 2014), Sensory Integration Program (Sams et al., 2006), Picture Exchange Communication System (Flippin et al., 2010), Speech-Language Therapy (Batool & Ijaz, 2015), Verbal Behavior Therapy (Skinner, 1957), DIRR-B (Coulter, 2009), RDI program (Gutstein et al., 2007), SCERTS (Rubin et al., 2013), and AIT (Berard, 1993).

Experience with technology. The results from the present study indicated that mental health practitioners use technology approximately 5 hours a day and have played online games for about 8 years with a range for both of 1 to 21 years. Also, they have used technology for approximately 15½ years but have used interactive VREs for only around 2 times with a range of 1 to 5. Overall, practitioners reported using technology a lot during a day and for a fairly long time. However, they have minimal experience with VREs, which aligns with existing researchers who reported that technology mainly has been used by practitioners and educators in the form of assisted and instructional technology (e.g., smart tablets, smart phones, online gaming applications and chatrooms) to help children with social and communication skills (Ayres et al., 2008; Kulman, 2005), as well as with behavioral issues at home and/or school (Casey, 1992). In addition, many practitioners use technology (e.g., computers, tablets, or smartphones) to provide remote services to clients using telehealth or HTMH (e.g., video conferencing, e-mail), including children with ASD (Luxton et al., 2014; Novotney, 2011; Shallcross, 2011).

Similar to the results in the present study that practitioners have little experience with VREs (approximately 2 times), Parks Associates (2016) reported that 60% of approximately 3 million households knew very little about VRs or HMDs and VRScout, Inc.'s (2016) indicated that approximately 70% of 1,000 participants in their research had never heard of or used a HMD (e.g., Oculus Rift, Samsung Gear, HTC Vive, Google Cardboard). Based on previous research findings, the general population has limited experience using advanced technology, thus professional specialty areas such as mental health practitioners in the present research also had limited experience and knowledge of VREs and HMDs. However, in the last decade, incorporating technology into treatment, such as VREs is something new to the mental health community, with advantages; such as a safe environment to safeguard an individual against dangerous situations or humiliating situations (Scozzari & Gamberini, 2011; Standen & Brown, 2005). Additionally, Rizzo et al. (2012) used a VRE in treatment with individuals who exhibit anxiety, PTSD, and phobias specific to ASD as well as Turner et al. (2016) who developed mental health based video games and virtual worlds for clients to engage in a therapeutic environment. Although research is limited pertaining to the utilization of VREs with HMDs, research has shown success with certain populations; such as pilots in the U.S. Air Force in medical research (Gigante, 1993), children with ASD (Ehrlich & Munger, 2012; Strickland et al., 1996; Wallace et al., 2010), as well as individuals who are not diagnosed with ASD (Slater et al., 2009).

Assessment of Presence in the VRTE

Additionally, in the present study, an important finding was that while experiencing the VRTE when using the HMD, mental health practitioners' presence experiences were significantly higher than when using the Laptop alone. Overall, practitioners perceived that they felt more present in the VRTE with the HMD (M = 131.68) than with the Laptop alone (M = 75.36) for both Conditions. Practitioners' feelings of more presence when using the HMD are consistent with the findings of previous studies, such as Slater et al.'s (2009). The authors indicated that using a HMD induces greater presence, higher immersion, and more realism when participating in a VRE. In other studies by Jung et al. (2006) and Standen and Brown (2005), the authors reported that presence in a VRE can be an important element when assisting children with ASD to improve and advance their social and cognitive abilities while completing various simulated tasks (e.g., grocery shopping, road safety). The authors stated that using a HMD with children diagnosed with ASD could assist these children with their perceptual processes, as described by Piaget (1957) during the developmental process that occurs in the preoperational stage (2-7 years old). At this stage, children learn to use language to understand that objects represent images and words where children think about an object and use words that symbolizes objects which Piaget called symbolism. Additional research with children diagnosed with ASD who wore the 2012 Oculus Rift HMD when participating in a VRE, children reported they had an enjoyable learning experience and felt present in the VRE (Ehrlich & Munger, 2012). In a recent study, Samur (2016) indicated that the new HMD models such as the Oculus Rift or the

HTC Vive offer a higher degree of presence in comparison to older models. Regarding mental health practitioners' perceptions of the four types of presence (i.e., subscales) during their participation in the VRTE, descriptions of each type and the results regarding each type are provided in the sections below.

Spatial presence. Spatial presence "occur[s] when part or all of a person's perception fails to accurately acknowledge the role of technology that makes it appear that s/he is in a physical location and environment different from her/his actual location and environment in the physical world" (International Society for Presence Research, 2000, Presence defined, para. 7a). In spatial presence, an individual has a sense of space orientation (e.g., walking around in a room providing a more naturalistic experience). According to Wallace et al. (2010) spatial presence is "how physically located the participant feels in the virtual reality environment" (p. 206). In the present study, mental health practitioners perceived spatial presence in both Conditions A and B as significantly higher in the VRTE with the HMD (M = 42.14, M = 40.64) than with the Laptop alone (M = 27.71, M = 16.86). Regardless of the order of the conditions, the HMD had a higher impact on practitioners' perceived spatial presence in the VRTE. Practitioners felt more immersed or physically located in the virtual VRE when using the HMD. In past research, major challenges using VREs were found with children diagnosed with ASD regarding their interaction and communication as well as social skills (Danilovic, 2009). Wallace et al. (2010) questioned the utility of VREs because of the sensory and cognitive deficits children have with ASD. However, in other research, using a HMD with a VRE, two children with strong visual and spatial skills were taught how to safely cross a street (Strickland et al., 1996). Strickland et al. (1996) also indicated that a HMD enables individuals to feel that they are immersed in a VRE. As indicated in Piaget's theory (1957), an important element for children's development is that they need to acclimate to their environment and adapt to the mental and physical stimuli, which according to Danilovic (2009) could occur in a VRE such as the VRTE that was used in the present research.

Social presence. "Social presence … occurs when part or all of a person's perception fails to accurately acknowledge the role of technology that makes it appear that s/he is communicating with one or more other people or entities… in two-way communication with another person or people, or with an artificial entity (e.g., a computer "agent")" (International Society for Presence Research, 2000, Presence defined, para. 7e). In the present study, mental health practitioners perceived social presence for both Conditions A and B in the VRTE as significantly higher with the HMD (M = 39.21, M = 34.14) than with the Laptop alone (M = 23.86, M = 16.79). Regardless of the order of the conditions, the HMD had a higher impact on practitioners' perceptions of social presence in the VRTE. As noted in the present study, practitioners perceived that they interacted more socially with the avatars in the VRTE while wearing the HMD than when using the Laptop alone. According to Kandalaft et al. (2013), social presence is a key component needed to engage individuals using various virtual elements like avatar people or objects within a VRE, especially with certain populations like children with a diagnosis of ASD. As noted by Herrera et al. (2008), a VRE can assist children with comprehension of symbolism, increase their imaginative abilities, and learn how to pretend play thereby enhancing their functional and symbolic understanding of their real world environment with others in a social context.

Engagement. "Engagement … occur[s] when part or all of a person's perception is directed toward objects, events, and/or people created by the technology, and away from objects, events, and/or people in the physical world" (International Society for Presence Research, 2000, Presence defined, para. 7d). In the present study, mental health practitioners' perceptions of engagement for both Conditions A and B revealed no significant difference. However, in the findings for the present research, mental health practitioners' age positively correlated and was significantly related to their engagement experience in the VRTE when using the HMD. The findings indicated that the older mental health practitioners felt more engaged in the VRTE. Hubschmann (2017) indicated that adults who are between 30 and 40 years old prefer to use VREs unlike adults who are 50 years or older with limited knowledge and experience with VREs. Also, according to Burch (2016), adults between the ages 35 to 50, consider themselves as having more knowledge and experience with VREs and are more enthusiastic about VREs. In contrast to Hubschmann's (2017) and Burch's (2016) studies, in the present study, even though the average age of practitioners was 37, four practitioners were 53 or older with the oldest age of 68. And, although, practitioners reported using technology approximately 5 hours a day and have used technology for approximately 15½ years; they only used VREs two times.

Although the results were not significantly different for practitioners' engagement with the HMD and the Laptop alone, as noted by Evans (2012), engagement is an important element when keeping clients engaged in therapy. Also, when working with certain populations like children with ASD, engagement is a key element that can promote therapeutic progression of imagination and social interaction in simulated social situations like in a VRE (Ehrlich & Munger, 2012). According to Harris and Reid (2005), a VRE can be highly motivating because of the active engagement that can occur through virtual play, which also aligns with Piaget's (1962) theory in which engagement in play is considered to be an important tool for a child's developmental growth.

Social realism. "Social realism occurs when part or all of a person's perception fails to accurately acknowledge the role of technology that makes it appear that s/he is in a physical location and environment in which the social characteristics correspond to those of the physical world, i.e., s/he perceives that the objects, events, and/or people s/he encounters do or could exist in the physical world" (International Society for Presence Research, 2000, Presence defined, para. 7c). As indicated by Slater et al. (2009), higher realism in a VRE provides greater presence for an individual. In the present study, mental health practitioners did not perceive that the HMD was significantly different in social realism than the Laptop in both Conditions A and B. However, mental health practitioners' number of years using technology and online games as well as the number of hours they use technology negatively correlated with their social realism experiences in the VRTE. The findings indicated that the more practitioners use technology (i.e., years and hours using technology and years of online gaming), the higher their expectations were for social realism in the VRTE. In similar technology, Galloway (2004) stated that "One of the most central theoretical issues in gaming is how and in what way one makes connections between the gaming world and the real world both from the inside outward in the form of affective action, and from the outside inward in the form of realistic representation" and "realism … is about a relationship between the game and the gamer" (para. 4 and 29). In gaming, like in VREs, users do not want to be just passive observers. They want their social experience to feel *real* as if they are part of the action in the game or virtual environment. Based on the present study, the results indicated that practitioners are very familiar with technology and online gaming, thus they had high expectations of the social realism in the VRTE.

Although the results were not significant between the HMD and the Laptop alone for adult practitioners' perceptions of social realism, Strickland et al. (2011) stated that an HMD is able to enhance individuals' sense of realism and is important for adaptation to mental and physical stimuli in VREs which is a key element that individuals need to acclimate in their environments. Additionally, when working with children, social realism in VREs is important to assisting children with understanding facial and emotional processing and language and independent living skills (Grynszpan et al., 2013) as well as assisting children diagnosed with ASD to enhance their imagination, interaction, and engagement in a social setting thereby enabling generalization of what they learned in a real life social context (Ehrlich & Munger, 2012; Slater et al., 2009).

Implications

In the present section, implications for mental health practitioners and technology in mental health practice are provided.

Implications for Mental Health Practitioners

Mental health practitioners reported some physical discomfort when wearing the HMD, which influenced their concerns about the ease of use of the HMD for themselves and children. Their reports are similar to previous researchers (Ehrlich & Munger, 2012; Strickland et al., 1996) who indicated that children with ASD experienced physical discomfort and problems keeping a HMD on their heads during a VRE experience. An implication related to these findings is that although HMDs have been improved, children may experience physical discomfort or other problems when wearing HMDs. Thus, practitioners should consider proper clinical screening prior to using a HMD with children because current HMDs like the Oculus Rift HMD according to the chief executive officer of Oculus VR LLC, Brendan Iribe, are designed to fit individuals 13 years or older (Code Conference, 2015). If a practitioner decides to use the HMD with a child under the age of 13, consideration must be given to whether the

HMD can be secured appropriately on a child's head to minimize vision issues or physical discomfort that could occur. Practitioners in the study reported the HMD's therapeutic application was appropriate for children with ASD as young as 8 years old.

When using the HMD, mental health practitioners reported a higher likelihood of using the HMD with the Laptop in therapy with children diagnosed with ASD, versus the Laptop alone. Also, practitioners reported that their experience felt more present when viewing the VRTE with the HMD than the Laptop alone. An implication from these findings is that practitioners believe their experience was more real when using the HMD and they are more likely to use a HMD with Laptop than just using a Laptop alone when working with children diagnosed with ASD. Studies by Samur (2016) and Slater et al. (2009) were similar as the present finding. The authors indicated that a HMD can provide a higher level of realism in a VRE because it induces a greater sense of presence. Because feelings of being present in a social environment is a key element to a child's development, efforts in advancing technology with HMDs should continue in order that clinical practice with HMDs could occur in the future.

Implications for Technology in Mental Health Practice

Engagement was not significantly different for mental health practitioners when viewing the VRTE with the HMD and the Laptop. Lack of engagement in the VRTE when using the HMD aligns with Alton (2017) report, who indicated that current VREs lack the context and social capabilities, due to the wired HMD restricting an individual's movements when viewing a VRE. An implication related to these findings is that social skills learned in a VRE may not transfer so readily to the real world settings because of the lack of engagement. Improved and increased engagement provided by new technologies could help to alleviate this problem.

Social realism was not significantly different for mental health practitioners when viewing the VRTE with the HMD and the Laptop. Lack of social realism in the VRTE aligns with Roth et al. (2016) findings, who indicated that although realism in VREs is an important factor that affects interpersonal interactions and co-presence, limitations were found in their research with the facial expressions during the role plays. An implication related to these findings is that the VRTE in the present was not interactive enough to convey social realism (i.e., interacting and communicating with other avatars and/or objects). Thus, developers of VREs should work closely with mental health practitioners in order to develop socially realistic environments for therapeutic use. Also, practitioners who plan to use virtual reality platforms should monitor technology as it advances, which may provide more interactive components.

Mental health practitioners reported difficulty when using the Xbox controller and the HMD; however, practitioners also reported limited knowledge of interactive virtual reality technologies. Practitioners reported experiences similar to studies by VRScout, Inc. (2016) and Parks Associates (2016) whose participants reported limited or no knowledge of VREs. In another study by Boeldt et al. (2015) researchers surveyed 1,406 health care providers with 37.95% of those surveyed who felt uneasy using new technology in treatment and 58.25% reported liking technology but preferring a practitioner completed a professional diagnosis. An implication related to these findings is that practitioners have little experience when using technology in practice, thus they should actively seek training in order to recognize and use technology in clinical practice and as a treatment tool when working with children.

Future Research

The present research study leaves room for a variety of research studies to follow. Currently, a limited amount of research exists using VRE and HMDs with children diagnosed with ASD. No research to-date has been conducted from a mental health practitioner's perspective regarding the viable use of a VRE with children diagnosed with ASD. Because technology continues to advance and treatment options expand, future research could include a larger participant sample that is not limited to mental health practitioners in Louisiana and include other professionals, such as child psychologists and psychiatrists, neurosurgeons, psychiatric nurses, occupational and speech therapists, school counselors, and special education teachers in diverse clinical mental health settings. Additionally, future research could examine mental health practitioners' perceptions of presence in a VRTE for future applicability in therapy with children diagnosed with ASD, incorporating the latest equipment of VREs and HMDs for treatment applicability.

Also, future research could replicate the present study with the same procedures and research design using the new VRE platforms. For example, *Sansar* is expected to provide a greater virtual experience and could be used in future research studies. Additionally, future research with updated and more advanced equipment that might include controllers to navigate in the VRE, VR tracker gloves, and new HMDs which could allow users the ability to use both hands when experiencing a VRE, thus feel more immersed and engaged in the VRE.

As technology continues to advance, future research could assess improvement in HMD that address physical discomfort issues that occurred in the present study. While past research with HMDs, such as Ehrlich and Munger (2012) and Strickland et al. (1996), and the present research have used the most advanced HMDs, participants' physical discomfort still occurred. Future research could include more extensive quantitative and qualitative data on physical issues that participants experience while wearing HMDs.

In the present study, although participants were given instructions prior to their VRTE experience in what to expect and what technology would be used, practitioners were not trained in how to utilize the Laptop or the HMD. Mental health practitioners' unfamiliarity with how to use the technology may have impacted their overall VRTE experience. Future research could involve similar assessment of presence; however, could also include training participants prior to using the technology when experiencing a VRE.

The TPI has been used to assess presence mostly in gaming and media environments. Future research using the TPI in other technology driven settings could be examined. Although, the internal consistency was reliable for the four subscales of presence that were included in the TPI in the present study (i.e., Spatial Presence, Social Presence-Actor Within Medium, Engagement (mental immersion), and Social Realism), more research is encouraged using the specific four subscales used in the present study in other VREs. Also, further research is suggested that includes the other four subscales in the TPI (i.e., Social Presence-Passive Interpersonal, Social Presence-Active Interpersonal, Social Richness, and Perceptual Realism) to assess validity and reliability of the TPI in other VREs.

Limitations

Concerning the design of the study and data collection four general limitations are provided. The first limitation was that the sample size that was recruited in present study was a total of 28 mental health practitioners from Louisiana. Because of the small sample size when testing for normality, Condition A, unlike with Condition B, the distribution was not normal. Oztuna et al. (2006) noted that in such cases small sample sizes can effect data distributions. Second, although the results from the present study revealed that participants' perceptions of presence using the HMD in the VRTE versus the Laptop was higher, as well as participants reported a higher likelihood of using the HMD versus the Laptop in treatment with children diagnosed with ASD, a larger sample size may have made the present study's data generalizable to reflect more reliability (Smith, 2017). A third limitation was related to mental health practitioners' familiarity with interactive virtual technologies. Based on the present study's result, a small number of participants had experience using interactive virtual technologies, thus participants experienced difficulties when operating both technologies when observing the VRTE (i.e., Laptop using the Xbox controller, and the HMD using the Xbox controller). If participants were provided with training in how use the technology, their overall VRTE experience may have been different. A fourth limitation was that the TPI has only been used in media and gaming environments. Although, the TPI has been validated using the two forms of media and gaming environment contexts, the TPI has not been tested or validated in an immersive VRE.

Conclusions

Results of the present study supported the initial hypothesis that mental health practitioners' overall perceived presence when experiencing the VRTE would be higher when wearing the HMD versus the Laptop alone. The majority of practitioners reported that they had many years of experience using technology in general and online gaming, however, the number of times they have used interactive virtual technology was low. Overall, mental health practitioners reported that they would use a VRTE in treatment with children diagnosed with ASD, although the majority of practitioners reported slight physical discomfort while wearing the HMD such as nausea or dizziness. Because of the reported slight physical discomfort they speculated that children may have problems keeping the HMD on their heads, indicating the need for further development and advancement in technology with HMDs. Although the results from the present study are promising regarding technology and VREs being used in clinical practice with children diagnosed with ASD; mental health practitioners are encouraged to seek training and knowledge in how to use VREs and HMDs especially with children. Because technology is advancing very quickly; greater levels of presence, engagement, and realism will be offered to users making the VRE experience more real and possibly therapeutic.

References

Abou-Setta, A., Sadek, I., Shalaby, A., & Hazzaa, N. (2006). *Auditory integration training for autistic children*. Retrieved from http://www.earcarecenter.com/ait_paper.pdf

Al-Krenawi, A., Graham, J. R., & Fakher-Aldin, M. (2003). Telephone counseling: A comparison of Arab and Jewish Israeli usage. *International Social Work*, *46*(4), 495-509.

Alton, M. (2017). *Uxs technology planning report: Virtual reality*. Retrieved from https://www.strategyanalytics.com/access-services/ux-innovation/user-experience-strategies/reports/report-detail/uxs-technology-planning-report-virtual-reality#.WghlGManGUn

American Academy of Pediatrics. (2014). *Autism prevalence now 1 in 68, varies by sex, race/ethnic group.* Retrieved from http://www.aappublications.org/content/early/2014/03/27/aapnews.20140327-1

American Counseling Association. (2014). *ACA Code of Ethics*. Alexandria, VA: Author.

American Psychiatric Association. (1968). *Diagnostic and statistical manual of mental disorders* (2nd ed.). Washington, DC: Author.

American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC: Author.

American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed., text rev.). Washington, DC: Author.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Washington, DC: Author.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.

American Psychiatric Association. (2015). *APA Commentary on Ethics in Practice*. Retrieved from https://www.psychiatry.org/psychiatrists/practice/ethics

American Psychiatric Association. (2015). *Diagnostic and statistical manual of mental disorders*. Retrieved from http://www.psychiatry.org/psychiatrists/practice/dsm

American Psychological Association. (2008a). *Guidelines for the practice of telepsychology*. Retrieved from https://www.apa.org/pubs/journals/features/amp-a0035001.pdf

American Psychological Association. (2008b). *Telepsychology, medication, and collaboration module*. Retrieved from http://www.apa.org/workforce/publications/08-hsp/telepsychology/index.aspx

American Speech-Language-Hearing Association. (2004). *Auditory integration therapy*. Retrieved from https://web.archive.org/web/20080407005653/http://www.asha.org/NR/rdonlyres/EC6C8637-57F3-4AD2-AEBB-66F6BE3DEE72/0/v1TRAIT.pdf

Anckarsäter, H., Nilson, T., Saury, J. M., Ramstam, M., & Gillberg, C. (2008). Autism spectrum disorders in institutionalized subjects. *Nordic Journal of Psychiatry*, *62*(2), 160-167.

Anderson, M. (2015). *Technology device ownership: 2015*. Retrieved from http://www.pewinternet.org/files/2015/10/PI_2015-10-29_device-ownership_FINAL.pdf

Anthony, K., Merz-Nagel, D., & Goss, S. (2010). *The use of technology in mental health: Applications, ethics, and practice*. Retrieved from https://psychcentral.com/lib/the-use-of-technology-in-mental-health-applications-ethics-and-practice/

APA Practice Organization. (2015). *Text therapy: New platforms spark questions*. Retrieved from http://www.apapracticecentral.org/update/2015/06-25/text-therapy.aspx

Arieti, S. (1950). Autistic thought. Its formal mechanisms and its relationship to schizophrenia. *Journal of Nervous and Mental Disease, 111*(4), 288-303.

Ayres, K. M., Mechling, L., & Sansosti, F. J. (2013). The use of mobile technologies to assist with life skills/independence of students with moderate/severe intellectual disability and/or autism spectrum disorders: Considerations for the future of school psychology. *Psychology in the Schools*, *50*(3), 259-271.

Bartle, R. (2003). *Designing virtual worlds*. San Francisco, CA: New Riders.

Batool, I., & Ijaz, A. (2015). Effectiveness of speech and language therapy for autism spectrum disorder. *Journal of Pakistan Psychiatric Society*, *12*(1), 14-17.

Bellani, M., Fornasari, L., Chittaro, L., & Brambilla, P. (2011). Virtual reality in autism: State of the art. *Epidemiology and Psychiatric Sciences*, *20*(3), 235-238. doi:10.1017/S2045796011000448.

Ben-Zeev, D., Kaiser, M.S., & Brenner, J.C. (2013). Development and usability of FOCUS: A smartphone system for self-management of schizophrenia. *Psychiatric Rehabilitation Journal, 36(*4), 289-296. doi: 10.1037/prj0000019.

Boeldt, L.D., Wineinger, E.N., Waalen, J., Gollamudi, S., Grossberg, A., Steinhubl, R.S., … Topol, J.E. (2015). How consumers and physicians view new medical technology: Comparative survey. *Journal of Medical Internet Research*, *17*(9). Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4642377/

Boucher, J., Pronk, N., & Gahling, E. (2003, Fall). Telephone based lifestyle counseling. *Diabetes Spectrum*, *13*(4), 190.

Bowers, K., Lin, P., & Erickson, C. (2015). Pharmacogenomic medicine in autism: Challenges and opportunities. *Pediatric Drugs, 17*(2), 115-124. doi: 10.1007/s40272-014-0106-0.

Burch, A. (2016). *VR and consumer sentiment*. Retrieved from https://touchstoneresearch.com/vr-and-consumer-sentiment/

Casey, J. (1992). *Counseling using technology with at-risk youth.* Retrieved from https://www.ericdigests.org/1992-3/risk.htm

Centers for Disease Control and Prevention. (2007). *CDC releases new data on autism spectrum disorders (asds) from multiple communities in the United States*. Retrieved from http://www.cdc.gov/media/pressrel/2007/r070208.htm

Centers for Disease Control and Prevention. (2016). *Autism Spectrum Disorder (ASD): Data & Statistics*. Retrieved from https://www.cdc.gov/ncbddd/autism/data.html

Centore, A. J., & Milacci, F. (2008). A study of mental health counselors' use of and perspectives on distance counseling. *Journal of Mental Health Counseling, 30*(3), 267-282.

Childress, C. A. (2000). Ethical issues in providing online psychotherapeutic interventions. *Journal of Medical Internet Research, 2*(1): e5. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1761841/

Christensen, D.L., Baio, J., Braun, V.K., Bilder, D., Charles, J., Constantino, J.N., Daniels, J.,… Yeargin-Allsopp, M. (2016). Prevalence and characteristics of autism spectrum disorder among children aged 8 years-autism and developmental disabilities monitoring network, 11 sites, United States, 2012. *Morbidity and Mortality Weekly Report (MMWR) Surveillance Summary, 65*(3), 1-23.

Clough, B., & Casey, L. (2015). Smart designs for smart technologies: Research challenges and emerging solutions for scientist-practitioners with e-mental health. *Professional Psychology: Research and practice, 46*(6), 429-436.

Code Conference. (2015). *Oculus co-founder and ceo Brendan Iribe*. Retrieved from https://www.recode.net/2015/6/23/11684506/podcasts-code-conference-2015-oculus-co-founder-and-ceo-brendan-iribe

Cohen, J. (1992). *A power primer*. Retrieved from http://www.radford.edu/~jaspelme/611/Spring-2006/Cohen_Psyc_Bull_1992.pdf

Coulter, R. A. (2009). Understanding the visual symptoms of individuals with autism spectrum disorder (asd). *Optometry & Vision Development, 40*(3), 164-175.

Cowan, P. A. (1978). Piaget with feeling: Cognitive, social and emotional dimensions. *Journal of Educational Research, 72*, 114-115.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches.* Thousand Oaks, CA: Sage Publications, Inc.

Cunningham, C., & Glenn, S. (2004). Self-awareness in young adults with down syndrome: I. Awareness of down syndrome and disability. *International Journal of Disability, Development & Education, 51*(4), 335-361. doi: 10.1080/1034912042000295017.

Danilovic, S. (2009). Review of autism and second life - An introduction. *Journal on Developmental Disabilities*, *15*(3), 125-129.

Dawson, G., & Watling, R. (2000). Interventions to facilitate auditory, visual, and motor integration in autism: A review of the evidence. *Journal of Autism and Developmental Disorders, 30*(5), 415-21.

DiGuiseppi, C., Hepburn, S., Davis, J.M., Fidler, D.J., Hartway, S., Lee, N.R.,… Robinson, C. (2010). Screening for autism spectrum disorders in children with down syndrome. *The Journal of Developmental and Behavioral Pediatrics, 31*,181-191.

Downing, D. (2007). Autism: Are we entering the final straight? In memory of Bernard Rimland. *Journal of Nutritional & Environmental Medicine, 16*(3/4), 173-180. doi: 10.1080/13590840701804377.

Edelson, S. M. (2009). Bernard Rimland (1928–2006). *Journal of Autism and Developmental Disorders,* 821-822. doi: 10.1007/s10803-009-0708-5.

Edutrendsonline. (2012). *Influence of technology in school counseling*. Retrieved from http://edutrendsonline.com/2012/12/18/influence-of-technology-in-school-counseling/

Ehrlich, J., & Munger, J. (2012). *Utilizing head mounted displays as a learning tool for children with autism.* Retrieved from https://www.researchgate.net/publication/269111159_Utilizing_Head_Mounted_Displays_as_a_Learning_Tool_for_Children_with_Autism

Ekstein, R. (1991). Bruno Bettelheim (1903–1990): Obituary. *American Psychologist*, *46*(10), 1080. doi:10.1037/0003-066X.46.10.1080.

Evans, J. D. (1996). *Straightforward statistics for the behavioral sciences*. Pacific Grove, CA: Brooks/Cole Publishing.

Evans, S. (2012). Using computer echnology in expressive arts therapy practice: A proposal for increased use. *Journal of Creativity in Mental Health, 7*(1), 49-63.

Feldman, R. (2008). *Development across the life span* (5th ed.). Upper Saddle River, NJ: Pearson Education.

Field, A. (2013). *Discovering statistics using IBM SPSS statistics* (4^{th} ed.). Thousand Oaks, CA: Sage Publications, Inc.

Field, T. A., Beeson, E. T., & Jones, L. K. (2015). The new ABCS: A practitioner's guide to neuroscience-informed cognitive-behavior therapy. *Journal of Mental Health Counseling, 37*(3), 206-220. doi:10.17744/mehc.37.3.02

Fink, J. (1999). *Cyberseduction: Reality in the age of psychotechnology*. Amherst, NY: Prometheus Books.

Flippin, M., Reszka, S., & Watson, L. R. (2010). Effectiveness of the picture exchange communication system (PECS) on communication and speech for children with autism spectrum disorders: A meta-analysis. *American Journal of Speech-Language Pathology, 19*(2), 178-195. doi: 10.1044/1058-0360(2010/09-0022).

Frith, U. (1998). What autism teaches us about communication. *Logopedics Phoniatrics Vocology, 23*(2), 51-58. doi: 10.1080/140154398434194.

Frith, U. (2001). Mind blindness and the brain in autism. *Neuron*, *32*(6), 969-979.

Furth, H. G. (1977). *The operative and figurative aspects of knowledge in Piaget's theory*. B. A. Geber (Ed.). London and NY: Routledge.

Gallagher, H. L., & Frith, C. D. (2003). Functional imaging of theory of mind. *Trends in Cognitive Sciences*, *7*(2), 77-83.

Galloway, R.A. (2004). Social realism in gaming. *The International Journal of Computer Game Research, 4*(1). Retrieve from http://www.gamestudies.org/0401/galloway/

Gigante, M. A. (1993). Virtual reality: Definitions, history and applications. *In virtual reality systems* (pp. 3-14). San Diego, CA: Academic Press Inc.

Godleski, L., Darkins, D. A.., & Peters, J. (2012). Outcomes of 98,609 U.S. department of veterans affairs patients enrolled in telemental health services, 2006-2010. *Psychiatric Services, 63*(4), 383-385.

Gray, D. (1993). Perceptions of stigma: The parents of autistic children. *Sociology of Health and Illness, 15*(1), 102-120.

Greenberg, A., Tomaino, M., & Charlop, M. (2012). Assessing generalization of the picture exchange communication system in children with autism. *Journal of Developmental and Physical Disabilities*, *24*(6), 539-558. doi: 10.1007/s10882-012-9288-y.

Greene, A. H. (2012). HIPAA compliance for clinician texting. *Journal of AHIMA, 83*(4), 34-36.

Grynszpan, O., Weiss, P., Perez-Diaz, F., & Gal, E. (2014). Innovative technology-based interventions for autism spectrum disorders: A meta-analysis. *Autism: The International Journal of Research & Practice, 18*(4), 346-361. doi: 10.1177/1362361313476767.

Gutstein, S., Burgess, A., & Montfort, K. (2007). Evaluation of the relationship development intervention program. *Autism, 11*(5), 397-411.

Haberstroh, S., Duffey, T., Evans, M., Gee, R., & Trepal, H. (2007). The experience of online counseling. *Journal of Mental Health Counseling, 29*(3), 269-282.

Hallmayer, J., Cleveland, S., Torres, A., Phillips, J., Cohen, B., Torigoe, T.,… Risch, N. (2011). Genetic heritability and shared environmental factors among twin pairs with autism. *Archives of General Psychiatry, 68*(11), 1095-1102.

Hammes, J. G. W., & Langdell, T. (1981). Precursors of symbol formation and childhood autism. *Journal of Autism and Developmental Disorders, 11*, 331-345.

Harris, K., & Reid, D. (2005). The influence of virtual reality play on children's motivation. *The Canadian Journal of Occupational Therapy, (72)*1, 21-29.

Harris, E.S., & Robinson Kurpius, E.S. (2014). Social networking and professional ethics: Client searchers, informed consent, and disclosure. *Professional psychology: Research and Practice, 45*(1), 11-19. doi: 10.1037/a0033478.

Heilig, M. (n.d.). *Sensorama machine*. Retrieved from http://www.mortonheilig.com/InventorVR.html

Heinlen, K., Welfel, R. E., Richmond, E., & O'Donnell, M. (2003). The nature, scope, and ethics of psychologists' e-therapy web sites: What consumers find when surfing the web. *Psychotherapy, Theory, Research, Practice, Training, 40*(1/2), 112-124. doi: 10.1037/0033-3204.40.1/2.112.

Heinrich-Heine-Universität Düsseldorf. (2014). *G*power: Statistical power analyses for windows and mac*. Retrieved from http://www.gpower.hhu.de/en.html

Herrera, G., Alcantud, F., Jordan, R., Blanquer, A., Labajo, G., & De Pablo, C. (2008). Development of symbolic play through the use of virtual reality tools in children with autistic spectrum disorders: Two case studies. *Autism: The International Journal of Research and Practice*, *12*(2), 143-157.

Hinsie, L. E., & Shatsky, J. (1948). *Psychiatric dictionary*. New York: Oxford University Press.

Hoque, M., Lane, J., Kaliouby, R., Goodwin, M., & Picard, R. (2009). Exploring speech therapy games with children with autism spectrum. *International Speech Communication Association*. Retrieved from http://dspace.mit.edu/handle/1721.1/56580

Howlin, P. (2011). Review of early start Denver model for young children with autism: Promoting language, learning, and engagement. *Child and Adolescent Mental Health, 16*(2), 128. doi:10.1111/j.1475-3588.2011.00603_2.x.

Huang, A. X., & Wheeler, J. J. (2006). High-functional autism: An overview of characteristics and related issues. *International Journal of Special Education*, *21*(2), 109-123.

Hubschmann, M. (2017). *What are the ages of virtual reality users*. Retrieved from https://www.linkedin.com/pulse/what-ages-virtual-reality-users-michal-hubschmann/

Institute of Education Sciences. (2013). *Early childhood education interventions for children with disabilities*. Retrieved from https://ies.ed.gov/ncee/wwc/pdf/intervention_reports/wwc_socialskills_020513.pdf

International Society for Presence Research. (2000). *The concept of presence: Explication statement*. Retrieved from https://ispr.info/about-presence-2/about-presence/

Ivey, M. B., & Ivey, A. E. (1988). *Assessing and facilitating children's cognitive development*. Retrieved from https://www.academicvideostore.com/sites/default/files/video-attachments/DCTchildrenarticle.pdf

Jahoda, A., & Markova, I. (2004). Coping with social stigma: People with intellectual disabilities moving from institutions and family home. *Journal of Intellectual Disability Research, 48*(8), 719-729. doi:10.1111/j.1365-2788.2003.00561.x.

Jencius, M. (2011). *Two sides of social media*. Retrieved from https://www.counseling.org/resources/library/Counseling%20Today/October2011CTOnline.pdf

Jung, K. E., Lee, H. J., Lee, Y. S., & Lee, J. H. (2006). Efficacy of sensory integration treatment based on virtual reality - Tangible interaction for children with autism. *Annual Review of Cybertherapy and Telemedicine*, *4*, 45-49.

Kandalaft, M. R., Didehbani, N., Krawczyk, D. C., Allen, T. T., & Chapman, S. B. (2013). Virtual reality social cognition training for young adults with high-functioning autism. *Journal of Autism and Developmental Disorders, 43*(1), 34-44.

Karim-Abdel, A. E., & Mohammed, A. H. (2015). Effectiveness of sensory integration program in motor skills in children with autism. *Egyptian Journal of Medical Human Genetics, 16*(4), 375-380. doi:10.1016/j.ejmhg.2014.12.008.

Kolmes, K. (2010). *Email tips for clinicians*. Retrieved from http://drkkolmes.com/2010/04/28/email-tips-for-clinicians/

Kulma, R. (2015). *Why child therapists need to use technology in treatment*. Retrieved from http://learningworksforkids.com/2015/07/why-child-therapists-need-to-uses-technology-in-their-treatment/

Lane, H. (1995). *The wild boy of Aveyron*. Cambridge, MA: Harvard University Press.

Latency. (2015). *In Oxford English online dictionary.* Retrieved from http://www.oxforddictionaries.com/us/definition/american_english/latency

Laugeson, E. A., Ellingsen, R., Sanderson, J., Tucci, L., & Bates, S. (2014). The ABC's of teaching social skills to adolescents with autism spectrum disorder in the classroom: The UCLA “PEERS” program. *Journal of Autism and Developmental Disorders, 44*(9), 2244-2256.

Laugeson, E. A., & Park, M. N. (2014). Using a CBT approach to teach social skills to adolescents with autism spectrum disorder and other social challenges: The PEERS® method. *Journal of Rational - Emotive & Cognitive - Behavior Therapy, 32*(1), 84-97. doi: 10.1007/s10942-014-0181-8

Leong, F. T. (Ed.) (2008). Technology and treatment. In *Encyclopedia of counseling* (pp. 411-415) [Adobe Digital Editions Version]. doi: http://dx.doi.org/10.4135/9781412963978.

Lessing, L. (2000). *Code and other codes of cyberspace*. New York, NY: Basic Books.

Linden Research, Inc. (2016). *About Linden Lab*. Retrieved from http://www.lindenlab.com/about

Linden Research, Inc. (2017). *The metaverse's next chapter: Sansar opens to the public in creator beta*. Retrieved from https://www.lindenlab.com/releases/sansar-creator-beta-opens

Lieberman, L. M. (1982). Itard: The great problem solver. *Journal of Learning Disabilities, 15*(9), 566-68.

Lindgren, S., & Doobay, A. (2011). *Evidence-based interventions for autism spectrum disorders*. Retrieved from http://www.interventionsunlimited.com/editoruploads/files/Iowa%20DHS%20Autism%20Interventions%206-10-11.pdf

Lombard, M., (2013). *Measuring presence: The Temple Presence Inventory (TPI)*. Retrieved from http://matthewlombard.com/research/p2_ab.html

Lombard, M., & Ditton, T. (1997). At the heart of it all: The concept of presence. *Journal of Computer-Mediated Communication, 3*(2). Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1083-6101.1997.tb00072.x/full

Lombard, M., Weinstein, L., & Ditton, T. B. (2011). *Measuring telepresence: The validity of the Temple Presence Inventory (TPI) in a gaming context.* Retrieved from http://matthewlombard.com/research/TPIvalidity2011.pdf

Luxton, D. D., Pruitt, D. L., & Osenbach, E. J. (2014). Best practices for remote psychological assessment via telehealth technologies. *Professional psychology: Research and Practice, 45*(1), 27-35.

Maenner, M. J., Schieve, L. A., Rice, C. E., Cunniff, C., Giarelli, E., Kirby, R. S., Lee, L. C., Nicholas, J. S., Wingate, M. S., & Durkin, M. S. (2013). Frequency and pattern of documented diagnostic features and the age of autism identification. *Journal of the American Academy of Child and Adolescent Psychiatry*, *52*(4), 401-413.

Mahajnah, M., Sharkia, R., Shalabe, H., Terkel-Dawer, R., Akawi, A., & Zelnik, N. (2015). Clinical characteristics of autism spectrum disorder in Israel: Impact of ethnic and social diversities. *BioMed Research International, 2015*, 1-7.

Mallen, M., Vogel, L. D., & Rochlen, A. B. (2005). The practical aspects of online counseling: Ethics, training, technology, and competency. *The Counseling Psychologist*, *33*(6), 776-818.

Markopoulos, P. (2016a, June 3). *Virtual reality environment (VRE): First pilot study* [Video File]. Retrieved from https://youtu.be/rsm5ATTdq2c

Markopoulos, P. (2016b, August 11). *Virtual reality therapy environment (VRTE): Second pilot study* [Video File]. Retrieved from https://youtu.be/1J-cNAN450I

Martin, D. (2012). *The ever-changing social perception of autism spectrum disorders in the United States*. Retrieved from http://uncw.edu/csurf/Explorations/documents/DanielleMartin.pdf

Martz, E. (2004). A philosophical perspective to confront disability stigmatization and promote adaption to disability. *Journal of Loss and Trauma, 9*(2), 139-158.

Maskey, M., Lowry, J., Rodgers, J., McConachie, H., & Parr, J. R. (2014). Reducing specific phobia/fear in young people with autism spectrum disorders (ASDs) through a virtual reality environment intervention. *Plos ONE, 9*(7), 1-12. doi:10.1371/journal.pone.0100374.

May, T., Cornish, K., & Rinehart, N. (2014). Does gender matter? A one year follow-up of autistic, attention and anxiety symptoms in high-functioning children with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 44*(5), 1077-1086. doi: 10.1007/s10803-013-1964-y.

McConachie, H., McLaughlin, E., Grahame, V., Taylor, H., Honey, E., Tavernor, L., Rodgers, J., Freeston, M., Hemm, C., Steen, N., & Le Couteur, A. (2014). Group therapy for anxiety in children with autism spectrum disorder. *Autism, 18*(6), 723-732.

McGreevy, M. (1991). *The virtual environment display system*. Retrieved from https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19910013709.pdf

McLeod, S. A. (2015). *Jean Piaget*. Retrieved from www.simplypsychology.org/piaget.html

Militerni, R., Bravaccio, C., Falco, C., Fico, C., & Palermo, M. T. (2002). Repetitive behaviors in autistic disorder. *European Child & Adolescent Psychiatry, 11*(5), 210.

Mohammadzaheri, F., Koegel, L. K., Rezaee, M., & Rafiee, S. M. (2014). A randomized clinical trial comparison between pivotal response treatment (PRT) and structured applied behavior analysis (ABA) intervention for children with autism. *Journal of Autism and Developmental Disorders*, *44*(11), 2769-2777.

Molteni, P., Guldberg, K., & Logan, N. (2013). Autism and multidisciplinary teamwork through the SCERTS model. *British Journal of Special Education, 40*(3), 137-145. doi:10.1111/1467-8578.12030.

Moore, D., Cheng, Y., McGrath, P., & Powell, N. J. (2005). Collaborative virtual environment technology for people with autism. *Focus on Autism and Other Developmental Disabilities, 20*(4), 231-243.

Mor, N., & Berkson, G. (2003). Attitudes toward stereotyped behaviors. *Journal of Developmental and Physical Disabilities, 15*(4), 351-365.

Morgan, S. B. (1986). Autism and Piaget's theory: Are the two compatible? *Journal of Autism and Developmental Disorders, 16*(4), 441-457.

Murch, S. H., Anthony, A., Casson, D. H., Malik, M., Berelowiz, M., Dhillon, A. P.,…Walker-Smith, J. A. (2004). Retraction of an interpretation. *The Lancet, 363*(9411), 750.

Myers, J., & Gibson, D. (1999). *Technology competence of counselor educators.* Retrieved from http://www.ericdigests.org/2000-3/counselor.htm

Myers, J. E., Shoffner, M, & Briggs, M. (2002). Developmental counseling and therapy: An effective approach to understanding and counseling children. *Professional School Counseling, 5*, 194-202.

National Association of Social Workers. (2008). *Code of ethics of the national association of social workers*. Washington, DC: Author.

National Board for Certified Counselors. (2016). *NBCC code of ethics*. Retrieved from http://www.nbcc.org/Assets/Ethics/NBCCCodeofEthics.pdf

National Institute of Mental Health. (2017). *Technology and the future of mental health*. Retrieved from https://www.nimh.nih.gov/health/topics/technology-and-the-future-of-mental-health-treatment/index.shtml

National Institute of Neurological Disorders and Stroke. (2015). *Autism fact sheet*. Retrieved from http://www.ninds.nih.gov/disorders/autism/detail_autism.htm

Norbury, C. F., Brock, J., Cragg, L., Einav, S., Griffiths, H., & Nation, K. (2009). Eye-movement patterns are associated with communicative competence in autistic spectrum disorders. *The Journal of Child Psychology and Psychiatry, 50*(7), 834-842.

Novotney, A. (2011). *A new emphasis on telehealth: How can psychologists stay ahead of the curve and keep patients safe?* Retrieved from http://www.apa.org/monitor/2011/06/telehealth.aspx

Oculus VR, LLC. (2016). *Rift; Next-generation virtual reality*. Retrieved from https://www3.oculus.com/en-us/blog/oculus-rift-pre-orders-now-open-first-shipments-march-28/

Online Therapy Institute. (2015). *Ethical framework for the use of technology in mental health*. Retrieved from http://onlinetherapyinstitute.com/ethical-training/

Oztuna, D., Elhan, A.H., & Tuccar, E. (2006). Investigation of four different normality tests in terms of type 1 error rate and power under different distributions. *Turkish Journal of Medical Sciences, 36*(3), 171-176.

Ozonoff, S., Young, G. S., Carter, A., Messinger, D., Yirmiya, N., Zwaigenbaum, L.,…Stone, W. L. (2011). Recurrence risk for autism spectrum disorders: A baby siblings research consortium study. *Pediatrics, 128*, 488-495.

Pajareya, K., & Nopmaneejumruslers, K. (2011). A pilot randomized controlled trial of DIR/floortime parent training intervention for pre-school children with autistic spectrum disorders. *Autistic Society, 15*(2), 1-15.

Panyametheekul, S., & Herring, S. (2003). Gender and turn allocation in a Thai chat room. *Journal of Computer Mediated Communication, 9*(1). doi:10.1111/j.1083-6101.2003.tb00362.x.

Parsons, S., & Mitchell, P. (2002). The potential of virtual reality in social skills training for people with autistic spectrum disorders. *Journal of Intellectual Disability Research, 46,* 430-443.

Parsons, S., Mitchell, P., & Leonard, A. (2004). The use and understanding of virtual environments by adolescents with autistic spectrum disorders. *Journal of Autism and Developmental Disorders, 34*(4), 449-466. doi:10.1023/B:JADD.0000037421.98517.8d.

Pew Research Center. (2011). *Americans and text messaging*. Retrieved from http://www.pewinternet.org/2011/09/19/americans-and-text-messaging/

Piaget, J. (1952). *The origins of intelligence in children*. New York, NY: International Universities Press.

Piaget, J. (1962). *Play, dreams, and imitation in childhood*. New York, NY: The Norton Library.

Porayska-Pomsta, K., Frauenberger, C., Pain, H., Rajendran, G., Smith, T., Menzies, R., & ... Lemon, O. (2012). Developing technology for autism: An interdisciplinary approach. *Personal & Ubiquitous Computing, 16*(2), 117-127. doi: 10.1007/s00779-011-0384-2.

Pruitt, D. L., Luxton, D. D., & Shore, P. (2014). Additional clinical benefits of home-based telemental health treatments. *Professional psychology: Research and Practice, 45*(5), 340-346.

Qyashie, Y. R. (2015). *Telemental health is blooming*. Retrieved from https://www.behavioral.net/article/telemental-health-booming

Ramachandran, V. S., & Oberman, L. M. (2006). *Broken mirrors: A theory of autism*. Retrieved from http://cbc.ucsd.edu/pdf/brokenmirrors_asd.pdf

Reamer, F. (2006). *Navigating the new age of electronic counseling*. Retrieved from http://www.socialworktoday.com/news/eoe_0706.shtml

Riemer-Reiss, M. L. (2000). Utilizing distance technology for mental health counseling. (Cover story). *Journal of Mental Health Counseling, 22*(3), 189.

Rimland, B., & Edelson, S. M. (1995). Brief report: A pilot study of auditory integration training in autism. *Journal of Autism and Developmental Disorders*, *25*(1), 61-70. doi: 10.1007/BF02178168.

Rizzo, S. (2010, May 24). *Vietnam PTSD documentary* [Video File]. Retrieved from https://www.youtube.com/watch?v=C_2ZkvAMih8

Rizzo, A. S., Parsons, T. D., Kenny, P., & Buckwalter, G. J. (2012). *Using virtual reality for clinical assessment and intervention.* Retrieved from http://ict.usc.edu/pubs/Using%20Virtual%20Reality%20for%20Clinical%20Assessment%20and%20Intervention.pdf

Rodriquez, N. M., Thompson, R. H., Stocco, C. S., & Schlichenmeyer, K. (2013). Arranging and ordering in autism spectrum disorder: Characteristics, severity, and environmental correlates. *Journal of Intellectual and Developmental Disability, 38*(3), 242-255. doi:10.3109/13668250.2013.812192.

Rogers, S. J., & Dawson, G. (2010). *Early start Denver model for young children with autism.* New York, NY: Guilford Press.

Rommelse, N. N. J., Stigchel, S., & Sergeant, J. A. (2008). A review on eye movement studies in childhood and adolescent psychiatry. *Brain and Cognition, 68*, 391-414.

Rosenthal, J., Massie, H., & Wulff, K. (1980). A comparison of cognitive development in normal and psychotic children in the first two years of life from home movies. *Journal of Autism and Developmental Disorders, 10,* 433-444.

Roth, D., Lugrin, L. J., Galakhov, D., Hoffmann, A., Bente, G., Latoschik, E. M., & Fuhrmann, A. (2016). *Avatar realism and social interaction in virtual reality*. Retrieved from https://www.researchgate.net/publication/289952482_Avatar_Realism_and_Social_Interaction_Quality_in_Virtual_Reality

Rubin, E., Prizant, B. M., Laurent, A. C., & Wetherby, A. M. (2013). Social communication, emotional regulation, and transactional support (SCERTS). In S. Goldsteing, J. A. Naglieri (Eds.), *Interventions for autism spectrum disorders: Translating science into practice* (pp. 107-127). New York. NY: Springer Science.

Sams, M. J., Fortney, E. V., & Willenbring, S. (2006). Occupational therapy incorporating animals for children with autism: A pilot investigation. *American Journal of Occupational Therapy, 60*(3), 268-274. doi:10.5014/ajot.60.3.268.

Samur, X. S. (2016). *Comparing stage presence and virtual reality presence*. Retrieved from http://www.scielo.br/scielo.php?script=sci_arttext&pid=S2237-26602016000200242

Scarpa, A., & Reyes, M. (2011). Improving emotion regulation with CBT in young children with high functioning autism spectrum disorders: A pilot study. *Behavioural and Cognitive Psychotherapy, 39,* 495-500. doi: 10.1017/S1352465811000063.

Schendel, D., & Bhasin, T.K. (2008). Birth weight and gestational age characteristics of children with autism, including a comparison with other developmental disabilities. *Pediatrics, 121*(6), 1155-1164. doi:10.1542/peds.2007-1049.

Schmidt, C., & Schmidt, M. (2008). *Three-dimensional virtual learning environments for social skills acquisition among individuals with autism spectrum disorders*. Retrieved from https://www.researchgate.net/publication/221238503_Three-dimensional_virtual_learning_environments_for_mediating_social_skills_acquisition_among_individuals_with_autism_spectrum_disorders

Schoen, A. A. (2003). What potential does the applied behavior analysis approach have for the treatment of children and youth with autism?. *Journal of Instructional Psychology, 30*(2), 125-130.

Scozzari, S., & Gamberini, L. (2011). Virtual reality as a tool for cognitive behavioral therapy: A review. In Brahnam, S., & Jain, L.C. (Eds.). *Advanced computational intelligence paradigm in healthcare 6* (pp. 63-108). doi: 10.1007/978-3-642-17824-5.

Second Life. (2012). *Category: Lsl encryption*. Retrieved from http://wiki.secondlife.com/wiki/Category:LSL_Encryption

Severson, K. D., Aune, J. A., & Jodlowski, D. (2008). *Bruno Betterlheim, autism, and the rhetoric of scientific authority. Autism and representation* (pp. 66-77). New York, NY: Taylor and Francis.

Shaker-Naeeni, H., Govender, T., & Chowdhury, U. (2014). Cognitive behavioural therapy for anxiety in children and adolescents with autism spectrum disorder. *British Journal of Medical Practitioners, 7*(3), 7-15.

Shallcross, L. (2011). *Finding technology's role in the counseling relationship*. Retrieved from http://ct.counseling.org/2011/10/finding-technologys-role-in-the-counseling-relationship/

Shatayermman, O. (2009). An exploratory study of the stigma associated with a diagnosis of Asperger's syndrome: The mental health impact on the adolescents and young adults diagnosed with a disability with a social nature. *Journal of Human Behavior in the Social Environment*, *19*(3), 298-313. doi: 10.1080/10911350902790720.

Sigman, M., & Ungerer, J. (1984). Attachment behaviors in autistic children. *Journal of Autism and Developmental Disorders, 14*(3), 231-244.

Simonoff, E., Pickles, A., Charman, T., Chandler, S., Loucas, T., Baird, G. (2008). Psychiatric disorders in children with autism spectrum disorders: Prevalence, comorbidity, and associated factors in a population-derived sample. *Journal of the American Academy of Child and Adolescent Psychiatry, 47*(8), 921-929.

Skinner, B. F. (1987). *Upon further reflection*. Englewood Cliffs, NJ: Prentice-Hall.

Slater, M. (2009). Place illusion and plausibility can lead to realistic behaviour in immersive virtual environments. *Philosophical Transactions of Royal Society B: Biological Sciences, 364*(1535), 3549-3557.

Slater, M., Khanna, P., Mortensen, J., & Yu, I. (2009). Visual realism enhances realistic response in an immersive virtual environment. *IEEE Computer Graphics and Applications, 29*(3), 76-84.

Slavin, R. (2005). Educational implications of Piaget's theory. In *Educational psychology: Theory and practice* (8^{th} ed., pp. 1-640). Boston, MA: Allyn & Bacon, Inc.

Smith, S. (2017). Importance of sample size in research. Retrieved from https://sciencing.com/importance-sample-size-research-5960162.html

Solso, R., Maclin, O., & Maclin, K. (2008). *Cognitive psychology* (8^{th} ed.). Boston, MA: Allyn & Bacon, Inc.

Standen, P. J., & Brown, D. J. (2005). Virtual reality in the rehabilitation of people with intellectual disabilities: Review. *Cyberpsychology & Behavior, 8*(3), 272-282. doi:10.1089/cpb.2005.8.272.

Stendal, K., Balandin, S., & Molka-Danielsen, J. (2011). Virtual worlds: A new opportunity for people with lifelong disability?. *Journal of Intellectual & Developmental Disability, 36*(1), 80-83.

Steuer, J. S. (1992). Defining virtual reality: Dimensions determining telepresence. *Journal of Communication, 42*(4), 73-93. doi:10.1111/j.1460-2466.1992tb00812.x.

Strickland, D. (1997). Virtual reality for the treatment of autism. In G. Riva (Eds.), *Virtual reality in neuro-psycho-physiology: Cognitive, clinical and methodological issues in assessment and rehabilitation* (pp. 81-86). Amsterdam, Netherlands: IOS Press.

Strickland, D., Marcus, L., Mesibov, G., & Hogan, K. (1996). Brief report: Two case studies using virtual reality as a learning tool for autistic children. *Journal of Autism and Developmental Disorders, 26*(6), 651-659.

Sumi, S., Taniai, H., Miyachi, T., & Tanemura, M. (2006). Sibling risk of pervasive developmental disorder estimated by means of an epidemiologic survey in Nagoya, Japan. *Journal of Human Genetics, 51*, 518-522.

Sundberg, M., & Michael, J. (2001). The benefits of skinner’s analysis of verbal behavior for children with autism. *Behavior Modification, 25*(5), 698-724.

Sutherland, I. E. (1968). A head-mounted three dimensional display. *Proceedings of AFIPS, 68*, 757-764.

Swensen, H. C. (1980). Ego development and a general model for counseling and psychotherapy. *Journal of Counseling and Development, 58*(5), 382-388. doi:10.1002/j.2164-4918.1980.tb00417.x.

Tager-Flusberg, H. (2007). Evaluating the theory-of-mind hypothesis of Autism. *Association for Psychological Science, 16*(6), 311-315.

Taniai, H., Nishiyama, T., Miyahci, T., Imaeda, M., & Sumi, S. (2008). Genetic influences on the broad spectrum of autism: Study of proband-ascertained twins. *American Journal of Medical Genetics*, *174B*(6), 844-849.

Taylor, L. E., Swerdfeger, A. L., & Eslick, G. D. (2014). Vaccines are not associated with autism: An evidence-based meta-analysis of case-control and cohort studies. *Vaccine, 32*(29), 3623-3229.

The Interdisciplinary Council on Development and Learning, Inc. (2015). *DIR and the DIRfloortime approach*. Retrieved from http://www.icdl.com/DIR

The National Autistic Society. (2016, March 31). *Can you make it to the end?* [Video File]. Retrieved from https://www.youtube.com/watch?v=Lr4_dOorquQ

Trepagnier, C. Y., Sebrechts, M. M., Finkelmeyer, A., Coleman, M., Stewart, W. J., & Werner-Adler, M. (2005). Virtual environments to address autistic social deficits. *Annual Review of Cybertherapy and Telemedicine, 3*, 101-107.

Trust, M. K. (2016). *Internal objects*. Retrieved from http://www.melanie-klein-trust.org.uk/internal-objects

Tsatsanis, K. (2004). Heterogeneity in learning style in asperger syndrome and high-functioning autism. *Topics in Language Disorders, 24*(4), 260-270.

Turner, A.W., Thomas, B., & Casey, M.L. (2016). *Developing games for mental health: A primer*. Retrieved from https://www.researchgate.net/publication/301940610_Developing_Games_for_Mental_Health_A_Primer

U.S. Department of Education, National Center for Education Statistics. (2015a). *Students with disabilities*. Retrieved from http://nces.ed.gov/fastfacts/display.asp?id=64

U.S. Department of Education, National Center for Education Statistics. (2015b). *Percent of children with disabilities (idea) by disability category, ages 6 through 21*. Retrieved from https://www2.ed.gov/fund/data/report/idea/partbspap/2013/la-acc-stateprofile-11-12.pdf

Vatanoglu-Lutz, E. E., Ataman, A. D., & Biçer, *S.* (2014). Medicine in stamps: History of autism spectrum disorder (ASD) through philately. *Journal of Neurological Sciences, 31*(2), 426-434.

Vera, L., Campos, R., Herrera, G., & Romero, C. (2007). *Computer graphics applications in the education process of people with learning difficulties. Computers & Graphics, 31*(4), 649-658. doi:10.1016/j.cag.2007.03.003.

Virtual Reality Society. (2016). *Head-Mounted Displays (HMDs).* Retrieved from http://www.vrs.org.uk/virtual-reality-gear/head-mounted-displays/

Vivanti, G., Paynter, J., Duncan, E., Fothergill, H., Dissanayake, C., & Rogers, S. (2014). Effectiveness and feasibility of the early start Denver model implemented in a group-based community childcare setting. *Journal of Autism and Developmental Disorders, 44*(12), 3140-3153. doi: 10.1007/s10803-014-2168-9.

Wakefield, A. (1999). MMR vaccination and autism. *The Lance*, *35*(9182), 949-950. doi: http://dx.doi.org/10.1016/S0140-6736(05)75696-8.

Walbam, M. K. (2014). The relevance of sensory processing disorder to social work practice: An interdisciplinary approach. *Child & Adolescent Social Work Journal, 31*(1), 61-70. doi: 10.1007/s10560-013-0308-2.

Wallace, S., Parsons, S., Westbury, A., White, K., White, K., & Bailey, A. (2010). Sense of presence and atypical social judgments in immersive virtual environments: Responses of adolescents with autism spectrum disorders. *Autism: The International Journal of Research and Practice, 14*(3), 199-213.

Wang, M., & Reid, D. (2011). Virtual reality in pediatric neurorehabilitation: Attention deficit hyperactivity disorder, autism and cerebral palsy. *Neuroepidemiology, 36*(1), 2-18. doi: 10.1159/000320847.

WebMD. (2014). *Medicines for autism.* Retrieved from http://www.webmd.com/brain/autism/medications-for-autism

Wells, M., Mitchell, K. J., Finkelhor, D., & Becker-Blease, K. A. (2007). Online mental health treatment: Concerns and considerations. *CyberPsychology & Behavior, 10*(3), 453-459.

Whitelaw, B. (1982). A Piagetian perspective for the practicing counselor. *Elementary School Guidance & Counseling, 16*(3), 210-217.

Wilkinson, T., & Reinhardt, R. (2015). Technology in counselor education: HIPAA and HITECH as best practice. *The Professional Counselor, 5*(3), 407-418. doi:10.15241/tw.5.3.407.

Wilson, A.B.J., Onorati, K., Mishkind, M., Reger, M., & Gahm, G. (2008). Soldier attitudes about technology-based approaches to mental health care. *CyberPsychology & Behavior, 11*(6), 767-769. doi: 10.1089/cpb.2008.0071.

World Health Organization. (2017). *The icd-10 version 2016: Pervasive developmental disorders*. Retrieved from http://apps.who.int/classifications/icd10/browse/2016/en#/F84

Worona, S. (2003). Privacy, security, and anonymity: An evolving balance. *Educause Review, 38*(3), 62-63.

Zecavati, N., & Spence, S. J. (2009). Neurometabolic disorders and dysfunction in autism spectrum disorders. *Current Neurology and Neuroscience Reports*, *9*(2), 129-136.

Appendix A

Pilot Study: Faculty Demographic Questionnaire

Pilot Study: Faculty Demographic Questionnaire

Please respond to each of the following items:

Section I. Demographics

1. Gender:

- ❍ Male
- ❍ Female
- ❍ Transgender

2. Age:
[Drop down tab for every year starting at 20 years old through 76 years old or over]

3. Ethnicity:
- ❍ White/Caucasian
- ❍ Black/African American
- ❍ Hispanic/Latino
- ❍ Asian/Pacific Islander
- ❍ American Indian or Alaskan Native
- ❍ Other (U.S. Citizen) (please specify):___________
- ❍ Non U.S. Citizen (please specify):____________

4. Doctoral Degree: ____________________

5. Years of experience or knowledge with children diagnosed with Autism:
[Drop down tab starting at 0 years of experience through 16 years or over]

Section II. General Use of Technology

6. Types of technology you use to in your daily life (select all that may apply):
- ❑ Smart phones
- ❑ Smart tablets
- ❑ Desktop computers
- ❑ Laptop computers
- ❑ Television
- ❑ Smart television
- ❑ 3-D Movies
- ❑ Other (please specify): ____________________

7. Types of computer software programs you use in your daily life (select all that may apply):

- ❑ Word
- ❑ Excel
- ❑ PowerPoint
- ❑ Photoshop
- ❑ Videoconferencing (e.g., Skype, Google Hangouts, etc.)
- ❑ Internet
- ❑ Electronic mail
- ❑ Online chat
- ❑ Twitter
- ❑ Facebook
- ❑ Educational software (please specify):________________
- ❑ Other (please specify):____________________

8. Years of experience using technology in your daily life:
[Drop down tab starting at 0 years of experience through 20 years or over]

9. Hours you spend using technology (e.g., smart phones, smart tablets, etc.) in a typical day (estimate as closely as possible):

- ❍ 0 hours
- ❍ Less than 1 hour
- ❍ 1 to 2 hours
- ❍ 3 to 4 hours
- ❍ 5 to 6 hours
- ❍ 7 to 8 hours
- ❍ 9 to 10 hours
- ❍ More than 10 hours

10. Years of experience playing online games:
[Drop down tab starting at 0 years of experience through 20 years or over]

11. Number of times that you have used interactive virtual reality technology (e.g., Second Life):

- ❍ Never
- ❍ 1 time
- ❍ 2-4 times
- ❍ 5-7 times
- ❍ 8 or more times

Appendix B

Pilot Study: Student Demographic Questionnaire

Pilot Study: Student Demographic Questionnaire

Please respond to each of the following items:

Section I. Demographics

1. Gender:
- ❍ Male
- ❍ Female
- ❍ Transgender

2. Age:
[Drop down tab for every year starting at 20 years old through 76 years old or over]

3. Ethnicity:
- ❍ White/Caucasian
- ❍ Black/African American
- ❍ Hispanic/Latino
- ❍ Asian/Pacific Islander
- ❍ American Indian or Alaskan Native
- ❍ Other (U.S. Citizen) (please specify):____________
- ❍ Non U.S. Citizen (please specify):____________

4. Degree working towards:
- ❍ Master's degree
- ❍ Doctorate degree

5. Degree emphasis area: ___________________________

6. Years of experience or knowledge with children diagnosed with Autism:
[Drop down tab starting at 0 years of experience through 16 years or over]

Section II. General Use of Technology

7. Types of technology you use to in your daily life (select all that may apply):
- ❑ Smart phones
- ❑ Smart tablets
- ❑ Desktop computers
- ❑ Laptop computers
- ❑ Television
- ❑ Smart television
- ❑ 3-D Movies
- ❑ Other (please specify): _____________________

8. Types of computer software programs you use in your daily life (select all that may apply):
- ❑ Word
- ❑ Excel
- ❑ PowerPoint
- ❑ Photoshop
- ❑ Videoconferencing (e.g., Skype, Google Hangouts, etc.)
- ❑ Internet
- ❑ Electronic mail
- ❑ Online chat
- ❑ Twitter
- ❑ Facebook
- ❑ Educational software (please specify):________________
- ❑ Other (please specify):____________________

9. Years of experience using technology in your daily life:
[Drop down tab starting at 0 years of experience through 20 years or over]

10. Hours you spend using technology (e.g., smart phones, smart tablets, etc.) in a typical day (estimate as closely as possible):
- ❍ 0 hours
- ❍ Less than 1 hour
- ❍ 1 to 2 hours
- ❍ 3 to 4 hours
- ❍ 5 to 6 hours
- ❍ 7 to 8 hours
- ❍ 9 to 10 hours
- ❍ More than 10 hours

11. Years of experience playing online games:
[Drop down tab starting at 0 years of experience through 20 years or over]

12. Number of times that you have used interactive virtual reality technology (e.g., Second Life):

- ❍ Never
- ❍ 1 time
- ❍ 2-4 times
- ❍ 5-7 times
- ❍ 8 or more times

Appendix C

Pilot Study: Virtual Reality Therapy Environment Questionnaire (VRTEQ)

Pilot Study: Virtual Reality Therapy Environment Questionnaire (VRTEQ)

Based on your memory of watching the real life online video and the virtual reality therapy environment, please rate your responses to the following items:

1. Overall, to what extent did the virtual reality environment resemble the real life film video?
- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

2. To what extent did the sensory overload conditions of the shopping mall in the virtual reality environment resemble the shopping mall in the real life film?
- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

3. To what extent did the sensory overload condition of the photo booth kiosk with the constant flashing in the virtual reality environment resemble the photo booth kiosk in the real life film?
- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

4. To what extent did the sensory overload condition of the sound of coins dropping on the floor in the virtual reality environment resemble the coins dropping on the floor in the real life film?
- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

5. To what extent did the sensory overload condition of a person drinking a beverage in the virtual reality environment resemble the person drinking a beverage in the real life film?
- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

6. To what extent did the sensory overload condition of the balloons in the virtual reality environment resemble the balloons in the real life film?

- 1 Not at all
- 2
- 3
- 4
- 5
- 6
- 7 Very much

7. To what extent did the sensory overload condition of the televisions playing resemble the televisions in the real life film?

- 1 Not at all
- 2
- 3
- 4
- 5
- 6
- 7 Very much

8. To what extent did the sensory overload condition of the sound of the alarm system in the virtual reality environment resemble the sound of the alarm in the real life film?

- 1 Not at all
- 2
- 3
- 4
- 5
- 6
- 7 Very much

9. To what extent did the sensory overload condition of the sound of bucket and water splashing in the virtual reality environment resemble the sound of bucket and water splashing in the real life film?

- 1 Not at all
- 2
- 3
- 4
- 5
- 6
- 7 Very much

10. Overall, to what extent did the people in the virtual reality environment resemble the people in the real life film?

- 1 Not at all
- 2
- 3
- 4
- 5
- 6
- 7 Very much

11. Overall, to what extent was the virtual reality environment as engaging as the real life film:
- 1 Not at all
- 2
- 3
- 4
- 5
- 6
- 7 Very much

12. To what extent do you believe that the virtual reality environment could be used in therapy with children diagnosed with Autism?
- 1 Not likely
- 2
- 3
- 4
- 5
- 6
- 7 Very likely

13. Please provide comments or feedback you have regarding the virtual reality therapy environment video:

Appendix D

Pilot Study: IRB Approval Letter

Pilot Study: IRB Approval Letter

University Committee for the Protection of Human Subjects in Research University of New Orleans

Campus Correspondence

Principal Investigator: Roxane L. Dufrene

Co-Investigators: Panagiotis Markopoulos

Date: June, 02 2016

Protocol Title: "Comparison of the National Autistic Society Real Life Film to the Virtual Reality Therapy Environment Video"

IRB#: 01Jun16

The IRB has deemed that the research and procedures described in this protocol application are exempt from federal regulations under 45 CFR 46.101category 2, due to the fact that data will be collected anonymously.

Exempt protocols do not have an expiration date; however, if there are any changes made to this protocol that may cause it to be no longer exempt from CFR 46, the IRB requires another standard application from the investigator(s) which should provide the same information that is in this application with changes that may have changed the exempt status.

If an adverse, unforeseen event occurs (e.g., physical, social, or emotional harm), you are required to inform the IRB as soon as possible after the event.

Best wishes on your project.
Sincerely,

Robert D. Laird, Ph.D., Chair
UNO Committee for the Protection of Human Subjects in Research

Appendix E

Pilot Study: Faculty Informed Consent

Pilot Study: Faculty Informed Consent

Dear Faculty,

I hope this email finds you well. My name is Panagiotis Markopoulos, a doctoral student in the Counselor Education Program in the Department of Educational Leadership, Counseling and Foundations. I am collecting data for my pilot study entitled "Comparison of The National Autistic Society Real Life Film to the Virtual Reality Therapy Environment Video." The purpose of my pilot study is to assess perceptions of faculty and graduate students of a real life film and its resemblance to a virtual reality therapy environment. This pilot study has been approved by the University of New Orleans' Institutional Review Board.

I am requesting your expertise, which will take approximately 13 minutes where you will first watch two short videos: The National Autistic Society real life film, entitled "Can You Make It To The End?" of a child diagnosed with Autism and a video entitled "Virtual Reality Therapy Environment (VRTE)" of a child (avatar) diagnosed with Autism (Markopoulos, 2016). Then, you will complete two short questionnaires: *Demographic Questionnaire* and *Virtual Reality Therapy Environment Questionnaire (VRTEQ)*.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. The results of the pilot study may be published, but your name will not be used. All data obtained will only be reported in an aggregate format. Participating is thought to have no known risks. There are no direct benefits to participants, however this pilot study may be beneficial to those who provide therapy services and interventions to children diagnosed with Autism. I have read and understand the consent form and desire of my own free will to participate in this study. By clicking on the link below or copying and pasting the link in my browser, I agree to participate

http://neworleans.co1.qualtrics.com/SE/?SID=SV_bls0qtXv9JqehEx

Thank you in advance for your willingness to participate. Please direct any questions or concerns about this pilot study to the co-investigator, Panagiotis Markopoulos (pmarkopo@uno.edu, 504-430-2103); the principal investigator and faculty adviser, Dr. Roxane L. Dufrene (rdufren1@uno.edu, 504-280-7434); or Dr. Ann O'Hanlon, member of the Human Subjects Research Institutional Review Board at the University of New Orleans (aohanlon@uno.edu, 504-280-7390 & 504-280-3990).

Thank you in advance for your assistance.

Sincerely,

Panagiotis Markopoulos, M.A., PLPC
Counselor Education Doctoral Student
Counselor Education Program, University of New Orleans

Appendix F

Pilot Study: Email to Faculty and Student Informed Consent

Pilot Study: Email to Faculty and Student Informed Consent

Dear Faculty,

I hope this email finds you well. My name is Panagiotis Markopoulos, a doctoral student in the Counselor Education Program in the Department of Educational Leadership, Counseling and Foundations. I am in the process of collecting data for a pilot study entitled "Comparison of The National Autistic Society Real Life Film to the Virtual Reality Therapy Environment Video."

I would appreciate your support in disseminating the following email to your graduate students enrolled in your summer classes.

Dear Student,

I am a doctoral student in the Counselor Education Program in the Department of Educational Leadership, Counseling and Foundations. I am collecting data for my pilot study entitled "Comparison of The National Autistic Society Real Life Film to the Virtual Reality Therapy Environment Video". The purpose of my pilot study is to assess perceptions of faculty and graduate students of a real life film and its resemblance to a virtual reality therapy environment. This pilot study has been approved by the University of New Orleans' Institutional Review Board.

I am requesting your participation, which will take approximately 13 minutes where you will first watch two short videos: The National Autistic Society real life film, entitled "Can You Make It To The End?" of a child diagnosed with Autism and a video entitled "Virtual Reality Therapy Environment (VRTE)" of a child (avatar) diagnosed with Autism (Markopoulos, 2016). Then, you will complete two short questionnaires: *Demographic Questionnaire* and *Virtual Reality Therapy Environment Questionnaire (VRTEQ)*.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty and it will not affect your grade. The results of the pilot study may be published, but your name will not be used. All data obtained from participants will only be reported in an aggregate format. Participating in this pilot study is thought to have no risks to participants. There are no direct benefits to participants, however this pilot study may be beneficial to those who provide therapy services and interventions to children diagnosed with Autism. To be eligible to participate, participants need to identify as graduate students (master's or doctoral). I have read and understand the consent form and desire of my own free will to participate in this study. By clicking on the link below or copying and pasting the link in my browser, I agree to participate

http://neworleans.co1.qualtrics.com/SE/?SID=SV_e4CdCMSFluKMOCp

Thank you in advance for your willingness to participate. Please direct any questions or concerns about this pilot study to the co-investigator, Panagiotis Markopoulos (pmarkopo@uno.edu, 504-430-2103); the principal investigator and faculty adviser, Dr. Roxane L. Dufrene (rdufren1@uno.edu, 504-280-7434); or Dr. Ann O'Hanlon, member of the Human Subjects Research Institutional Review Board at the University of New Orleans (aohanlon@uno.edu, 504-280-7390 & 504-280-3990).

Sincerely,
Panagiotis Markopoulos, M.A., PLPC
Counselor Education Doctoral Student
Counselor Education Program, University of New Orleans

Appendix G

Pilot Study: Student Demographic Questionnaire-Revised

Pilot Study: Student Demographic Questionnaire-Revised

Please respond to each of the following items by placing a check mark (X):

Section I. Demographics

1. Gender:
- ❍ Male
- ❍ Female
- ❍ Transgender

2. Age: _________

3. Ethnicity:
- ❍ White/Caucasian
- ❍ Black/African American
- ❍ Hispanic/Latino
- ❍ Asian/Pacific Islander
- ❍ American Indian or Alaskan Native

Section II. General Use of Technology

4. Types of technology you use to in your daily life (select all that may apply):
- ❑ Smart phones
- ❑ Smart tablets
- ❑ Desktop computers
- ❑ Laptop computers
- ❑ Television
- ❑ Smart television
- ❑ 3-D Movies
- ❑ Other (please specify): ____________________

5. Types of computer software programs you use in your daily life (select all that may apply):
- ❑ Word
- ❑ Excel
- ❑ PowerPoint
- ❑ Photoshop
- ❑ Videoconferencing (e.g., Skype, Google Hangouts, etc.)
- ❑ Internet
- ❑ Electronic mail
- ❑ Online chat
- ❑ Twitter
- ❑ Facebook
- ❑ Educational software (please specify):________________
- ❑ Other (please specify):____________________

6. Years of experience using technology in your daily life [from 0 years through 20 years]:____

7. Hours you spend using technology (e.g., smart phones, smart tablets, etc.) in a typical day (estimate as closely as possible):

- ❍ 0 hours
- ❍ Less than 1 hour
- ❍ 1 to 2 hours
- ❍ 3 to 4 hours
- ❍ 5 to 6 hours
- ❍ 7 to 8 hours
- ❍ 9 to 10 hours
- ❍ More than 10 hours

8. Years of experience playing online games [from 0 years through 20 years]: _______________

9. Number of times that you have used interactive virtual reality technology (e.g., Second Life):

- ❍ Never
- ❍ 1 time
- ❍ 2-4 times
- ❍ 5-7 times
- ❍ 8 or more times

Appendix H

Pilot Study: Virtual Reality Environment Questionnaire-Revised (VREQ-R)

Pilot Study: Virtual Reality Environment Questionnaire-Revised (VREQ-R)

Based on your memory of watching the two films, please rate each item using the 1 to 7 scale of the *similarity* of the virtual reality environment to the real life online video:

1. Overall, to what extent was the virtual reality environment similar to the real life film video?

❍ 1 Not at all
❍ 2
❍ 3
❍ 4
❍ 5
❍ 6
❍ 7 Very much

2. To what extent was the *shopping mall entrance door opening* in the virtual reality environment similar to the shopping mall entrance door in the real life film?

❍ 1 Not at all
❍ 2
❍ 3
❍ 4
❍ 5
❍ 6
❍ 7 Very much

3. To what extent was the *riding mechanical dog* in the virtual reality environment similar to the riding mechanical dog in the real life film?

❍ 1 Not at all
❍ 2
❍ 3
❍ 4
❍ 5
❍ 6
❍ 7 Very much

4. To what extent was the *photo booth kiosk with the constant flashing* in the virtual reality environment similar to the photo booth kiosk in the real life film?

❍ 1 Not at all
❍ 2
❍ 3
❍ 4
❍ 5
❍ 6
❍ 7 Very much

5. To what extent was the *ATM machine and the sound of the coins dropping on the floor* in the virtual reality environment similar to the ATM machine and coins in the real life film?
- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

6. To what extent was the *person drinking a beverage* in the virtual reality environment similar to the person drinking a beverage in the real life film?
- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

7. To what extent was the *balloons popping* in the virtual reality environment similar to the balloons in the real life film?
- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

8. To what extent was the *televisions playing* similar to the televisions playing in the real life film?
- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

9. To what extent was the *bucket dumping and water splashing in* the virtual reality environment similar to the bucket dumping and water splashing in the real life film?
- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

10. To what extent was the *sound of the alarm system* in the virtual reality environment similar to the sound of the alarm in the real life film?

- 1 Not at all
- 2
- 3
- 4
- 5
- 6
- 7 Very much

11. Please provide comments or feedback you have regarding the virtual reality environment video:

Appendix I

Pilot Study: Student Verbal Informed Consent

Pilot Study: Student Verbal Informed Consent

Dear Student,

I am a doctoral student in the Counselor Education Program in the Department of Educational Leadership, Counseling and Foundations. I am collecting data for my pilot study entitled "Comparison of The National Autistic Society Real Life Film to the Virtual Reality Environment Video." The purpose of my pilot study is to assess undergraduate perceptions of a real life film and its similarity to a virtual reality environment. This pilot study has been approved by the University of New Orleans' Institutional Review Board.

I am requesting your participation, which will take approximately 13 minutes where you will watch two short videos entitled "Can You Make It To The End?" and "Virtual Reality Environment (VRE)." After you have watched the two videos, you will complete two short questionnaires: *Demographic Questionnaire-Revised* and *Virtual Reality Environment Questionnaire (VREQ)-Revised*. Completing the two questionnaires is your consent to participate. DO NOT write your name on the survey. The answers you give will be kept confidential.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty and it will not affect your grade. The results of the pilot study may be published, but your name will not be used. All data obtained from participants will only be reported in an aggregate format. Participating in this pilot study is thought to have no risks to participants. There are no direct benefits to participants. To be eligible to participate, participants need to identify as undergraduate students.

Thank you in advance for your willingness to participate. Please direct any questions or concerns about this pilot study to the co-investigator, Panagiotis Markopoulos (pmarkopo@uno.edu, 504-430-2103); the principal investigator and faculty adviser, Dr. Roxane L. Dufrene (rdufren1@uno.edu, 504-280-7434); or Dr. Ann O'Hanlon, member of the Human Subjects Research Institutional Review Board at the University of New Orleans (aohanlon@uno.edu, 504-280-7390 & 504-280-3990).

Sincerely,
Panagiotis Markopoulos, M.A., PLPC
Counselor Education Doctoral Student
Counselor Education Program, University of New Orleans

Appendix J

Demographic Questionnaire

Demographic Questionnaire

Please respond to each of the following items:

Section I. Demographics

1. Gender:
- ❍ Male
- ❍ Female
- ❍ Transgender

2. Age:
[Drop down tab for every year starting at 20 years old through 76 years old or over]

3. Ethnicity:
- ❍ White/Caucasian
- ❍ Black/African American
- ❍ Hispanic/Latino
- ❍ Asian/Pacific Islander
- ❍ American Indian or Alaskan Native
- ❍ Other:________________

4. Degree:
- ❍ Master's:____________________
- ❍ Doctorate: __________________
- ❍ Medical: __________________

5. Professional licensure (please select all that may apply):
- ❑ Provisional Licensed Professional Counselor (PLPC)
- ❑ Licensed Professional Counselor (LPC)
- ❑ Licensed Psychologist
- ❑ Psychiatric Doctor (M.D.)
- ❑ Licensed Clinical Social Worker (LCSW)
- ❑ Licensed Clinical Social Worker-BACS (LCSW-BACS)
- ❑ Licensed Master Social Worker (LMSW)
- ❑ Registered Social Worker (RSW)
- ❑ Licensed Applied Behavior Analyst (ABA)
- ❑ Other (please specify):____________________

6. Credentials – if applicable (please select all that may apply):
- ❑ National Certified Counselor (NCC)
- ❑ Certified Clinical Mental Health Counselor (CCMHC)
- ❑ Applied Behavior Analysis (ABA)
- ❑ Cognitive Behavioral Therapy (CBT)
- ❑ Other (please specify): _____________________

7. Work setting (please select all that may apply):
- ❑ Private Practice
- ❑ School
- ❑ Mental Health Agency
- ❑ Hospital
- ❑ Other (please specify): _____________________

8. Years of experience and/or knowledge working with children diagnosed with Autism:
[Drop down tab starting at 0 years of experience through 16 years or over]

Section II. Use of Technology

9. Years of experience using technology (e.g., smart tablets, smart phones, computer based educational software, etc.) in therapy with children diagnosed with Autism (for practitioners):
[Drop down tab starting at 0 years of experience through 15 years or over]

10. Years of experience using technology in your daily life:
[Drop down tab starting at 0 years of experience through 20 years or over]

11. Hours you spend using technology (e.g., smart phones, smart tablets, etc.) in a typical day (estimate as closely as possible):
- 0 hours
- Less than 1 hour
- 1 to 2 hours
- 3 to 4 hours
- 5 to 6 hours
- 7 to 8 hours
- 9 to 10 hours
- More than 10 hours

12. Years of experience playing online games:
[Drop down tab starting at 0 years of experience through 20 years or over]

13. Number of times that you have used interactive virtual reality technology (e.g., Second Life):
- Never
- 1 time
- 2-4 times
- 5-7 times
- 8 or more times

Appendix K

Temple Presence Inventory (TPI)

Temple Presence Inventory (TPI)
Lombard, Weinstein, & Ditton (2011)

Please select the responses that best represent your answers to the following questions as they relate to your virtual reality environment experience as a therapist avatar. There are no right or wrong answers; please simply give your first impressions and answer all of the questions as accurately as possible.

Throughout the questions, the phrases "the environment you saw/heard" and "objects, events, or people you saw/heard" refer to the things or people that were presented in the virtual reality therapy environment, not your immediate physical surroundings (i.e., the actual room you were in during the virtual reality experience).

I. SPATIAL PRESENCE

1. How much did it seem as if the objects and people you saw/heard had come to the place you were?
- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

2. How much did it seem as if you could reach out and touch the objects or people you saw/heard?
- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

3. How often when an object seemed to be headed toward you did you want to move to get out of its way?
- ❍ 1 Never
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Always

4. To what extent did you experience a sense of being there inside the environment you saw/heard?
- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

5. To what extent did it seem that sounds came from specific different locations?
- 1 Not at all
- 2
- 3
- 4
- 5
- 6
- 7 Very much

6. How often did you want to or try to touch something you saw/heard?
- 1 Never
- 2
- 3
- 4
- 5
- 6
- 7 Always

7. Did the experience seem more like looking at the events/people on a computer screen or more like looking at the events/people through a window?
- 1 Like a computer screen
- 2
- 3
- 4
- 5
- 6
- 7 Like a window

II. SOCIAL PRESENCE – ACTOR W/I MEDIUM (PARASOCIAL INTERACTION)

8. How often did you have the sensation that people you saw/heard could also see/hear you?
- 1 Never
- 2
- 3
- 4
- 5
- 6
- 7 Always

9. To what extent did you feel you could interact with the person or people you saw/heard?
- 1 None
- 2
- 3
- 4
- 5
- 6
- 7 Very much

10. How much did it seem as if you and the people you saw/heard both left the places where you were and went to a new place?

- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

11. How much did it seem as if you and the people you saw/heard were together in the same place?

- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

12. How often did it feel as if someone you saw/heard in the environment was talking directly to you?

- ❍ 1 Never
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Always

13. How often did you want to or did you make eye-contact with someone you saw/heard?

- ❍ 1 Never
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Always

14. Seeing and hearing a person through a medium constitutes an interaction with him or her. How much control over the interaction with the person or people you saw/heard did you feel you had?

- ❍ 1 None
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

III. ENGAGEMENT (MENTAL IMMERSION)

15. To what extent did you feel mentally immersed in the experience?
- 1 Not at all
- 2
- 3
- 4
- 5
- 6
- 7 Very much

16. How involving was the experience?
- 1 Not at all
- 2
- 3
- 4
- 5
- 6
- 7 Very much

17. How completely were your senses engaged?
- 1 Not at all
- 2
- 3
- 4
- 5
- 6
- 7 Very much

18. To what extent did you experience a sensation of reality?
- 1 Not at all
- 2
- 3
- 4
- 5
- 6
- 7 Very much

19. How relaxing or exciting was the experience?
- 1 Very relaxing
- 2
- 3
- 4
- 5
- 6
- 7 Very exciting

20. How engaging was the scenario?
- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

V. SOCIAL REALISM

21. The events I saw/heard <u>would</u> occur in the real world:
- ❍ 1 Strongly disagree
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Strongly agree

22. The events I saw/heard <u>could</u> occur in the real world:
- ❍ 1 Strongly disagree
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Strongly agree

23. The way in which the events I saw/heard occurred is a lot like the way they occur in the real world:
- ❍ 1 Strongly disagree
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Strongly agree

EVALUATION OF YOUR OVERALL EQUIPMENT EXPERIENCE

24. Please rate the degree to which you experienced each of the following during your overall experience you just had using the technology equipment, by selecting the appropriate response:

Increased salivation	Absent	Slight	Moderate	Severe
Sweating	Absent	Slight	Moderate	Severe
Nausea	Absent	Slight	Moderate	Severe
Difficulty concentrating	Absent	Slight	Moderate	Severe
Stomach awareness	Absent	Slight	Moderate	Severe
Fatigue	Absent	Slight	Moderate	Severe
Headache	Absent	Slight	Moderate	Severe
Eyestrain	Absent	Slight	Moderate	Severe
Difficulty focusing	Absent	Slight	Moderate	Severe
Blurred vision	Absent	Slight	Moderate	Severe
Fullness of head	Absent	Slight	Moderate	Severe
Dizzy (while your eyes were open)	Absent	Slight	Moderate	Severe
Dizzy (while your eyes were closed)	Absent	Slight	Moderate	Severe

Vertigo (sensation of loss of balance)	Absent	Slight	Moderate	Severe
General discomfort	Absent	Slight	Moderate	Severe
Stress or tension	Absent	Slight	Moderate	Severe
Adrenaline rush	Absent	Slight	Moderate	Severe

25. How comfortable were you with your viewing position?
- ❍ 1 Not at all
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very much

26. How likely after your exposure to the virtual reality therapy environment, would you see this technology being used in therapy with children diagnosed with Autism?
- ❍ 1 Not likely
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7 Very likely

27. What parts of the technology, if any, you found most challenging? (please select all that may apply):
- ❑ Virtual Reality Therapy Environment (VRTE)
- ❑ Oculus Rift HMD
- ❑ Xbox One Controller
- ❑ Other (please specify): ____________________
- ❑ Non-applicable

28. What age group would you use this technology with?
[Drop down tab starting at 3 years old through 20 years or over]

29. Briefly describe any reasons, if any, of the challenges inherent of the use of the virtual reality therapy environment with children diagnosed with Autism:

30. Please provide comments or feedback regarding your experience with the virtual reality therapy environment:

Appendix L

Authors' Permission to Use the Temple Presence Inventory (TPI)

Authors' Permission to Use the Temple Presence Inventory (TPI)
(http://matthewlombard.com/research/p2_ab.html)

Matthew Lombard

Research

Teaching | Research | Curriculum Vitae | Personal | Contact

Measuring presence: The Temple Presence Inventory (TPI)

Matthew Lombard, Theresa B. Ditton and Lisa Weinstein

The Temple Presence Inventory (TPI) is a set of questionnaire items that can be used to measure dimensions of (tele)presence.

The TPI:

- Contains items culled from a comprehensive literature review of presence theory and research
- Has been developed and validated using traditional psychological measurement procedures
- Is appropriate for use with most media and media content
- Measures diverse presence dimensions including several types of social presence
- Is free

Researchers can use the entire inventory, sets of items for specific dimensions, and/or individual items as deemed useful and appropriate for a specific study. Items can also be modified as needed. All that we ask is that you help refine the instrument by reporting on your experience using all or part of the TPI. Please direct reports of use and/or questions to Matthew Lombard at lombard@temple.edu.

Appendix M

IRB Approval Letter

IRB Approval Letter

University Committee for the Protection
of Human Subjects in Research
University of New Orleans

Campus Correspondence

Principal Investigator: Roxane Dufrene

Co-Investigator: Panagiotis Markopoulos

Date: January 3, 2017

Protocol Title: Mental Health Practitioners' Perceptions of the Delivery Method of a Virtual Reality Therapy Environment for Use for Children Diagnosed with Autism

IRB#: 06Dec16

The IRB has deemed that the research and procedures are compliant with the University of New Orleans and federal guidelines. The above referenced human subjects protocol has been reviewed and approved using expedited procedures (under 45 CFR 46.116(a) category (7).

Approval is only valid for one year from the approval date. Any changes to the procedures or protocols must be reviewed and approved by the IRB prior to implementation. Use the IRB number listed on this letter in all future correspondence regarding this proposal.

If an adverse, unforeseen event occurs (e.g., physical, social, or emotional harm), you are required to inform the IRB as soon as possible after the event.

Best wishes on your project!

Sincerely,

Robert D. Laird, Ph.D., Chair
UNO Committee for the Protection of Human Subjects in Research

Appendix N
Invitation to Practitioners

Main Study: Invitation to Practitioners

Dear Practitioner,

I am a doctoral student in the Counselor Education Program in the Department of Educational Leadership, Counseling and Foundations, pursuing my doctoral degree.

I would like to seek your help in collecting data for my experimental research study. The purpose of my research is to assess mental health practitioners' perceptions of a virtual reality therapy environment (VRTE) developed by me, the researcher, and its possible use with children diagnosed with Autism. This study has been approved by the University of New Orleans' Institutional Review Board (IRB#:06Dec16).

Because of the nature of this study, I am seeking 45-minutes to an hour of your time for me to visit your clinical setting environment and introduce you this new research approach. The inclusionary criteria for this study is that the participants be 1) licensed in a mental health field (i.e., provisional licensed professional counselor (PLPC), licensed professional counselor (LPC), licensed clinical, child or school psychologist, psychiatric doctor of medicine (M.D.), licensed clinical social worker (LCSW), and licensed applied behavior analyst (ABA)), 2) experience and/or knowledge in providing therapy to children diagnosed with Autism.

If you choose to participate in this study, you will be asked to experience a virtual reality therapy environment (VRTE) which includes two phases; The first phase includes participating in approximately 5 minutes of a Second Life virtual reality experience via the use of a laptop computer which I, the researcher, will supply. The second phase includes approximately 5 minutes of a virtual experience to Second Life virtual reality platform using the 2016 Oculus Rift head-mounted display which I, the researcher, will supply. The overall virtual reality therapy environment is anticipated to take no more than 15 minutes to complete. After the completion of the above two phases, you will be asked to complete the *Demographic Questionnaire* followed by the *Temple Presence Inventory* (*TPI*) which ask you questions based on what you have experienced in the virtual reality therapy environment. Both the questionnaire and instrument are online, anonymous, and are estimated to take no more than 15 minutes to complete. The results of the research study may be published but your name will remain confidential. All data obtained from participants will only be reported in an aggregate format.

In advance, I appreciate your willingness to support my research project. If you have any questions you can contact me by email at pmarkopo@uno.edu or by phone at (504) 430-2103. For additional information you may also contact my dissertation chair, Dr. Roxane L. Dufrene by email at rdufren1@uno.edu or by phone at (504) 280-7434.

Sincerely,
Panagiotis Markopoulos, M.A., PLPC
Counselor Education Doctoral Student
Counselor Education Program, University of New Orleans

Appendix O

Informed Consent

Informed Consent

Informed Consent
In accordance with the Office of Human Subjects Research at the University of New Orleans and the 2014 American Counseling Association *Code of Ethics* (Section G), the following information provides you, the potential participant, with an explanation of the purpose of my research study entitled "Mental Health Practitioners Perceptions' of the Delivery Method of a Virtual Reality Therapy Environment for Use for Children Diagnosed with Autism."

Introduction/Purpose
I am a doctoral student in the Counselor Education and Supervision program at the University of New Orleans, Department of Educational Leadership, Counseling and Foundations. I am conducting my dissertation research under the direction of my dissertation chairperson, Dr. Roxane L. Dufrene. My experimental research will provide important information about mental health practitioners' perceptions of a virtual reality therapy simulation environment developed by me, the researcher, and its possible use with children diagnosed with Autism. To be eligible to participate in this study, participants need to identify themselves as (1) a licensed in a mental health field (i.e., provisional licensed professional counselor, PLPC; licensed professional counselor, LPC; licensed clinical, child or school psychologist; psychiatric doctor of medicine, MD; licensed clinical social worker, LCSW; or licensed applied behavior analyst, ABA), and (2) experience and/or knowledge in providing therapy to children diagnosed with Autism.

Procedures
If you choose to participate in this study, you will be asked to participate in a virtual reality therapy environment (VRTE) which includes two phases; The first phase includes participating in approximately 5 minutes of a Second Life virtual reality environment via the use of a laptop computer which the researcher will supply. The second phase includes approximately 5 minutes of a virtual environment to Second Life virtual reality platform using the 2016 Oculus Rift head-mounted display which the researcher will supply. The instructions below are to assist you in becoming familiar with the Xbox One Controller and Oculus Rift that you will use during your participation in a VRTE simulation. The VRTE was designed to simulate the worldview of a child with Autism. During the simulation, you as a *therapist avatar* will assist a child avatar who has Autism walk through a mall. You, as the avatar therapist, will move through the VRTE twice. Once using the Xbox One Controller and once using the Xbox One Controller with the Oculus Rift head-mounted display. After the completion of the two above phases, you will be asked to complete the *Demographic Questionnaire* followed by the *Temple Presence Inventory* (*TPI*) which ask you questions based on what you have experienced in the VRTE. Both the questionnaire and instrument are online, anonymous, and are estimated to take no more than 15 minutes to complete. The results of the research study may be published but your name will remain confidential. All data obtained from participants will only be reported in an aggregate format.

Xbox One Controller. The Controller will enable *you*, as the avatar therapist, to manipulate your avatar to walk through the VRTE, which is depicted as a mall. You will be asked to use the Controller to move through 9 sequential checkpoints depicted by numbers within the VRTE. The controller will be used for both of your VRTE simulation experiences.

Left stick: Moves your therapist avatar forward or backward and left or right.

Right stick: Changes camera pitch and rotation around the vertical axis.

Oculus Rift. The Rift will allow you as the avatar therapist a 360^0 viewing angle. You will use the Rift during one of the two simulations you will complete.

The researcher will place the Oculus Rift on your head and adjust it for your visual fit.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty.

Risks/Discomforts
Participating in this experimental study is thought to have minimal risks which could include headaches, dizziness, and/or eyestrain.

Benefits
This study may be beneficial to those who provide social skills therapy treatment and interventions to children diagnosed with Autism. Assessing mental health practitioners' perceptions regarding this new technology as a therapy intervention when working with children diagnosed with Autism, could provide a new approach to therapy with children in the Autism spectrum.

Confidentiality
All data obtained from participants will be kept confidential and will only be reported in aggregate format (by reporting only combined results and never reporting individual participant results). No one other than the primary investigator or co-investigator listed below will have access to the data. The data collected will be stored in the HIPPA-compliant, Qualtrics-secure database for at least three years after completion of the research.

Questions about the Research
Please direct any questions or concerns about this study to the co-investigator, Panagiotis Markopoulos (pmarkopo@uno.edu); the principal investigator and faculty adviser, Dr. Roxane L. Dufrene (rdufren1@uno.edu); or Dr. Ann O'Hanlon, member of the Office of Human Subjects Research Committee at the University of New Orleans (aohanlon@uno.edu, 504-280-7390 & 504-280-3990).

I have read and understood the above consent form and desire of my own free will to participate in this study (please place a check mark below):

- ❍ Yes
- ❍ No

Thank you,
Panagiotis Markopoulos, M.A., PLPC
Doctoral student at the University of New Orleans

VITA

Panagiotis Markopoulos, son of Angelos and Eleftherias Markopoulou, was born and raised in Petroupoli Attiki, Athens, Greece in 1983. In 2007, Panagiotis successfully completed his bachelor's and a master's degree with a major in social theology from the National and Capodistrian University in Greece. In 2007, Panagiotis moved to the United States where he earned a second bachelor's degree in sociology from Western Kentucky University. In 2012, he earned his master's degree from a CACREP accredited Clinical Mental Health Counseling program at Eastern Kentucky University. Panagiotis has a diverse clinical work history in hospitals and schools as well as residential, correctional, and private practice mental health settings, with both adolescent and adult populations. Panagiotis' clinical and research focus is with children, adolescents and young adults who have been diagnosed with autism spectrum disorder.