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Establishing Content and Face Validity of an Assessment to Evaluate the Attitudes, Self-efficacy, and Knowledge of Pre-professional Students Related to Assistive Technology for Children with Autism Spectrum Disorder (asd)

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ESTABLISHING CONTENT AND FACE VALIDITY OF AN ASSESSMENT TO EVALUATE THE ATTITUDES, SELF-EFFICACY, AND KNOWLEDGE OF PRE-PROFESSIONAL STUDENTS RELATED TO ASSISTIVE TECHNOLOGY FOR CHILDREN WITH ASD

by

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ABSTRACT

ESTABLISHING CONTENT AND FACE VALIDITY OF AN ASSESSMENT TO EVALUATE THE ATTITUDES, SELF-EFFICACY, AND KNOWLEDGE OF PRE-PROFESSIONAL STUDENTS RELATED TO ASSISTIVE TECHNOLOGY FOR CHILDREN WITH AUTISM SPECTRUM DISORDER (ASD)

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Under the Supervision of Professor Kris Barnekow, Ph.D.

OBJECTIVE. The purpose of the study was to create an online assessment in order to better understand the knowledge, attitudes, and self-efficacy that pre-professional students have in the fields of assistive technology and ASD and establish content and face validity for this assessment.

METHOD. 12 content experts, both professors and practitioners, within the fields of occupational therapy, physical therapy, speech language pathology, and special education, as well as experts in autism spectrum disorder and assistive technology, participated in the content validation process. A total of 16 students within these disciplines completed the assessment with pilot data gathered and provided feedback on face validity.

RESULTS. The content validity index (.939) of the final version of the assessment indicates strong content validity. Data gathered from the face validation portion of the study indicate that pre-professional students see value in participating in the assessment and would be open to completing it again. Reported pilot data suggest the majority of pre-professional students

believe their profession plays a role in providing assistive technology services to children with ASD (81.25%). The majority of participants also have demonstrated knowledge in this area, with all participants selecting the correct response for 25% of the knowledge items.

CONCLUSIONS. Results of this study support continued investigation regarding the potential use of this assessment as an outcome measure for pre-professional programs and/or federal training programs. The use of this assessment on a larger scale may guide content provided in coursework or continuing education opportunities, with the ultimate goal to increase the quality of service provision for children with ASD.

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Introduction

In this chapter, the prevalence of autism spectrum disorder (ASD), common characteristics present in children who have ASD, and assistive technology strategies used with children who have the disorder are discussed. The relevance of the Person-Environment-Occupational Performance Model, as well as Ayres' Sensory Integration Theory, in conceptualizing these different areas are addressed. The assistive technology strategies discussed are classified by separating them into the following categories: no-tech, low-tech, and high-tech. Following an overview of the categories of assistive technology, parent perceptions of assistive technology are explored to better understand their thoughts and concerns about implementation and adherence of the strategies. In addition, research regarding the role of a variety of professionals and their education related to assistive technology, ASD and the role of assistive technology in ASD are discussed. This information supports the need for the utilization of an assessment to better understand the knowledge, attitudes, and self-efficacy that incoming professionals have regarding assistive technology and ASD, both independently and combined. Finally, an overview of content and face validation is provided, along with an explanation of the importance of including these steps in the process of assessment creation.

Person-Environment-Occupational Performance (PEOP) Model

The PEOP Model was constructed by Christiansen & Baum in 1985, with revisions in 2005 and 2015, and is structured with support from the ecological systems theory (Baum, Christiansen, & Bass, 2015). Ecological systems theory was developed by Urie Bronfenbrenner in 1977 and provides a framework with which to consider the 'fit' between a person and their environment. Bronfenbrenner espouses that children exist within multiple contexts, or

ecologies, that interact with each other and influence their development (Bronfenbrenner, 1977). The PEOP model transforms the ecological systems theory into a model that supports occupational therapy practice. The PEOP model encourages professionals to consider their client's ability to participate in occupations as an interaction between intrinsic factors (physiological, cognitive, spiritual, neurobehavioral, psychological) as well as environmental factors (social support, social and economic systems, culture and values, built environment and technology, natural environment) (Brown & Dunn, 2010; Zingerevich & LaVesser, 2009). Ultimately, increased fit among the person, environment, and occupation, represents more optimal occupational outcomes, or occupational performance (Christiansen, Baum, & Bass Haugen 2005).

The PEOP Model offers a top-down approach in evaluating the components of occupational performance that support, enable, or restrict individuals from participating in occupations. By utilizing a top-down approach, professionals who use the PEOP Model assess their client's function and participation in relation to their daily occupations and create treatment plans based on the client's ability to participate in those occupations. This model is useful to implement when working with children with ASD due to its ability to focus on the needs of a child and their support system, while also examining the aspects of the child, support system, and environment that lead to occupational performance deficits. In order to use this model, however, there must be a deep understanding of the characteristics of the person, their environment, and their desired occupations (Baum et al., 2015). First, characteristics of the person will be considered. In this case, the focus will be children with autism spectrum disorder.

Overview of ASD

ASD is a neurodevelopmental disability that typically appears during the first three years of life (Nagib & Williams, 2017). While the reported prevalence of ASD varies, Maenner et al. and Centers for Disease Control and Prevention (2020) share that 1 in 54 school-aged children in the United States have the condition. Diagnostic criteria for ASD includes the presence of (a) persistent deficits in social communication and social interaction within multiple contexts, (b) restricted and/or repetitive patterns of behaviors, interests, or activities, (c) symptoms that are present in early developmental period, (d) symptoms that cause significant impairments in areas of functioning, and disturbances that are not better explained by an intellectual disability or global developmental delay (American Psychiatric Association, 2013). Many factors impact the age of diagnosis of ASD, including race, ethnicity, socioeconomic status, and family characteristics (Valicenti et al., 2012). Bickel et al. (2015) report that earlier diagnosis is predicted by later birth order, higher parental education, fewer children in the house, and having a sibling with ASD. McCanlies et al. (2012) found that exposures to environmental toxins, such as lacquer and varnish, occurred more in parents of children with ASD as compared to parents of typically developing children. Another risk factor for the development of ASD is premature birth; Agrawal, Rao, Bulsara, and Patole (2018) discovered that the prevalence of ASD in preterm infants was significantly higher (7%) than in the general population (0.76%).

After a diagnosis of ASD, referral to early intervention services is crucial. Kogan et al. (2008) found that families with children who have ASD have trouble accessing needed services and that their overall level of satisfaction regarding services they receive is low. Previous

research suggests that children with ASD are more likely to have difficulties accessing and utilizing health care and educational services compared to children with other developmental or mental health conditions (Ahmedani & Hock, 2012; Vohra et al., 2014). Difficulties in receiving services may be related to ambivalence in seeking respite services and support groups, transportation, cost, and overwhelming feelings as related to obtaining initial ASD-related services (Roizen et al., 1996). Results of a recent study conducted by Durkin and colleagues (2017) indicate socioeconomic status (SES) also impacts the ability to receive services as ASD is more easily identified in communities with high SES and communities with increased access to related services. Early intervention services for ASD involve a variety of disciplines that focus primarily on managing behavior and improving social and communication skills to enable optimal social functioning and independence (Elder, Brasher, & Alexander (2016); Lovaas, 1987; Wetherby & Woods, 2006). However, individuals with ASD may require ongoing support in medical, educational, and vocational systems throughout the lifespan (Myers & Johnson, 2007).

ASD and Environmental Influences

Growing research is devoted to understanding how children with ASD perceive their environments. Due to sensory dysfunction, individuals with ASD perceive and interact with their worlds differently. They may be extremely sensitive to some senses and may also be unresponsive to sensations that others find unpleasant, such as extreme heat, cold, and pain (Nagib & Williams, 2017). According to Ayres' Sensory Integration Theory, these responses are due to dysfunction involving registration, modulation, discrimination, or internal organization of sensory information (Ayres, 1979; Schaaf, Benevides, Kelly, & Mailloux-Maggio, 2012).

Impairments in sensory skills can keep children from executing successful adaptive responses to situational demands and prevent them from engaging in meaningful occupations (Jasmin et al., 2009). Other areas of functioning including temperament, sleep, behaviors and emotions may also be negatively affected by sensory dysfunction (Brock et al., 2012; Reynolds et al., 2012).

When considering the environment of a child with ASD, both physical and social factors can affect a child's development and participation in occupations (Sood et al., 2014). Physical factors include density of the space, availability of resources, and physical items within the space (Evans, 2006). The physical structure of a child's home or school environment could be conducive to learning and participation if the environment is accessible but can impose barriers to participation if there is a lack of toys or materials for exploration, for example (Missiuna & Pollack, 1991).

Social factors include the availability and expectations of caregivers, and the child's relationships with those significant individuals (American Occupational Therapy Association (AOTA), 2014). A child's social environment includes family, peers, and neighbors who they may build relationships within the home, school, and community. Family members, including caregivers, siblings, and others, may experience stress related to having a child with ASD (Higgins, Bailey, & Pearce, 2005). Bagby, Dickie, and Baranek (2012) interviewed parents of typically developing children and children with ASD. Bagby et al. (2012) concluded that sensory experiences affected family occupations by influencing what a family chose to do or not to do and the extent to which experiences, meaning, and feelings were shared, among others. While children with ASD and their families experience unique challenges associated with their

environments, there are strategies that can be implemented to manage these challenges, including assistive technology.

Assistive Technology and ASD

In an attempt to improve the quality of life for children diagnosed with ASD, a variety of assistive technology devices, both low and high-tech, have been created and adapted to augment their abilities (Faucett et al., 2017). For example, Mills and Chapparo (2017) investigated the utilization of the Sensory Activity Schedule, a sensory-based intervention, to increase the participation of students with ASD who experienced sensory processing dysfunction. The Sensory Activity Schedule consists of specific activities and environmental modifications that are aimed at enhancing occupational performance and engagement in schools. One form of assistive technology that was successful in addressing sensory processing dysfunction and increasing participation in school was the use of a therapy ball to decrease jumping and climbing during class activities (Mills & Chapparo, 2017). Other areas of dysfunction in children with ASD that can be addressed with assistive technology strategies are shared below.

As the prevalence of ASD has grown over time, so have advancements in technology dedicated to individuals with ASD. Assistive technology is defined and interpreted in many different ways in the literature. Smith (2017) defines assistive technology as any product that supports an individual's ability to optimize their function, independence and participation in their environment. This means that everyday technologies, whether simple or complex, become assistive in nature when applied by skilled practitioners to increase the participation of individuals with disabilities (Bondoc et al., 2016). Assistive technology devices can be

categorized by level of technology and also purpose of technology. In this case, assistive technology devices will be categorized by level of technology, including no-tech, low-tech, and high-tech (Bouck, 2017; Zabala, 2007; Blackhurst, 2001). One of the main focuses of these technologies in children with ASD is communication, as it is one of the primary areas affected by the disorder (Schuh & Eigsti, 2012). However, other areas addressed by assistive technology in this population include increasing social skills and addressing motor deficits.

Table 1 displays each level of assistive technology and their corresponding defining characteristics and examples. Table 2 displays examples of assistive technology that fall within each of the three levels (no-tech, low-tech, and high-tech) and the areas that these strategies address in children with ASD. See Appendix A for more detailed information. When looking at the data within the tables, it is clear that there are a variety of assistive technology strategies that may increase participation for children with ASD. These strategies range from no-tech to high-tech and have features that may be useful for some children and limiting to others. However, when considering the recommendation for and implementation of assistive technology devices for children with ASD, it is vital to consider the viewpoint of their caregivers. Caregivers contribute significantly to the adherence or neglect of assistive technology use in their children. Next, we will examine how parents view assistive technology, and how their perspective may influence the strategies chosen for a particular child.

Table 1

Levels of Assistive Technology and Defining Characteristics and Examples of Each

Level of assistive technology	**Defining characteristics**	**Examples of ways to address deficits**

No-tech	Use of teaching strategies or an individual; utilize existing conditions; flexible in use as these strategies can be utilized without reliance on other materials	Pausing during conversation; strategically planning social interactions during low-stress times in a children's day and in a calming environment; encouraging self-talk
Low-tech	May function without a power source or may be electronic or battery-operated; require little to moderate training; low-cost	Communication boards, such as PECS; turn-taking cards; picture cards that break down complex motor activities into steps
High-tech	Originally associated with computers but also include technologies on phones and tablets; expensive and require the most training; require complex technical support if they malfunction	AAC applications, such as Proloquo2Go; smartphone applications that address social skills in children with ASD, such as Aiko & Egor: Animation 4 Autism; accessibility features offered on a computer interface

Note. Data for no-tech defining characteristics from Bouck (2017), Blackhurst (2001), and Zabala (2007). Data for low-tech defining characteristics from Dell et al. (2008). Data for high-tech defining characteristics from Edyburn (2005), Berhmann and Schaff (2001), Stokes (2009), and Jacobsen (2012).

Table 2

Areas Addressed by Assistive Technology Examples in Each Category

No-tech strategies			
Example	**Improves expressive communication skills**	**Improves social skills**	**Improves motor skills**
Pausing during conversation	**X**	**X**	
Strategic scheduling of interactions		**X**	
Dedicating time prior to interactions for discussion	**X**	**X**	
Modeling movements			**X**
Encouraging self-talk	**X**	**X**	**X**
Low-tech assistive technology			
Example	**Improves expressive communication skills**	**Improves social skills**	**Improves motor skills**

Communication boards	**X**	**X**	
Turn-taking cards	**X**	**X**	
Picture cards for complex motor activities			**X**
Creation of physical boundaries in a room			**X**
High-tech assistive technology			
Example	**Improves expressive communication skills**	**Improves social skills**	**Improves motor skills**
Proloquo2Go	**X**	**X**	
Dynavox V	**X**	**X**	
Aiko & Egor		**X**	
Accessibility features offered on computer interface			**X**

Note. Data for no-tech examples from Stokes (2009), Chang and Locke (2016), and Assaro-Saddler and Saddler (2010). Data for low-tech examples from Wetherby (1986), Simpson (2004), Sigafoos et al. (2013), Stokes (2009), Daubert, Hornstein and Tincani (2014), Fittipaldi and Mowling (2009), and Stokes, Wirkus-Pallaske, and Reed (2000). Data for high-tech examples from Alzrayer, Banda and Koul (2016), Stokes (2009), Caron, Light, Davidoff, and Drager (2017), Gaskin, Hoffman and Turner (2015), and Lofland (n.d.).

Family Perceptions of Assistive Technology

The involvement of parents and caregivers throughout the process of prescribing and implementing assistive technology for use with their children is essential (Jeffs, Behrmann, & Bannan-Ritland, 2006; Lahm & Sizemore, 2002). Lancioni, Sigafoos, O'Reilly, and Singh (2013) state that assessment of attitudes of caregivers, family members, and individuals toward different assistive technologies is an important research area that is currently neglected. A qualitative study explored barriers to effective assistive technology implementation, and one theme that emerged was perceived parental ability and attitudes related to the implementation of assistive technology (Hutinger, Johanson, & Stoneburner, 1996). Parents'

concerns were related to the availability of assistive technology training, their comfort with computers and computer technology, and a lack of communication between parents and school staff, among other factors. In addition, Lode (1992) identified lack of support and lack of family involvement as main reasons for abandoning assistive technology devices. However, Peterson (2017) found that parents are willing to try to implement whatever recommendations are made by teachers or healthcare professionals to help their children learn. It is critical to examine parental attitudes related to assistive technology use with their children because these attitudes are typically strong predictors of subsequent parental behaviors and success of uptake of these strategies (Clark, Austin, & Craike, 2014).

When prescribing augmentative and alternative communication (AAC) devices to children, the team approach, which involves collaboration of family members, the child, teachers, speech-language pathologists (SLPs), occupational therapists (OTs), and other specialists, is optimal (Angelo, 2000; Kintsh & DePaula, 2002; Batorowicz & Shepherd, 2011). However, Batorowicz and Shepherd (2011) discovered that clinicians prescribing AAC, a subset of assistive technology strategies, are apprehensive at times to include family members. Specifically, apprehension among clinicians regarding the inclusion of the family in prescription review (PR) meetings is related to the use of technical or clinical jargon. Batorowicz and Shepherd (2011) argue that involving families in all PR meetings may provide educational value and be an empowering experience for family members. Better understanding the perspective and education of professionals who are involved in the prescription of AAC and other assistive technology devices for children with ASD will clarify the role of caregivers in the process.

Cardon, Wilcox, & Campbell (2011) found that caregivers report difficulties in most activities and routines that their children with ASD participate in. These activities include bathing, morning routines, evening routines, and mealtimes. The two most-cited reasons for difficulties in these activities were a child's inability to perform the task and external problem behaviors. The use of assistive technology to address these difficulties may result in more positive experiences. However, this study found that less than half of the parents reported being able to find solutions that involved the use of assistive technology strategies. Out of 134 caregivers who participated in the online assessment, 34 caregivers reported using no-tech strategies during a bathing routine. These strategies included singing to the child, giving verbal reinforcement, and making sure there were few people around to reduce stimulation. Most caregivers in this study reported receiving training about assistive technology from their early intervention providers. However, only 6.7% of caregivers felt very competent in their ability to use adaptations and assistive technology to participate in daily activities. Perhaps the lack of specialized training in assistive technology among early intervention providers and other related service professionals is related to caregivers' confidence in utilizing assistive technology strategies to increase their child's ability to engage in daily activities.

Previous research demonstrates that caregivers are able to identify potential benefits of assistive technology for their child, however, barriers related to lack of support from professionals, lack of personal knowledge, and lack of time, energy, and drive prevent successful implementation (Peterson, 2017; Tegler, Pless, Johansson, & Sonnander, 2019). Peterson (2017) shares that the primary barrier to implementation of assistive technology in children with ASD revolves around the child's teachers' and healthcare providers' knowledge of

and comfort with assistive technology, as well as cost. However, when skilled practitioners with expertise in assistive technology work to implement these strategies into the lives of children with ASD, the impact is positive. Donato, Shane, and Hemsley (2014) share that parents whose children with ASD use visual supports, such as PECS, Proloquo2Go, and other mobile technologies, are pleased with the impact it has on their daily lives. One parent shared, "We find the visuals are very, very good because it tends to take some of the pressure off the need for the words." This supports the potential impact that assistive technology can have when implemented by experienced and trained professionals. By better understanding the barriers associated with successful assistive technology implementation in various contexts of a child's life, strategies may be developed to overcome these challenges.

The Role of Service Professions

In order to increase the appropriate utilization of assistive technology in the treatment of children with ASD, service providers must be educated on the role and appropriate uses of assistive technology in context. In the following section, the roles of a variety of service professions will be outlined, both in general and specifically in relation to providing services to children with ASD. The perceptions of these professions related to assistive technology and their role in providing assistive technology services will also be discussed when possible. Finally, research associated with each field and its contribution to providing assistive technology services to children with ASD will be considered. See Table 3 for information regarding minimum degree requirements for each of the professions.

Table 3

Professions and Current Corresponding Minimum Degree Requirements

Professional	Minimum degree requirement
Occupational therapist	Master's degree
Physical therapist	Clinical doctorate degree
Speech-language pathologist (SLP)	Master's degree
Special education teacher	Bachelor's degree

Occupational therapy

The American Occupational Therapy Association (AOTA) states that occupational therapy is the only profession that assists individuals across their lifespan to do the things that they want and need to do. Occupational therapy practitioners use customized interventions to improve individuals' ability to perform daily activities (AOTA, 2019). When working with children with ASD, occupational therapy practitioners use evidence-based strategies to address deficits in self-regulation, sensory integration, motor development, social participation, and other areas of life. The primary role of occupational therapists (OTs) is to provide direct services to children and families while advocating for modifications and accommodations that will allow their clients to participate in daily and community activities. Because of the role of occupational therapy practitioners in the care of children with ASD, it is important to consider their role in providing assistive technology services as well. Kanny and Anson (1998) performed a replication study to see what changes occurred in the education of occupational therapy students, as related to assistive technology, between 1989 and 1994-1995. Results from a mailed questionnaire revealed that 89% of programs in 1994-1995 included assistive technology content in lectures throughout their curricula compared with 54% of programs in 1989. These results suggest a greater emphasis is being placed in the area of assistive technology within

occupational therapy programs, however, the extent to which assistive technology concepts are being addressed likely varies significantly across programs.

Occupational therapy practitioners may utilize and recommend assistive technology use to improve a child's ability to engage in activities and to promote participation (Case-Smith & O'Brien, 2015). Particularly, assistive technology from an occupational therapy perspective may support language and communication in children with ASD, as well as moderating behavior challenges that may be present (Rispoli, van der Meer, Lang, & Camargo, 2010; Shane et al., 2012; van der Meer, Sutherland, O'Reilly, Lancioni, & Sigafoos, 2012). The technology utilized by occupational therapy practitioners varies from low tech support, like weighted silverware to provide sensory feedback, to high tech support, such as electronic writing devices or word processors. Oftentimes, occupational therapists may work with other professionals, such as physical therapists or speech language pathologists to determine the most appropriate form of assistive technology for a child with ASD (Lindsay, 2010).

Physical therapy

The American Physical Therapy Association (APTA) describes physical therapy's role in care for children with ASD as helping them participate fully in daily routines at home and at school, acquire new motor skills, develop better coordination, and increase posture, among other areas of performance (APTA, 2018). The Academy of Pediatric Physical Therapy (2014) identifies hypotonia, developmental dyspraxia, repetitive movements, oral-motor dysfunction, decreased hand-eye coordination, and poor balance as areas that physical therapists are able to address when working with children with ASD. Karen Tartick, a physical therapist who works in schools, shares that both exercise and structured play are evidence-based practices for children

with autism (APTA, 2018). Throughout the process of providing care, an emphasis is placed on modifying activities so that children with ASD are able to participate in the same environment as their peers (Academy of Pediatric Physical Therapy, 2014). Given this emphasis on inclusion, it is likely that assistive technology is used to facilitate participation. However, research related to assistive technology implementation by physical therapists to increase participation in children with ASD is limited, and evidence suggests the profession is not comfortable providing these services.

Although physical therapists have a role in recommending and implementing assistive technology use with their clients, physical therapists report having "less-than-adequate" training in assistive technology and a lack of confidence in providing these services (Long & Perry, 2008). Long and Perry (2008) mailed a survey questionnaire related to training needs of physical therapists in the area of assistive technology, their confidence in delivering assistive technology services, preferred methods of training, and challenges in being trained to 380 pediatric physical therapists. The results of the survey indicated that physical therapists would like accessible and affordable training that focuses on the funding of assistive technology, as well as knowledge of specific devices and assessment and evaluation methods (Long & Perry, 2008). Perhaps the most effective way to provide this education is within a physical therapy program.

Speech-language pathology

The American Speech-Language-Hearing Association (ASHA) shares that SLPs work to prevent, assess, diagnose, and treat speech, language, social and cognitive communication, and swallowing disorders in individuals who have deficits in these areas (ASHA, n.d. -a). SLPs play a

large role in screening, assessing, diagnosing, and treating individuals with ASD. Specifically, SLPs may educate other professionals on the needs of persons with ASD and their profession's role in treating this population, screening individuals who present with language and communication difficulties, assessing for the need of AAC devices as a mode of communication, and diagnosing the presence or absence of ASD as a part of a diagnostic team, among other important roles. ASHA shares that SLPs who work with individuals with ASD should be specifically educated and trained to do so (ASHA, n.d. -b).

When working with children who have ASD, speech-language pathologists may address deficits in independence and self-advocacy that result from core challenges in social interaction and verbal and nonverbal communication. Speech-language pathologists are able to contribute in one way by ensuring children with ASD have a functional communication system, which may include the use of AAC (ASHA, n.d. -b). However, the ability to recommend and implement AAC strategies is not always easy for speech-language pathologists. Lindsay (2010) shares that there are technical, social, and political barriers influencing clinicians' decisions to prescribe AAC devices. These include issues related to the complexity of devices, family views of technology, and gaps in funding and policy (Lindsay, 2010). While AAC devices have the potential to allow children with ASD to participate more fully in desired activities, the barriers to receiving appropriate services must be addressed to ensure successful implementation. Perhaps further education related to these assistive technology devices and the barriers that may be present would be useful.

Special education

The National Association of Special Education Teachers (NASET) share that special education teachers work with students who have learning, mental, emotional, or physical disabilities. Special education teachers adapt general education lessons and teach various subjects to students who have disabilities. NASET has numerous articles related to assistive technology and the role that special education teachers can play in the implementation of these devices. However, most of these articles are locked and reserved solely for members of NASET. The Montana Office of Public Instruction (2017) created a holistic guide that describes assistive technology through the scope of special education and goes in depth into the assessment, selection, purchasing, training, usage, and repair of assistive technology devices. The organization shares that teachers should consider assistive technology as a tool to address educational deficits in general education programs prior to referring a child to special education. If the support team finds that the child is still not able to perform in general education courses with assistive technology or other interventions, then a special education evaluation is conducted.

As a part of this evaluation, the evaluation team may determine whether or not further assistive technology assessment is needed. The results of this examination would be included in the development of an individualized education program (IEP) for the child. The efficacy of the assistive technology devices utilized is analyzed at least annually during the IEP meeting (Montana Office of Public Instruction, 2017). Because teachers play an active role in detecting when a child may need assistive technology services, it is important for them to receive education in this area of their scope of practice. When working with children with ASD, special

education teachers may utilize a variety of assistive technology devices to increase participation, augment communication, and develop social skills (Cramer, Hirano, Tentori, Yeganyan, & Hayes, 2011).

Utilization of technology to teach students with ASD was first cited over 35 years ago, when Colby (1973) examined the use of computers to increase understanding of how children use letters and sounds to form words. However, Knight, McKissick, and Saunders (2013) performed a comprehensive review of literature for articles published between 1993 and 2012 to determine the degree to which technology-related interventions could be considered an evidence-based intervention to teach academic skills to children with ASD. A total of 25 studies met inclusion criteria, and no group studies met criteria for quality or acceptable studies. The authors suggest that these results should encourage special education teachers and members of the treatment team to take caution in using technology-based interventions to teach academic skills to children with ASD (Knight et al., 2013). Wissick and Gardner (2008) also support the use of caution when using assistive technology, and state that "practitioners and teachers need training on technology assessments and evaluation models" (p. 91).

Costigan and Light (2010) performed a review of research related to preservice AAC training for speech-language pathologists, special education teachers, and occupational therapists in clinical and education practice. Results of their systematic review indicate that the amount of AAC content offered by preservice programs was low, with 18-38% of speech-language pathology programs, 76% of special education programs, and 100% of OT programs failing to offer an AAC course. However, 80-100% of speech-language pathology programs, 100% of special education programs, and 34-59% of OT programs reported AAC content was

incorporated into other courses, with an average of 1-4 hours of AAC-specific content covered. When considering interdisciplinary preservice AAC training, 14-22% of responding speech-language pathology programs welcomed other disciplines into AAC courses (Costigan & Light, 2010). Two particular studies investigated student competence in providing AAC services, with speech-language pathology programs reporting that less than half of graduating students (0-42%) were competent in providing AAC services following preservice education (Ratcliff & Beukelman, 1995; Ratcliff, Koul, & Lloyd, 2008. These findings further support the need for an assessment that will measure students' attitudes, self-efficacy, and knowledge, with the ultimate goal to increase their ability to provide quality assistive technology services to children with ASD.

Content Validation and Assessments

In the process of creating a new assessment tool to explore pre-professional students' knowledge, perceptions, and skills related to assistive technology and ASD, establishing content validity is vital in moving toward implementation of the assessment. Rickards, Magee, and Artino (2012) suggest that assessments created and implemented without evaluating content validity are not well-designed and the data gathered may fail to capture the essence of the intended variables measured by the assessment. Portney and Watkins (2015) share that content validity is a subjective process where claims of the validation of assessment questions are made by a panel of experts who review the instrument and determine whether the items satisfy the content domain. This process often requires multiple revisions of the instrument, and when all experts agree that all of the content domains has been adequately represented, content validity is supported. Once content validity has been established, future research will

explore the potential need for increased awareness, training, and experiences based on the results of the assessment in action.

Face Validation and Assessments

Establishing face validity functions to indicate that an assessment appears to measure what it is supposed to. Portney and Watkins (2015) posit that this is the weakest form of measurement validity, as there is no standard for judging face validity or determining 'how much' face validity an instrument has. Because of this, face validity is assessed as 'all-or-none'; an instrument either has face validity or it does not. However, measuring face validity is important as respondents may not be motivated to answer questions with honesty if they do not see the relevance of the questions (Portney & Watkins, 2015). To test for face validity, researchers obtain subjective assessments of an instrument from experts in the field of interest, or current or future individuals who are part of the desired population of participants to complete the validated instrument (Bolarinwa, 2015; Salkind, 2010).

Purpose of Study

The primary objective of this study is to assess content and face validity for the Assessment of Pre-Professional Students' Attitudes, Self-Efficacy and Knowledge in Assistive Technology and ASD. This assessment is intended to answer the research question: "How do the attitudes, self-efficacy, and knowledge in assistive technology and ASD differ within and across students in pre-service professional programs?". Establishing content and face validity of the instrument is essential before implementing the tool. In order to establish content and face validity, content experts in assistive technology, ASD, and each of the professional disciplines have been recruited to provide feedback on the content validity of the instrument. Pre-professional students in each target discipline have also been recruited to take the assessment after content validation methodology is complete, and to provide feedback related to the face validity of the instrument.

Once content and face validity have been established, this assessment tool will be utilized in future research to identify the knowledge that pre-professional students possess, the applied experiences they may have had in volunteering or service learning opportunities, and their attitudes about the potential role of assistive technology in treating ASD through the scope of their practice. Future coursework and continuing education opportunities can be modified or established based on the results of this assessment to increase knowledge, self-efficacy, and attitudes in a variety of pre-professional students and professionals.

Importance to the Field of Occupational Therapy

Promoting full participation in desired and necessary activities of daily living is a large part of occupational therapy's mission. Work is an occupation that consumes a majority of a professional's time. By addressing the experiences of pre-professional students related to assistive technology use in children with ASD, and better understanding how this may contribute to their practice, changes can be made to curricula or outside experiences. These changes will positively contribute to professionals' experiences recommending and implementing assistive technology services for children with ASD. By addressing the experiences of pre-professional students, children with ASD can benefit by receiving appropriate care and, if needed, assistive technology services that will allow them to fully participate in their occupations, including engagement in school and play.

The PEOP Model is used to better understand the occupational performance of a child with ASD and the role that technology plays in enhancing performance/participation, as it effectively breaks down the components of occupational performance. The model places an emphasis on a client-centered approach to therapy, with the environment impacting occupational functioning.

Figure 1 provides a visual depiction of the PEOP Model. The person, or intrinsic factors, that contribute to well-being can include physiological, cognitive, spiritual, neurobehavioral, and psychological factors. Some of these person factors are more relevant to autism spectrum disorder than others. For instance, cognitive factors are applicable and include the process of thinking, memory, reasoning, and attention. Maenner et al. and Centers for Disease Control and Prevention (2020) share that among children with ASD for whom data on intellectual

functioning were available, 33% were classified as having an intellectual disability (IQ≤70). Cognitive functioning is a person factor that contributes significantly to the occupational performance and participation of a child with ASD. Another person factor to consider in children with ASD is neurobehavioral, which includes systems that control motor and sensory inputs, such as balance and coordination. During school age, children with ASD display challenges with gross motor skills that include running and jumping (MacDonald et al., 2013). Leonard et al. (2013) conducted a study that involved 54 at-risk infants, with an older sibling with a diagnosis of ASD, and found that fine motor skills was a particular difficulty for those (n=17) who went on to develop ASD at 36 months. These person factors interact with each other, along with environmental factors, to influence a child's occupational participation and performance.

Figure 1

Visual Depiction of the Person-Environment-Occupational Performance (PEOP) Model

Note. Christiansen CH, Baum CM, Bass Haugen J. Occupational Therapy: Performance, Participation, and Well-Being. 3rd ed. Thorofare, NJ: SLACK Incorporated; 2005. Reprinted with permission from SLACK Incorporated. Reference # B166335309. See Appendix K for SLACK Incorporated permissions.

Within the PEOP Model, environmental factors are also stressed as contributory to the occupational performance and participation of individuals. The built environment and technology, social supports, and cultural values are of particular focus for children with ASD. Built environment and technology refers to buildings, public spaces, and tools, including assistive technology devices. The level of accessibility of the public spaces that children with ASD inhabit, particularly school spaces and the home, can have a great influence on their participation in occupations. Components of the built environment that can be deleterious to the participation of children with ASD while in school include intensity of lighting and sound, lack of personal space, and cluttered classrooms (McAllister & Macguire, 2012). Assistive technology has the ability to facilitate engagement for children with ASD in environments that might otherwise be inaccessible. However, as mentioned earlier, Peterson (2017) shares that the primary barrier to implementation of assistive technology in children with ASD is related to the child's teachers' and healthcare providers' lack of knowledge of and comfort with assistive technology. The appropriate implementation of assistive technology devices and strategies has the potential to positively impact occupational engagement and participation for children with ASD.

While assistive technology devices and strategies have the potential to increase participation for children with ASD, it is also important to consider the cultural values and social

supports of the child and their family. Previous research suggests that most parents are willing to try to implement whatever assistive technology devices and strategies are made by professionals to help their children learn (Peterson, 2017). However, there may be families who are resistant to certain kinds of assistive technology devices. It is vital that a team approach is used when selecting and implementing assistive technology devices and strategies in order to increase the likelihood of adherence (Angelo, 2000; Kintsh & DePaula, 2002; Batorowicz & Shepherd, 2011). Members of a school-based interdisciplinary team, including occupational and physical therapists, as well as speech language pathologists and special educators, should be actively involved in the process of implementing new strategies and devices to ensure the child's optimal occupational performance and participation.

In order to better understand occupational performance and participation as the interaction between person and environment factors with the desired occupation, a case example is useful. Children with ASD have varying deficits, including challenges with social communication and restrictive behaviors. These challenges are considered person-based factors that interact with their environment-based factors, such as their home environment, school environment, and support system, to influence their occupational performance. In order to address and moderate difficulties that children with ASD experience in the context of school or play, assistive technology can be a useful tool. For example, if a child with ASD (person) is provided with an opportunity to perform classroom activities (occupation) with his classmates while in standing (environment), then he may be more likely to engage with material as compared to being forced to sit throughout the activities. This is an example where a no-tech strategy (performing activities in standing) has the potential to increase a child's occupational

performance in school. The PEOP Model provides structure to the rationale behind this study, which involves the development of an assessment that will be distributed amongst a variety of students.

The development of an assessment that examines the experiences of students within a variety of disciplines also reflects the larger interdisciplinary team that occupational therapists are a part of. Because professionals in these disciplines have shared a lack of confidence in providing assistive technology services to their clients in previous research, establishing a measurement tool to evaluate students' attitudes, self-efficacy, and knowledge will be useful in supporting the need for interdisciplinary coursework and continuing education opportunities that address assistive technology implementation from the scope of a variety of disciplines. Before distributing this new assessment tool to students, content and face validity must be established to ensure that the assessment is effective and comprehensive, and that target domains are being measured as intended.

Method

Descriptive research methodology was used in this study to gather both quantitative data from content experts to determine the essentiality and clarity of assessment items, as well as qualitative data from content and face validators related to the usability of the assessment as a whole. In particular, to establish content validity, experts scored each assessment item on a 3-point ordinal scale for both essentiality and clarity. Space was also provided after each item for qualitative feedback and suggestions for revisions. See Appendix B for instructions provided to content validators. When establishing face validity, pre-professional students within the disciplines of occupational therapy, physical therapy, speech language pathology, and special education not only completed the assessment for pilot data, but also provided qualitative feedback on the assessment's usability and clarity. See Appendices E and G for examples of questions posed during face validation. By integrating both the quantitative and qualitative data gathered from both content and face validators, the final assessment will reflect the perspective of both experts in the field, as well as the students who the assessment aims to reach. This study was reviewed by the Institutional Review Board (IRB) at UW-Milwaukee and the protocol was granted Exempt status. The protocol for IRB# 20.098 was approved on November 12, 2019 for three years. See Appendix L for a copy of the IRB Protocol Form, and Appendix M for the IRB Exemption decision.

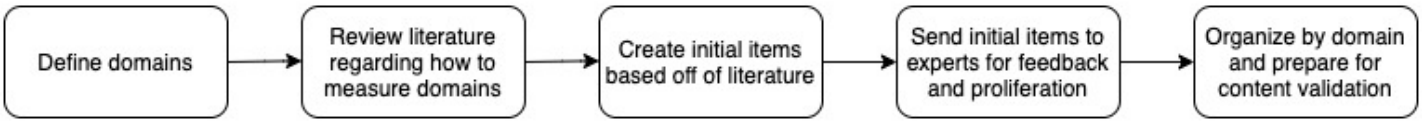
Assessment Development

To better understand the education and perceptions that incoming service providers have related to assistive technology and its use in children with ASD, an online assessment was developed. McCoach, Gable, and Madura (2013) outline the following steps during the

development phase of an assessment: specify purpose of the domain/construct to be developed, confirm that there are no existing instruments that serve the same purpose, and describe the domain and provide preliminary conceptual definition. After establishing the domains of the instrument, the item pool can be developed, otherwise known as the "question development" phase (Kline, 2013). During this phase, content should be included that may not perfectly fit the domain identified, as later evaluation by experts will eliminate inappropriate items from the pool. The initial pool of items should also be at least twice as long as the desired final scale, according to Kline (2013) and Schinka, Velicer, and Weiner (2012). Each question must be kept simple, straightforward, and follow conventions of normal conversation in order to prevent satisficing, or the act of providing "merely satisfactory answers," rather than the most accurate ones (Krosnick, 2018). See Figure 2 for the process of assessment creation.

Figure 2

Creation Process of Assessment of Pre-Professional Students' Attitudes, Self-Efficacy, and Knowledge in Assistive Technology and ASD.



The assessment utilized was conceptualized and created prior to the beginning of content and face validation methodology. First, relevant demographic questions were included. Then, a literature review was performed to better understand the factors that contribute to successful recommendation and uptake of assistive technology in a variety of patient populations. Previous research indicates that there is not a single factor that limits effective assistive technology implementation, rather, it is likely the interaction of multiple factors (Todis

& Walker, 1993; Carey & Sale, 1994; McGregor & Pachuski, 1996; Copley & Ziviani, 2004). Previous research in the field of assistive technology suggests that practitioner knowledge, self-efficacy, and attitudes are factors that contribute to successful implementation of assistive technology strategies (Alkahtani, 2013; Gustafson, 2006). In order to create the assessment, the domains of "attitude", "self-efficacy", and "knowledge" were operationally defined. See Appendix C for the operational definitions for each domain. Then, a literature review specific to the domains of "attitude" and "self-efficacy" was performed to gain a deeper understanding of the types of questions that are effective in measuring these domains.

Measuring Attitudes

Based upon a lack of comfort and knowledge in formulating items that measure "attitudes" and "self-efficacy", a further literature review was performed to better understand item creation. "Attitude" is a concept that has been studied in the social sciences for many years (Chaiklin, 2011). Although there is no universally accepted definition for the concept, one commonly agreed upon definition is "a mental or neural state of readiness… exerting a directive or dynamic influence on the individual's response to all objects and situations to which it is related" (Allport, 1935; Pickens, 2005). McLeod (2009) posits that attitude measurement is divided into two categories: direct measurement (rating an issue on a standard set of bipolar adjectives with opposite meanings) and indirect measurement (interpreting an ambiguous stimulus, such as a picture, and projecting attitudes into the ambiguous stimulus).

This assessment utilizes direct measurement through the use of a Likert scale that allows respondents to rate statements on a standard scale from "strongly disagree" to "strongly agree". The most common problem when attempting to measure attitudes is social desirability,

or the tendency for respondents to give socially desirable responses to the assessment items (Goldstein, 1960; Steenkamp, 2009). Because of this, responses on attitude scales are not always completely valid. However, gaining insight into the attitudes of pre-professional students as these attitudes relate to level of knowledge and experience working with assistive technology and children with ASD is useful in considering ways to enhance current coursework and potential continuing education experiences.

Measuring Self-Efficacy

It is important for incoming professionals to have a strong sense of self-efficacy in their ability to provide sufficient care and services to the population they will serve. According to Bandura (1994), perceived self-efficacy refers to the belief system that people have regarding their ability to produce levels of performance that exercise influence over situations affecting their lives. People with a strong sense of self-efficacy are able to easily approach difficult tasks and sustain the effort necessary to achieve objectives. In contrast, individuals with low self-efficacy avoid having to deal with tasks that involve a high degree of difficulty and quickly lose confidence in their own abilities (Bandura, 1995).

Lahm and Sizemore (2002) investigated self-efficacy among professionals who provide assistive technology services and found that the amount of formal education received by professionals impacted their ability and confidence in providing these services. They share, "when they [respondents] were involved in formal schooling, assistive technology was not the popular intervention that it is now… speech-language pathologists who were more recently graduated viewed their assistive technology background more positively" (Lahm & Sizemore, 2002). In order to measure pre-professional students' self-efficacy as it relates to providing

assistive technology services to children with ASD, a Likert scale that ranges from "strongly disagree" to "strongly agree" followed statements related to confidence in the ability to provide relevant services.

Question Development

After the domains were operationally defined and there was a deeper understanding about the ways in which to measure attitudes and self-efficacy, assessment questions were created for each domain. First, questions were proliferated between Cindy Ruedinger and Kris Barnekow based on relevant topics associated with ASD and assistive technology. Once these sample questions were created, they were sent to content validators within all professional disciplines prior to the content validation process to provide feedback. These experts were also encouraged to share additional questions for the assessment that related to assistive technology use in children with ASD from the perspective of their field. After all content validators provided feedback on the existing items and provided any additional items they could generate, these items were organized by domain into the Assessment of Pre-Professional Students' Attitudes, Self-Efficacy, and Knowledge in Assistive Technology and ASD and the first round of content validation was ready to begin.

Content Validation

In order to establish content validity of the Assessment of Pre-Professional Students' Attitudes, Self-Efficacy, and Knowledge in Assistive Technology and ASD, the current study utilized an online survey research design. Content validity refers to the degree to which aspects of an assessment are relevant to, and representative of, the targeted constructs of that assessment (Haynes, Richard, & Kubany, 1995). The content experts scored each item in the

assessment on a 3-point ordinal scale for essentiality and clarity. During the first round of content validation, space was provided after each item score for comments on the item or suggestions for revisions (see Appendix B for instructions provided to content validators).

Once the statistical results for each item meet or exceed a cut-off score, content validity of the instrument is assumed (Tojib & Sugianto, 2006). Through the process of establishing content validity, future research can be completed using the assessment tool to better understand pre-professional students' experience and knowledge related to assistive technology and ASD. This information will ultimately provide insight into the potential need to increase the number of courses or experiences offered for students related to assistive technology and its use with children with ASD, or a need for increased continuing education courses or modules that are available for professionals.

Participant Characteristics

Sampling ensured that experts involved in providing content validation ratings had specialized knowledge and experience in one of the six areas addressed within the assessment (assistive technology, autism spectrum disorder, occupational therapy, physical therapy, speech-language pathology, and special education). This knowledge and experience could be evident through their careers, certifications, and research interests. This criterion ensured that the content experts had experience necessary to effectively rate the clarity and essentiality of the assessment items.

Content experts were identified through affiliation with the University of Wisconsin-Milwaukee, membership in related organizations, and existing professional contacts. Experts were not required to be affiliated with the University of Wisconsin – Milwaukee to qualify for

participation in the study. Content experts were not compensated for their participation in the study.

Sampling Procedure

Participants were first identified through convenience sampling via existing relationships with the investigators. These initially identified participants were then asked to nominate further subjects who they felt would be a good fit for the study, through the use of snowball sampling. Participants were required to have a degree in their respective field, with certifications and additional experiences supporting their expertise. Professors were required to hold teaching positions at academic institutions, and clinicians were required to be currently practicing in their field.

Content experts were initially contacted through IRB-approved email communication and were provided with background on the study and the informed consent process. All identified participants demonstrated interest in participating in the study. Interested content experts were then provided a link which directed them to a Qualtrics survey where they performed the first round of content validation. There were no incentives associated with participation in content validation.

Data Collection

Feedback related to content validity was provided by experts through a two-step process and the use of a three-point ordinal scale within a Qualtrics survey that contained all of the proposed assessment questions with their domains noted. See Appendix C for the assessment titled “Assessment of Pre-Professional Students’ Attitudes, Self-Efficacy, and Knowledge in Assistive Technology”. See Appendix H for an excerpt of the question layout for

content validation within Qualtrics. Content experts were provided with definitions of important terms throughout the assessment as well as details regarding the qualities of "essentiality" and "clarity" that they would be rating each item on. Experts were asked to score each item on a scale of 0 to 2 where 0 = *not essential,* 1 = *useful but not essential,* and 2 = *essential.* They used a similar scale to rate each item's clarity, where 0 = *unclear*, 1 = *unclear but revisions improve clarity*, 2 = *clear*. Experts were also encouraged to contact the primary investigator if they were unsure about the scoring protocol or contents of the assessment. Content experts were given one month to complete the content validation process for each round, and extensions were given as necessary to ensure retention of participants. Weekly email reminders were also disseminated through Qualtrics software to increase the likelihood that the process would be completed.

Conditions and Design

All content experts were exposed to the entire assessment and were asked to rate all items, regardless of whether or not the item fell within their professional domain. This allowed the perspectives of all included professions to be factored into the content validation process. During the first round of the content validation process, content experts were asked to provide feedback or suggestions for improvement after each item in the assessment. During the second round of the assessment, content experts were asked to share any glaring issues noticed during the validation process but did not provide qualitative feedback at the item-level.

Data Diagnostics

After each round of content validation, data were exported from Qualtrics to Excel for inspection and analysis. Experts were unable to skip any item within Qualtrics, so all items were

scored and there was no missing data to treat. All data were included in analysis, including outliers. Utilization of a quantitative content validity method allowed for Lawshe's (1975) content validity ratio (CVR) and content validity index (CVI) to be utilized to select the most representative content to be included in the assessment tool. The CVR is used to determine whether a specific item should be retained or rejected in the instrument and is recognized as the method for establishing content validity (Wilson, Pan, & Schumsky, 2012). CVR is calculated by the following equation:

$$CVR = \frac{n_e - \frac{n}{2}}{\frac{n}{2}}$$

In the formula, "n_e" refers to the number of panelists indicating the item as essential and "n" refers to the total number of panelists. A resulting CVR score can be a negative number, positive number, or zero.

Item-level CVR were calculated for essentiality (CVR (E)) and for clarity (CVR (C)). Only items with CVR (E) ≥ 0.50 after the first round of content validation were considered further to determine if the item should be retained or revised. Lawshe (1975) created a table of necessary CVR values needed to consider an item valid based on the number of panelists included in the content validation process. According to Rodrigues, Adachi, Beattie, and MacDermid (2017), the higher CVR value indicates greater agreement among panelists. While the goal was to have 12 experts participate in both rounds of content validation in this study, to ensure consistency across both rounds of content validation with anticipation that there may be dropouts of experts, the minimum CVR values for a panel of 10 were used to determine inclusion/exclusion of items. Based on Lawshe's (1975) calculations, the minimum CVR for a panel of 10 would be

.62. In addition, Ayre and Scally (2014) revisited Lawshe's values and established updated critical values, where the minimum CVR for a panel of 10 would be .80. Ayre and Scally's updated critical value of 0.80 was utilized to determine which items would be included in the final version of the assessment. In cases where the CVR fell below .80, revisions were made, and the item was re-scored by the expert raters in the second round. See Figure 3 for a diagram depicting the process of Round 1 of content validation. Two rounds of the content validation process were completed, and if the CVR was still below .80 for a given item at the end of the second round, that item was removed from the final assessment. See Figure 4 for a diagram depicting the process of Round 2 of content validation.

The CVI was also calculated for each subscale and the entire assessment. The CVI is calculated by averaging all of the CVRs for the items that were included in the final instrument (Devon et al., 2007; Gilbert & Prion, 2016; Lawshe, 1975). The CVI assesses the content validity of an entire subscale and/or an entire instrument, after items have been removed that do not satisfy the CVR cutoff. Tilden, Nelson, and May (1990) suggest that a CVI value that exceeds 0.70 is sufficient, while Davis (1992) shares that values of more than 0.80 is preferred.

Face Validation and Pilot Data

Once content validity was established for the assessment, a separate group of participants who were a part of the target population completed the assessment and responded to questions related to face validity after completion of the assessment. This portion of the study provided both pilot data as well as feedback related to face validity. This assessment of validity was important to measure because it took into account the appearance of the assessment from the perspective of the target population. If participants do not believe

that the assessment is valid, they may be less inclined to complete the assessment (Orcher, 2005). Face validity indicates that an assessment *appears* to test what it is supposed to (Portney & Watkins, 2015). Litwin (1995) shares that face validity is established by untrained individuals to see if the items look "OK" to them; this is a more casual assessment of item appropriateness as compared to content validation.

Participant Characteristics

Current pre-professional students were recruited to complete the assessment and provide feedback afterwards about face validity, particularly about the appearance, usability, and perceived usefulness of the tool. Students from each pre-professional program of interest at the University of Wisconsin – Milwaukee were recruited to participate in the assessment, with a total of up to 20 total participants, with 5 from each discipline. In total, 5 occupational therapy students, 4 physical therapy students, 3 speech language pathology students, and 3 special education students completed all portions of the study. Participants in this portion of the study were asked to complete a series of screening questions prior to gaining access to the assessment. See Appendix D for the screening questions that were asked prior to the beginning of the assessment. Students were not compensated for their participation in the assessment and face validation process to ensure participants were intrinsically motivated to provide meaningful feedback. First, students completed the assessment as members of the target population that the assessment aims to be distributed to. Directly following the submission of the assessment, participants were also asked questions related to the face validity of the instrument.

Sampling Procedure

Sampling for the face validation portion of this study was completed through a modified snowball method. First, program directors from all four programs were identified and were emailed an approved script outlining the study, informed consent information, and a link to the Qualtrics assessment. Program directors were requested to forward this script to all of their students in the programs of interest. From there, students were able to voluntarily decide, or self-select, whether or not they would like to participate in the study; completion of the assessment was not a part of any course objectives or requirements. In order to complete the assessment and provide feedback on its usability, students had to be 18 years or older, identify as a student in one of the four disciplines included in the assessment, have an expressed interest in both assistive technology and autism spectrum disorder, and have 20 minutes to complete the assessment and provide feedback. Having expressed interest and time to dedicate to completing the assessment ensured that meaningful feedback could be provided from the target population. In total, 16 students participated in the entirety of this portion of the study. See Table 4 for more details regarding the demographics of the respondents.

Table 4

Face Validation Participant Demographics

	Participants (n = 16)	
Variable	**n**	**%**
Age (years)		
18-24	12	75
25-34	3	18.75
35 +	1	6.25
Highest Degree		
GED/H.S. Diploma	2	12.5
Bachelor's + credits	14	87.5

Discipline		
Occupational Therapy	5	31.25
Physical Therapy	4	25
Speech-Language Pathology	4	25
Special Education	3	18.75
Semesters Completed		
1	3	18.75
2	3	18.75
3	1	6.25
4	5	31.25
5	4	25
Previous ASD Coursework		
Yes	5	31.25
No	11	68.75
Previous AT Coursework		
Yes	14	87.5
No	2	12.5
Outside Experience (ASD)		
Yes	13	81.25
No	3	18.75
Outside Experience (AT)		
Yes	12	75
No	4	25
AT use with ASD		
Yes	7	43.75
No	9	56.25
Interest Working w/ School-Aged Kids		
Yes	13	81.25
Maybe	3	18.75

Note. GED = general education diploma; H.S. = high school; ASD = autism spectrum disorder; AT = assistive technology

Data Collection

Data collection occurred within Qualtrics software. See Appendix F for an excerpt of the assessment items within Qualtrics. Participants provided pilot data by completing the

assessment that had previously gone through two rounds of content validation, and participants also provided feedback regarding the assessment's face validity at the end. Participation in all portions of the assessment were voluntary. There are no statistical procedures established to measure face validity. However, the methodology used to measure face validity in this study was based off of the work of Oh et al. (2012) who utilized and published a variety of questions to establish face validity of an unrelated assessment. These researchers measured face validity through the use of a series of questions that were answered primarily using a standardized interval as follows: not at all, a little, moderately, quite a bit, and extremely. The format of these questions and the scoring scale was useful in creating the measure of face validity utilized in this study. The scoring scale was modified to include the following scoring options: extremely, moderately, and not at all. A small number of open-ended questions were also provided at the end of the face validity portion to encourage participants to provide rich feedback on the assessment's usability. See Appendix G to view an excerpt of face validation questions.

Conditions and Design

Students from all disciplines were exposed to the entire assessment, as the purpose of this assessment is to better understand the areas of strength and weakness that students from a variety of disciplines have.

Data Diagnostics: Face Validation

Quantitative responses were analyzed for mean values and ranges. items scored using a Likert scale were analyzed for frequency and percentage of responses and were reported as descriptive data. Short-answer responses from the face validation portion of the study were

analyzed informally for themes with the main purpose of informing the various reasons for trends noted in the pilot data provided by students throughout the assessment.

Data Diagnostics: Pilot Data

Data gathered throughout the assessment in the form of pilot data were analyzed for frequency and percentage of responses and were reported as descriptive, summarized data.

Results

Content Validation

Participant Flow

Characteristics of the content experts who participated in both rounds of the validation process are summarized in Table 5. The expert rater panel consisted of 12 total raters for the first round, and 10 raters for the second round. Two experts in the field of assistive technology, as well as two experts in the field of ASD were recruited for participation in the content validation portion of this study. Two content experts from each of the professional programs that are focused on in this study were also recruited, including one professor and one practicing clinician in a given field. Of the available demographic information provided by content validators, the average age was 50.9 years, with a range of 32-65 years. 91% (n=10) of participants identified as female, and the average years of professional experience was 25.7, with a range of 5-40 years.

Table 5

Content Validation Expert Demographics

Expert	Age (years)	Gender	Domain of expertise	Professional Affiliation	Professional Degree(s)	Years of Relevant Experience
1†	49	F	Occupational therapy	Professor of occupational therapy	M.S., ATP	25
2†	48	F	Occupational therapy	School-based occupational therapist	B.S.	26
3*†	56	F	Physical therapy	Professor of physical therapy, Researcher	B.A., B.S., M.S., Ph.D., Post-doc in Motor Development	33
4‡	50	F	Physical therapy	School-based physical therapist	DPT, Pediatric Certified Specialist	28

5†	52	F	Speech-language pathology	Professor of speech-language pathology, Researcher	Ph.D., CCC-SLP	27
6‡	54	F	Speech-language pathology	School-based speech-language pathologist	M.S., CCC-SLP	15
7†	40	F	Special education	Professor of special education, Researcher	Ed.D.	20
8‡	56	F	Special education	School-based special education teacher	B.A., M.A.	30
9†	65	M	Assistive technology	Professor of occupational therapy and assistive technology, Researcher	MOT, Ph.D.	40
10*‡			Assistive technology	School-based occupational therapist and assistive technology professional		
11†	58	F	Autism spectrum disorder (ASD)	Professor of occupational therapy, ASD researcher	B.S., M.S., Ph.D.	34
12‡	32	F	Autism spectrum disorder (ASD)	School-based occupational therapist	B.A., B.S., M.S.	5

Note. * = completed round 1 of CV, but did not complete round 2 of CV; **† =** participants identified through convenience sampling; **‡ =** participants identified through snowball sampling

Recruitment

Recruitment took place from October of 2019 to December of 2019. Data collection for the first round of content validation occurred from December of 2019 to January of 2020. Data analysis for the first round of content validation took place during January 2020, and data collection for the second round of content validation occurred from January to February of

2020. Participants were contacted in late April of 2020 with a request to provide additional demographic information, with that data gathered through early May of 2020.

Statistics and Data Analysis

Details of the validation process are shown in Appendices I and J. An initial 27 items were constructed with 3 subscales: attitudes (5 items), self-efficacy (7 items), and knowledge (15 items). These items were assessed by 12 experts in the first assessment stage. After Stage 1, 6 items were considered to have insufficient content validity (CVR (E) < 0.50) and were removed. A total of 19 items were revised (0.50 ≤ CVR (E) and/or CVR (C) ≤ 0.80) based on suggestions by content experts. The final 2 items required no edits, as the CVR met the set cutoffs (CVR (E) and CVR (C) ≥ 0.80). The remaining 21 items had sufficient content validity to be included in Stage 2. The CVI, or content validity index, for the entire instrument after the ineligible items were removed was 0.579. Based on suggestions made by the experts, 10 additional items were added to the assessment, resulting in 31 total items after the first round of content validation.

In Stage 2, the updated 31 items were assessed by 10 experts, as 2 experts dropped out between stages. After Stage 2, 3 total items were removed from the assessment (CVR (E) and/or CVR (C) < 0.80). Revisions did not take place after this stage, as this was the final step before moving onto face validation. See Table 6 for item-level CVR values. The final instrument included 28 items within 3 subscales, with a CVI of 0.939 after removing items that fell below the cutoff. See Table 7 for CVI values for each subscale of the final assessment.

Figure 3

Round 1 Content Validation Flow

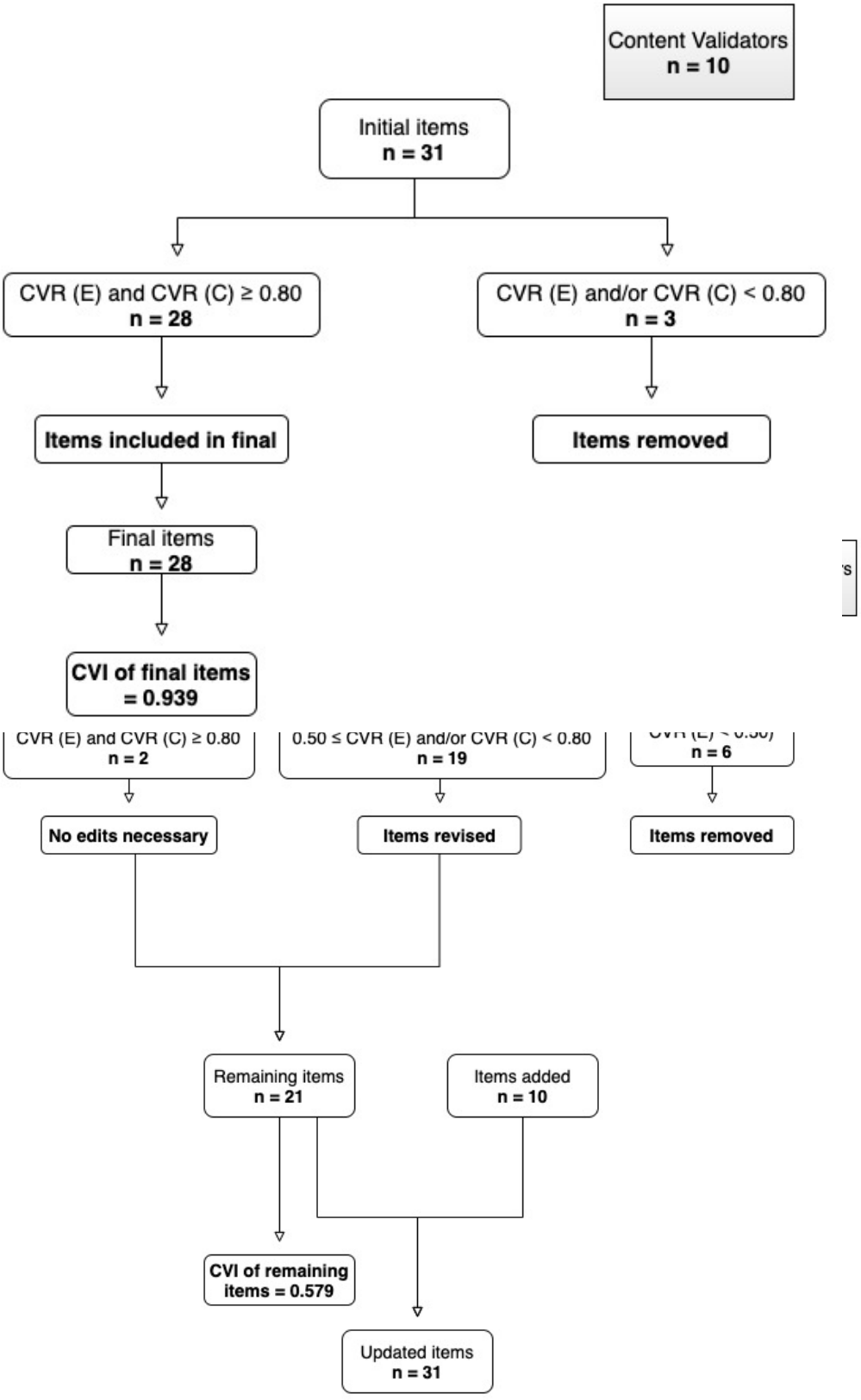


Figure 4

Round 2 Content Validation Flow

Table 6

Item-Level Content Validation Results, Using the Content Validity Ratio (CVR)

Domain: Attitudes										
	Round 1 (N=12)				Round 2 (N=10)				Final Instrument	
Item	**N_C**	**CVR (C)**	**N_E**	**CVR (E)**	**N_C**	**CVR (C)**	**N_E**	**CVR (E)**	**CVR (C)**	**CVR (E)**
Role in ASD	9	0.50	12	1.00	10	1.00	10	1.00	1.00	1.00
Role in AT«	11	0.83	11	0.83	10	1.00	10	1.00	1.00	1.00
No-tech	4	-0.33	11	0.83	9	0.80	10	1.00	0.80	1.00
Low-tech	4	-0.33	11	0.83	10	1.00	10	1.00	1.00	1.00
High-tech	4	-0.33	10	0.67	10	1.00	10	1.00	1.00	1.00
Family role	Item Added in Second Round				9	0.80	10	1.00	0.80	1.00
Collaboration	Item Added in Second Round				9	0.80	10	1.00	0.80	1.00

Domain: Self-Efficacy										
	Round 1 (N=12)				Round 2 (N=12)				Final Instrument	
Item	**N_C**	**CVR (C)**	**N_E**	**CVR (E)**	**N_C**	**CVR (C)**	**N_E**	**CVR (E)**	**CVR (C)**	**CVR (E)**
No-tech	8	0.33	11	0.83	9	0.80	9	0.80	0.80	0.80
Low-tech	8	0.33	11	0.83	9	0.80	10	1.00	0.80	1.00
High-tech	9	0.50	11	0.83	9	0.80	10	1.00	0.80	1.00
Evaluation	9	0.50	11	0.83	9	0.80	10	1.00	0.80	1.00
Goals and IEP	10	0.67	12	1.00	9	0.80	10	1.00	0.80	1.00
Teaching AT	8	0.33	11	0.83	10	1.00	10	1.00	1.00	1.00
Collaboration	8	0.33	11	0.83	10	1.00	10	1.00	1.00	1.00
Teach parents	Item Added in Second Round				10	1.00	10	1.00	1.00	1.00
Evaluation report	Item Added in Second Round				9	0.80	10	1.00	0.80	1.00

Domain: Knowledge										
	Round 1 (N=12)				Round 2 (N=12)				Final Instrument	
Item	**N_C**	**CVR (C)**	**N_E**	**CVR (E)**	**N_C**	**CVR (C)**	**N_E**	**CVR (E)**	**CVR (C)**	**CVR (E)**
Non-verbal	8	0.33	8	0.33	Item Removed After First Round					
No-tech	8	0.33	9	0.50	9	0.80	10	1.00	0.80	1.00
Low-tech«	11	0.83	11	0.83	9	0.80	10	1.00	0.80	1.00

High-tech	8	0.33	8	0.33	Item Removed After First Round					
Decreased fine motor	9	0.50	9	0.50	10	1.00	10	1.00	1.00	1.00
Disciplines involved	6	0.00	7	0.18	Item Removed After First Round					
Gym activities	6	0.00	6	0.00	Item Removed After First Round					
AAC device†	10	0.67	8	0.33	Item Removed After First Round					
Low-tech writing	10	0.67	9	0.50	10	1.00	10	1.00	1.00	1.00
Movement strategy	11	0.83	10	0.67	10	1.00	10	1.00	1.00	1.00
LRE	9	0.50	8	0.33	Item Removed After First Round					
Cause of ASD	10	0.67	9	0.50	10	1.00	9	0.80	1.00	0.80
Related services	10	0.67	9	0.50	9	0.80	10	1.00	0.80	1.00
Visual supports	6	0.00	10	0.67	10	1.00	10	1.00	1.00	1.00
Video modeling	12	1.00	10	0.67	10	1.00	10	1.00	1.00	1.00
High-tech	Item Added in Second Round				9	0.80	10	1.00	0.80	1.00
Purpose of AT	Item Added in Second Round				9	0.80	10	1.00	0.80	1.00
Documentation	Item Added in Second Round				7	0.40 **ø**	10	1.00 **ø**	x	x
Disciplines involved	Item Added in Second Round				9	0.80 **ø**	8	0.60 **ø**	x	x
Environmental factors	Item Added in Second Round				9	0.80	10	1.00	0.80	1.00
Systematic method	Item Added in Second Round				8	0.60 **ø**	9	0.80 **ø**	x	x

Note. CVR (C) = content validity ratio, rated for clarity; Nc = number of raters of rated item as clear; CVR (E) = content validity ratio, rated for essentiality; N_E = number of raters who rated item as essential

« = item met initial cutoff; no edits needed; † = item met cutoff of CVR but was removed based on feedback from experts; Ø = item removed after second round

Table 7

Subscale and Instrument Content Validation (CVI) Results

After Round 1:

	CVI	**Number of Items**

Assessment Tool Overall	**0.579**	**21**
Attitudes	0.450	5
Self-Efficacy	0.643	7
Knowledge	0.602	9

After Round 2:

	CVI	**Number of Items**
Assessment Tool Overall	**0.939**	**28**
Attitudes	0.957	7
Self-Efficacy	0.922	9
Knowledge	0.942	12

Note. CVI = content validity index

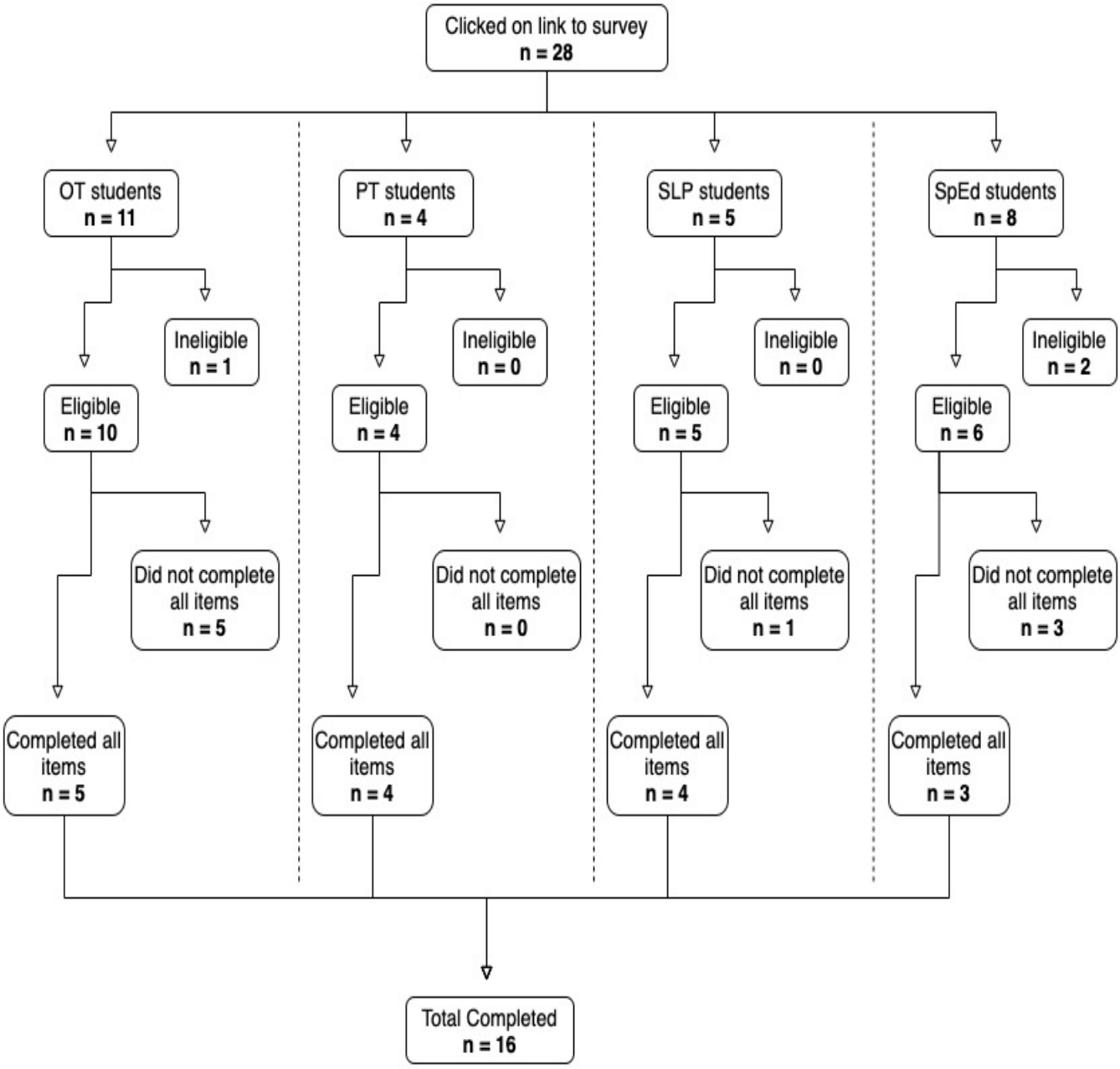
Face Validation and Pilot Data

Participant Flow

The flow of participants in the face validation process is shown in Figure 5. While 28 students began the eligibility items at the beginning of the assessment, only 25 met criteria to move on to the assessment itself. Of those 25 participants, 16 completed all of the demographic items, assessment items, and face validation questions. See Appendix I for more details regarding participant drop-off throughout the face validation process. 75% of participants (n=12) who completed the entire face validation process were between the ages of 18-24. 87.5% of students (n=14) had received a bachelor's degree and were in a master's or Doctoral-level professional program. 31.25% of participants (n=5) had taken previous coursework related to ASD, and 87.5% of participants (n=14) took coursework related to assistive technology. Detailed characteristics of the students who fully participated in the face validation portion of the study are summarized in Table 4.

Figure 5

Face Validation Participant Flow



Recruitment

Email communication occurred in late March and early April of 2020. A standardized recruitment email was sent to program directors in each of the four programs of interest. These program directors then forwarded the standardized email to the students in the target

programs. Students were provided with an anonymous link to the Qualtrics assessment within the recruitment email. The assessment was opened for three weeks for students to complete starting in early April and was closed at the end of April of 2020.

Statistics and Data Analysis: Face Validation

Quantitative data gathered during the face validation portion were compiled into Table 8 and Figure 6. On average, the assessment took participants 15 minutes to complete, with a range of 10-25 minutes. 50% of participants (n=8) found the questions extremely easy to understand, and the other 50% found the questions moderately easy to understand. 81.25% of participants (n=13) found the format extremely easy to understand. 68.75% of participants (n=11) felt the questions flowed extremely well from one to the next. The emergent themes and quotes from the short-answer portion of the face validation process can be found in Appendix J. 93.75% of students (n=15) indicated that they would be interested in taking the assessment again (1) to measure change over the course of their program, (2) to contribute to both research and the lives of children with ASD, and/or (3) due to the assessment's simplicity. Participants shared that the most useful aspects of the assessment included the (1) multiple choice scenarios, (2) definitions provided for unknown terms, and/or (3) the ability to evaluate their confidence using a scale. Finally, participants were also asked to identify the least useful aspects of the assessment. Participants shared the least useful aspects included (1) being unsure about whether to answer questions as a pre-professional student, or as if they were a professional, (2) a particularly time-intense item regarding previous coursework, and/or (3) the impact that perceived lack of knowledge had on participating in the assessment.

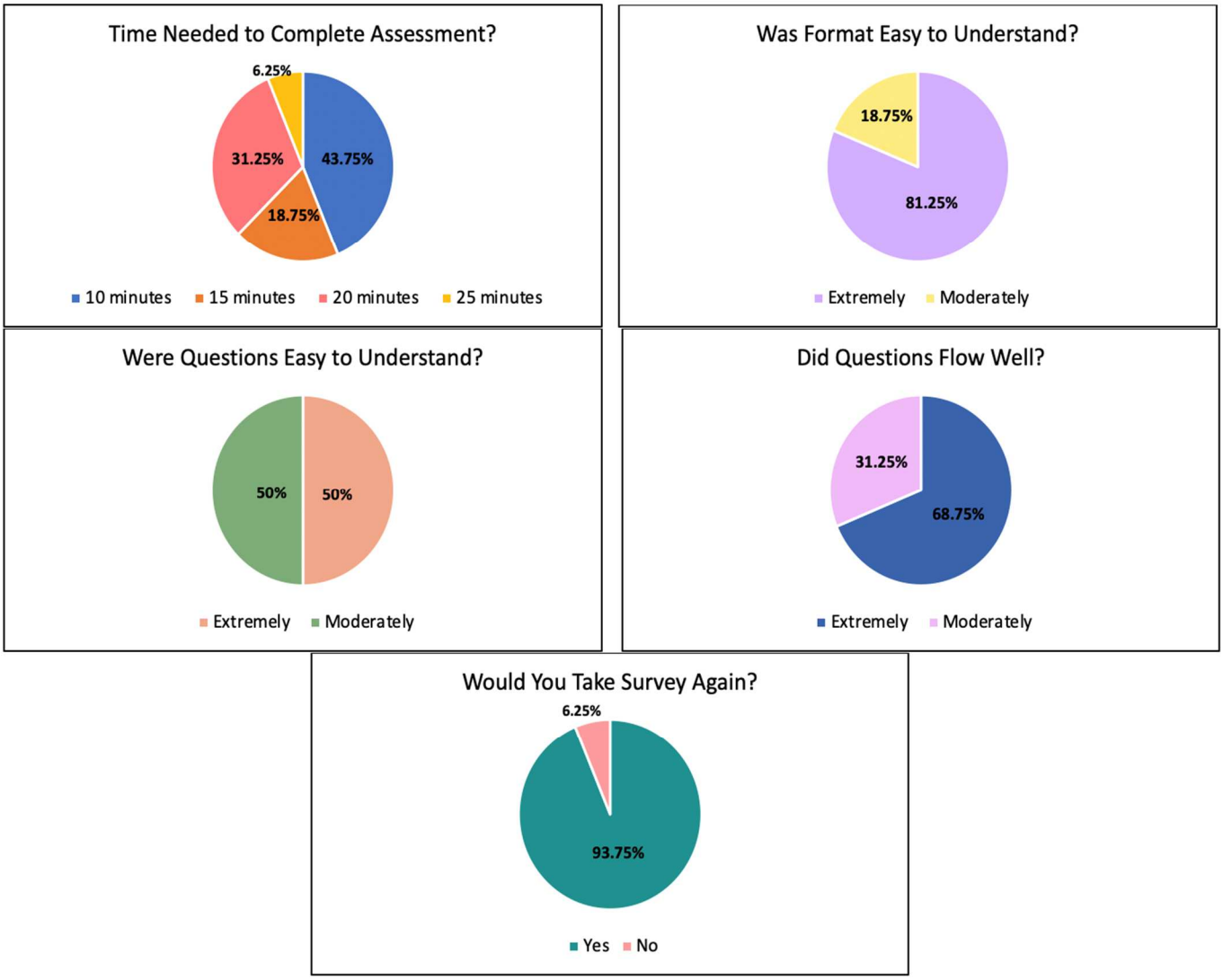
Table 8

Face Validation Quantitative Results

	Participants (n=16)	
Variable	**n**	**%**
Time to Complete (min)		
10	7	43.75
15	3	18.75
20	5	31.25
25	1	6.25
Questions Easy to Understand		
Extremely	8	50
Moderately	8	50
Not at all	0	0
Format Easy to Understand		
Extremely	13	81.25
Moderately	3	18.75
Not at all	0	0
Questions Flowed Well		
Extremely	11	68.75
Moderately	5	31.25
Not at all	0	0
Would Take Survey Again		
Yes	15	93.75
No	1	6.25

Figure 6

Item-Level Results of Quantitative Face Validation Items



Statistics and Data Analysis: Pilot Data

Pilot data gathered were compiled into Table 9. The major findings within the pilot data gathered were that 100% of students (n=16) in all disciplines believed that their profession plays a collaborative role in providing services to children with ASD and in providing AT services to clients; all participants also agreed that families play a vital role in the implementation of and

adherence to assistive technology in the context of schools; and the majority of participants (>50%) selected the correct response for each of the questions posed in the Knowledge section of the assessment.

Table 9

Pilot Data Results

		Participants (n = 16)	
Domain	**Question**	**n**	**%**
Attitude	**"I believe that my profession plays collaborative role in providing services to children with ASD"**		
	Strongly agree	13	81.25
	Agree	3	18.75
	"I believe that my profession plays a collaborative role in providing AT services to clients"		
	Strongly agree	12	75
	Agree	4	25
	"I believe that, when attempted, no-tech strategies are effective when used with children with ASD"		
	Strongly agree	2	12.50
	Agree	1	6.25
	No opinion	9	56.25
	Disagree	4	25
	"I believe that, when attempted, low-tech strategies are effective when used with children with ASD"		
	Strongly agree	3	18.75
	Agree	10	62.50
	No opinion	3	18.75
	"I believe that, when attempted, high-tech strategies are effective when used with children with ASD"		
	Strongly agree	2	12.50
	Agree	11	68.75
	No opinion	3	18.75
	"I believe that families play a vital role in implementation/adherence to AT in schools"		

	Strongly agree	12	75
	Agree	4	25
	"I believe AT implementation/adherence is most successful when recommendations are made with interdisciplinary collaboration"		
	Strongly agree	12	75
	Agree	3	18.75
	No opinion	1	6.25
Self-Efficacy	**"I am confident I could implement no-tech strategies in practice with children with ASD"**		
	Strongly disagree	1	6.25
	Disagree	3	18.75
	Agree	7	43.75
	Strongly agree	5	31.25
	"I am confident I could implement low-tech strategies in practice with children with ASD"		
	Strongly disagree	1	6.25
	Disagree	1	6.25
	No opinion	1	6.25
	Agree	7	43.75
	Strongly agree	6	37.50
	"I am confident I could implement high-tech strategies in practice with children with ASD"		
	Strongly disagree	1	6.25
	Disagree	3	18.75
	No opinion	1	6.25
	Agree	9	56.25
	Strongly agree	2	12.50
	"I am confident I could evaluate a student with ASD to determine the most effective AT device for their needs within my scope of practice"		
	Strongly disagree	1	6.25
	Disagree	6	37.50
	No opinion	2	12.50
	Agree	7	43.75
	"I am confident I could write clear and measurable goals that align with the student's needs related to AT within an IEP"		
	Strongly disagree	1	6.25
	Disagree	6	37.50
	No opinion	1	6.25

	Agree	6	37.50
	Strongly agree	2	12.50
	"I am confident I could write thorough AT evaluation reports within a child's IEP"		
	Strongly disagree	2	12.50
	Disagree	7	43.75
	No opinion	3	18.75
	Agree	3	18.75
	Strongly agree	1	6.25
	"I am confident I could teach paraprofessionals, teachers, other school professionals about AT devices and strategies that I recommend"		
	Strongly disagree	2	12.50
	Disagree	3	18.75
	No opinion	2	12.50
	Agree	8	50.00
	Strongly agree	1	6.25
	"I am confident I could teach parents and families about AT devices and strategies that I recommend"		
	Strongly disagree	2	12.50
	Disagree	2	12.50
	No opinion	3	18.75
	Agree	7	43.75
	Strongly agree	2	12.50
	"I am confident I could collaborate with professionals in other disciplines to provide the best recommendations for AT strategies and devices for children with ASD"		
	Strongly disagree	1	6.25
	Disagree	4	25.00
	Agree	9	56.25
	Strongly agree	2	12.50
Knowledge	**"The most appropriate no-tech strategy aimed to enhance motor skills in children with ASD is ___"**		
	strategic scheduling of interactions.	3	18.75
	*modeling movements.	13	81.25
	"The most appropriate low-tech device aimed to enhance expressive communication skills in children with ASD is ___"		
	*Picture Exchange Communication System (PECS).	13	81.25
	a visual calendar.	3	18.75

"The most appropriate high-tech device aimed to enhance social skills in children with ASD is a(n) ___"		
social script.	1	6.25
*AAC application on iPad.	15	93.75
"An appropriate AT device or strategy to address decreased fine motor skills in children with ASD is ___"		
communication boards.	1	6.25
*elastic shoelaces.	15	93.75
"The purpose of most AT interventions is to ___ a child with ASD to perform functional activities"		
rehabilitate	1	6.25
*enable	14	87.50
remediate	1	6.25
"Environmental factors are important to consider when making recommendations for AT for children with ASD. Environmental factors include ___"		
*family dynamics in the home.	13	81.25
child-specific behavioral deficits.	1	6.25
physical size of the child.	2	12.50
"The low-tech alternative writing strategy that is best suited for children with ASD who have decreased grip strength is ___"		
typing in word processor.	1	6.25
*an alternative pencil grip.	15	93.75
"The movement strategy that is least useful in allowing children with ASD to process information during class would be ___"		
standing at a desk.	6	37.50
sitting on a dynamic seat cushion.	1	6.25
*throwing bean bags.	9	56.25
"According to the Centers for Disease Control and Prevention (CDC), ASD is not ___"		
*due to childhood vaccinations.	16	100.00
"When determining related services for a student, the primary consideration should be ___"		
*the student's goals, derived from identified areas of need.	16	100.00
"A visual support that is used to communicate a sequence of events or to reinforce completion of a non-preferred activity is a(n) ___"		
*first-then board.	16	100.00

"A strategy that involves having a child with ASD watch a video of another child performing a target behavior is ___"			
	video self-modeling.	1	6.25
	*video modeling.	15	93.75

Note. "*" indicates the correct response for the Knowledge questions

Discussion

The purpose of this investigation was to examine content and face validity of the Assessment of Pre-Professional Students' Attitudes, Self-Efficacy, and Knowledge in Assistive Technology and ASD. With any given assessment tool, it is important that the tool measures what the authors claim that it measures, and that members of the target population are motivated to participate in the assessment. In addition, this study included the reporting of pilot data to support the need for additional, future research. The discussion is organized based on the three components of the study: content validation, face validation, and pilot data.

Content Validation

The results of this study lead to the conclusion that the items within the Assessment of Pre-Professional Students' Attitudes, Self-Efficacy and Knowledge in Assistive Technology and ASD are both clear and essential. The process of determining items to be included in the final assessment, with use of the CVR, was rigorous and ensured items with the highest level of expert agreement (CVR greater than or equal to 0.80) were included in the final version of the assessment. The CVI, or content validity for the entire instrument, was 0.579 after the first round with six total items removed based on content expert feedback.

Problem areas identified after the first round included posing a question with more than one potential "correct" answer, posing questions with too many complex words and posing questions that were too broad. This feedback aligns closely with the criteria for multiple-choice questions, as outlined by Fredrick J. Kelly (1916) who is cited as the developer of the multiple-choice item format (Gierl, Bulut, Guo, & Zhang, 2017; Rogers, 1995). Kelly's three criteria for a multiple-choice item are: a) the item should be interpreted by all students the same way; b) the

item should target a single problem so the answer is completely right or completely wrong, and c) the difficulty level of the item should not depend on obscure words (Gierl et al., 2017). After the first round of content validation, significant time was spent revising existing items (n=19) and creating new items (n=10) that satisfied the above criteria for multiple-choice items.

The revised items, along with the additional items included in the second round of content validation, were viewed as clearer and more essential by content validators. Content validity established for the final version of the assessment (CVI=0.939) was high, as the established CVI value specifying adequate validity ranges from 0.70-0.80 (Tilden et al., 1990; Davis, 1992). Where six items were removed during the first round of content validation, only three were removed during the second round. Item-level CVR was also high after the second round, with 12/28 of items being scored as a 1.00 CVR which indicates the highest level of validity and agreement among content validators (Ayre & Scally, 2014).

Face Validation

The results of this study also suggest that the majority of pre-professional students would be willing to take the survey again, thought questions flowed extremely well, and found the format extremely easy to understand. Many students shared that they would be interested in taking the survey again to measure change over the course of their academic program, with use of the assessment as an outcome measure. This assessment is intended for use by pre-professional students who anticipate working in a school-based setting with children with ASD, and the U.S. Department of Education along with the Office of Special Education Programs (OSEP) share that they would like to measure “the percentage of scholars completing preparation programs who are knowledgeable and skilled in evidence-based practices for

children with disabilities" (2018). In this way, the assessment could be used in the future to validate the efficacy of training programs provided through OSEP. Students also shared they would take the assessment again due to the positive impact they feel they had, and also based on the simplicity of the items and assessment as a whole.

When students were asked about the most useful aspects of the assessment, three shared themes were discovered: inclusion of multiple-choice items, the provided definitions for specific terms, and the ability to evaluate self-efficacy (confidence). Previous research has identified that, specifically for SLP students, experience working with children with ASD leads to greater confidence in practice, however, self-assessment of confidence, skills, and knowledge in working with children with ASD varies depending on the timing of clinical training and coursework (Cascella & Colella, 2004; Plumb & Plexico, 2013; Schwartz & Drager, 2008). Thus, utilization of this assessment in the future as a potential outcome measure would be useful in considering how the progression of coursework and clinical experiences may influence attitudes, self-efficacy, and knowledge.

Finally, the reported least useful areas of the assessment were inclusion of a particularly time-intensive item, illuminating students' perceived lack of knowledge in the content area, and an unclear perspective on how to answer some items. To address the unclear perspective, an additional sentence was added to the beginning of each domain that clarified that each item was to be rated based on their perspective currently as a student, not as if they were a clinician. The time-intensive item included in the assessment prompted students to record all of the courses they have taken related to ASD and/or assistive technology. This is an important item to include within the assessment, as this directly relates to their level of experience and

potential knowledge. Some students recommended providing a prompt at the beginning of the assessment suggesting that students have their transcripts with them to assist in that particular item. Interestingly, when considering participant drop-off (see Appendix I), 6 out of the 9 participants who started the assessment but did not complete it, terminated their participation after being introduced to the time-intensive item. Moving forward, this item may be relocated to the end of the assessment so that students have a greater likelihood of participating in the entirety of the assessment. Providing a warning at the beginning of the assessment that having transcripts would be useful for that item may also increase participation in that particular item.

Pilot Data

The purpose of collecting pilot data was to first determine if the items included in the assessment were comprehensible and easy to understand from the student perspective, and second to determine the potential need for further testing. Pilot testing can allow researchers to see if there are any ambiguities or if there are misleading, inappropriate, or redundant questions (De Vaus, 1993). This data can also serve to inform the researcher about the research process and likely outcomes. This allows the researcher to make necessary changes to an instrument prior to conducting a larger study (Cope, 2015). In order to receive meaningful feedback from participants on the face validity of the instrument, they were asked to complete the assessment in its entirety first.

Throughout the 'attitude' domain, the majority of students agreed or strongly agreed that their profession plays a collaborative role in providing AT services and providing services to children with ASD. The majority of participants also believed that no-tech (62.50%), low-tech (81.25%), and high-tech (81.25%) strategies are effective when implemented with children with

ASD. Interestingly, the only item that students responded “disagree” to was the item regarding the use of no-tech strategies for children with ASD. Researchers who have conducted research related to the perceptions of school-based professionals regarding the various levels of assistive technology have found that professionals are less aware of the strategies that qualify as “no-tech” or “low-tech” assistive technology (Jacobsen, 2012). However, when given examples of no-tech and low-tech assistive technology strategies, school-based professionals were better able to identify and see value in the use of these strategies (Derer, Polsgrove, & Rieth, 1996; Jacobsen, 2012). Edyburn (2006) shares that a barrier to assistive technology implementation is related to the broad federal definition of assistive technology. While the ‘attitude’ domain questions regarding the levels of assistive technology did include a definition of each level, they did not include examples. Perhaps the use of examples would have allowed participants to better understand the use of no-tech assistive technology strategies for children with ASD.

Throughout the “self-efficacy” domain of the assessment, the majority of participants either agreed or strongly agreed that they could implement no-, low-, and high-tech strategies in practice with children with ASD. The majority also believed they could teach school professionals, professionals in other disciplines, and parents/families about AT devices and strategies that they recommended. Only 25% of participants reported feeling confident that they could write a thorough AT evaluation within a child’s IEP, and 56.25% reported feeling confident that they could identify the most appropriate AT strategy for a child with ASD. While the majority of students reported feeling a high level of self-efficacy in identifying appropriate AT strategies for children with ASD, a large number also reported low levels of self-efficacy. This finding is supported in previous literature, where special education teachers and speech

language pathologists have reported 'serious shortcomings in preservice training' related to assistive technology (Chmiliar, 2007, p. 14). Addressing students perceived low self-efficacy in writing a thorough AT evaluation is also important as assistive technology is a required component of a student's IEP and must be considered each time an IEP is revisited (Koch, 2017).

Over the course of the "knowledge" domain of the assessment, greater than 50% of participants selected the correct response for each question. The questions in this particular section spanned the scope of all disciplines included in the survey, thus some questions may have been more directly related to some disciplines than others. However, even with this design in the knowledge section, students demonstrated the ability to select correct responses for the majority of questions. Over 80% of respondents chose the correct response for all items except for one. Specifically, respondents had the most difficulty with the item regarding the least useful movement strategy in allowing children with ASD to process information. The most commonly chosen responses were the correct response, throwing bean bags (56.25%), and standing at a desk (37.50%). Perhaps respondents selected the most useful movement strategy, rather than the least useful strategy. 100% of respondents selected the correct response for 3/12 knowledge questions.

Evaluating the knowledge of pre-professional students who intend to work with children with ASD is important as parents want their children with ASD to be educate and supported by professionals who are knowledgeable of the disorder. However, undertrained professionals may develop issues with parents, or provide lesser quality of care, if their knowledge is deemed less than adequate (Friend & Cook, 2010; Scheuermann et al., 2003). In this way, the

assessment would be useful to implement as an outcome measure to indicate the level of knowledge students have at the beginning and end of their schooling.

Limitations

Sampling

A convenience sample was used to select participants for the content validation portion of this study, with the subsequent use of snowball sampling where identified participants provided references for additional professionals who would be a good fit for the study. The use of snowball sampling introduces selection bias into the study, where participants may be more likely to recommend additional participants with similar characteristics or views. All participants in the content validation portion volunteered participation and resided in the same geographical region. Perhaps the perspectives obtained from the volunteer experts in this study are different than the perspectives of those professionals who chose not to participate.

Participant Drop-Out

Given the length of time required to perform the two-step content validation process, and the onset of a global pandemic at the tail-end of the content validation process, there was also a reduction in content validators from the first round (n=12) to the second round (n=10). The loss of these two content validators may have influenced the results of the second round of content validation. There were also nine students who initiated participation in the face validation/pilot portion of the study and terminated participation prior to completion of all aspects of the study. 6 out of the 9 total participants who did not complete the face validation/pilot portion dropped out when asked about previous coursework, which was

reported as a time-intensive item. This drop-off limited the total number of participants in the study and further limited the generalizability of findings.

Generalizability

In terms of the generalizability of the results gathered in this study, it is important to note that there are differences between the target population as a whole (pre-professional students) and the accessed sample in this study. The academic institution at which this study took place offers an Assistive Technology and Accessible Design (ATAD) certificate that provides students with specialized coursework and attracts professors with specialized knowledge and experience in this area. Thus, pre-professional students who have an interest in working with assistive technology may be more likely to attend this university for their schooling. This further contributes to the belief that the results of this pilot study may not be generalizable to the attitudes, self-efficacy, and knowledge of pre-professional students across the country or the world.

Implications

The results of this study indicate that content validity has been established for the Assessment of Pre-Professional Students' Attitudes, Self-Efficacy and Knowledge in Assistive Technology and ASD. The face validation portion of the study provided important information regarding the length of time the assessment takes to complete, the assessment's strengths and weaknesses, and recommendations to further strengthen the assessment. Results of the face validation portion have resulted in clarified instructions and altered placement of a specific item within the assessment. The pilot data reported in this study also indicate that the majority of students included in this study have strong perceived attitudes and self-efficacy related to assistive technology use in children with ASD and have demonstrated knowledge in this area as well. The results of this portion of the study support future research to better understand differences in attitudes, self-efficacy, and knowledge between the disciplines included in this study on a larger scale.

The sample of students who participated in the pilot data/face validation portion of the study were primarily between the ages of 18-24. Future research may investigate the attitudes, self-efficacy, and knowledge that 'second-career' students, or students who are returning to school after having previously worked in a different field, have related to assistive technology use in children with ASD. 'Second-career' students may have more life experience to contribute to their responses throughout the assessment.

The results of this study support the need and highlight potential benefits of using validated outcome measures to demonstrate changes in attitudes, self-efficacy, and knowledge over the course of professional or training programs. The use of an outcome measure could

further validate the strengths of a program, while also highlighting potential areas of weaknesses and potential areas for growth. As stated previously, national training programs, like the ones created by OSEP, benefit from the use of outcome measures to support the need and benefit. On a larger scale, the goal of using of this assessment as an outcome measure may ultimately result in incoming professionals who have higher levels of self-efficacy and knowledge, with greater attitudes about the impact they can have when working with children with ASD and assistive technology.

Future research should include an additional round of content validation with a new set of content validations, as well as implementation of the assessment with a greater number of pre-professional students across a larger geographical area to investigate differences between disciplines in their attitudes, self-efficacy, and knowledge. To address the time-intensive nature of one of the items, future research and development of this assessment could include an adapted checklist where participants could check off the various experiences (number of credits of coursework, hours of clinical experience, work history) that they have had related to ASD and assistive technology. To assess its sensitivity, the assessment could also be implemented at the beginning and end of a specific training program, or a dedicated course related to assistive technology. This could help determine if the assessment is sensitive to changes in students' knowledge related to assistive technology/ASD, as well as potential changes in their attitudes and/or self-efficacy. The introduction of the survey at the beginning and end of a specific training program or course could also support its use as an outcome measure.

References

Academy of Pediatric Physical Therapy. (2014). Practice recommendations for the school-based physical therapy evaluation of children with autism spectrum disorder. Retrieved April 3, 2019, from https://pediatricapta.org/includes/fact-sheets/pdfs/14%20Prac%20Rec%20for%20Schools%20for%20Eval%20of%20Autism.pdf

Agrawal, S., Rao, S. C., Bulsara, M. K., & Patole, S. K. (2018). Prevalence of autism spectrum disorder in preterm infants: A meta-analysis. *Pediatrics,142*(3). doi:10.1542/peds.2018-0134

Ahmedani, B. K., & Hock, R. M. (2012). Health care access and treatment for children with co-morbid autism and psychiatric conditions. *Social Psychiatry and Psychiatric Epidemiology,47*(11), 1807-1814. doi:10.1007/s00127-012-0482-0

Alkahtani, K. D. F. (2013). Teachers' knowledge and use of assistive technology for students with special educational needs. *Journal of Studies in Education*, *3*(2). doi: 10.5296/jse.v3i2.3424

Allport, G. W. (1935). Attitudes. In Murchison C. (Ed.), *Handbook of social psychology*. Worcester, MA: Clark University Press

Alzrayer, N. M., Banda, D. R., & Koul, R. (2017). Teaching children with autism spectrum disorder and other developmental disabilities to perform multistep requesting using an iPad. *Augmentative and Alternative Communication,33*(2), 65-76. doi:10.1080/07434618.2017.1306881

American Occupational Therapy Association. (2014). Occupational therapy practice framework:

Domain and process. *American Journal of Occupational Therapy,68*(Supplement_1). doi:10.5014/ajot.2014.68s1

American Occupational Therapy Association. (2018). Occupational Therapy's Role with Autism. Retrieved March 30, 2019, from https://www.aota.org/-q /media/corporate/files/aboutot/professionals/whatisot/cy/fact-sheets/autism fact sheet.pdf

American Occupational Therapy Association. (2019). What is Occupational Therapy? Retrieved March 30, 2019, from https://www.aota.org/Conference-Events/OTMonth/what-is-OT.aspx

American Physical Therapy Association APTA. (2018, July 1). *Physical therapy for people with autism*. https://www.apta.org/apta-magazine/2018/07/01/physical-therapy-for-people-with-autism.

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

American Psychology Association. (2017, January). Diagnosing and managing autism spectrum disorder (ASD). Retrieved April 3, 2019, from https://www.apa.org/helpcenter/autism

American Psychology Association. (n.d.). A career in clinical or counseling psychology. Retrieved April 3, 2019, from https://www.apa.org/action/science/clinical/education-training

American Speech-Language-Hearing Association. (n.d. -a). Autism Spectrum Disorder: Roles

and Responsibilities. Retrieved April 3, 2019, from https://www.asha.org/PRPSpecificTopic.aspx?folderid=8589935303§ion=Roles_and_Responsibilities

American Speech-Language-Hearing Association. (n.d. -b). Learn about the CSD professions: Speech-language pathology. Retrieved April 3, 2019, from https://www.asha.org/students/speech-language-pathology/

Angelo, D. H. (1997). AAC in the family and home. In S. Glennen & D. Decoste (Eds.), *Handbook of augmentative and alternative communication* (pp. 523–541). San Diego, CA: Singular.

Asaro-Saddler, K., & Saddler, B. (2010). Planning instruction and self-regulation training: Effects on writers with autism spectrum disorders. *Exceptional Children,77*(1), 107-124. doi:10.1177/001440291007700105

Auert, E., Trembath, D., Arciuli, J., & Thomas, D. (2012). Parents' expectations, awareness, and experiences of accessing evidence-based speech-language pathology services for their children with autism. *International Journal of Speech-Language Pathology,14*(2), 109-118. doi:10.3109/17549507.2011.652673

Ayre, C., & Scally, A. J. (2014). Critical values for Lawshe's Content Validity Ratio: Revisiting the original methods of calculation. *Measurement and Evaluation in Counseling and Development*, *47*(1), 79–86. https://doi.org/10.1177/0748175613513808

Ayres, A. J. (1979). *Sensory integration and the child.* Los Angeles: Western Psychological Services.

Baio, J., & Centers for Disease Control and Prevention. (2014) Prevalence of autism spectrum

disorders – Autism and developmental disabilities monitoring network, 11 sites, United States, 2014, *MMWR Surveillance Summaries,67*(6), pp. 1–23.

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), *Encyclopedia of human behaviour*. Vol. 4. (pp. 71-81). New York: Academic Press.

Bandura, A. (Ed.) (1995). *Self-efficacy in changing societies.*Cambridge: Cambridge University Press.

Batorowicz, B., & Shepherd, T. A. (2011). Teamwork in AAC: Examining Clinical Perceptions. *Augmentative and Alternative Communication,27*(1), 16-25. doi:10.3109/07434618.2010.546809

Baum, C. M., Christiansen, C.H., & Bass, J. B. (2015). The person-environment-occupational performance (PEOP) model. In C.M., Baum, C.H., Christiansen, & J.B. Bass (Eds.), *Occupational therapy: Performance, participation, and well-being* (pg. 49-55). Thorofare, NJ: Slack.

Bedwani, M. N., Bruck, S., & Costley, D. (2015). Augmentative and alternative communication for children with autism spectrum disorder: An evidence-based evaluation of the Language Acquisition through Motor Planning (LAMP) programme. *Cogent Education,2*(1). doi:10.1080/2331186x.2015.1045807

Behrmann, M. & Schaff, J. (2001). Assisting educators with assistive technology: Enabling children to achieve independence in living and learning. *Children and Families 42*(3), 24-28.

Berg, J. M., & Geschwind, D. H. (2012). Autism genetics: Searching for specificity and convergence. *Genome Biology,13*(7), 247. doi:10.1186/gb-2012-13-7-247

Bickel, J., Bridgemohan, C., Sideridis, G., & Huntington, N. (2015). Child and family characteristics associated with age of diagnosis of an autism spectrum disorder in a tertiary care setting. *Journal of Developmental & Behavioral Pediatrics,36*(1), 1-7. doi:10.1097/dbp.0000000000000117

Blackhurst, A. E. (2005). Historical perspectives about technology applications for people with disabilities. In D. Edyburn, K. Higgins, & R. Boone (Eds.), *Handbook of special education technology research and practice* (pp. 3-31). Whitefish Bay, WI: Knowledge by Design.

Blackhurst, E., & National Assistive Technology Research Institute. (2001). What is assistive technology? Retrieved from http://natri.uky.edu/resources/fundamentals/defined.html

Bolarinwa, O. (2015). Principles and methods of validity and reliability testing of questionnaires used in social and health science researches. *Nigerian Postgraduate Medical Journal*, *22*(4), 195. doi: 10.4103/1117-1936.173959

Bondoc, S., Goodrich, B., Gitlow, L., & Smith, R. O. (2016). Assistive technology and occupational performance. *American Journal of Occupational Therapy,70*(Supplement_2). doi:10.5014/ajot.2016.706s02

Borling, A., & Mumm, A. (2009). Autism spectrum disorders and the roles of the school social worker. Retrieved April 3, 2019, from https://www.socialworkers.org/assets/secured/documents/sections/school/newsletters/2009%20School%20Social%20Work%20Newsletter%20-%20Issue%202.pdf

Bouck, E. C. (2017). *Assistive technology*. Los Angeles: Sage Publications.

Brock, M. E., Freuler, A., Baranek, G. T., Watson, L. R., Poe, M. D., & Sabatino, A. (2012).

Temperament and sensory features of children with autism. *Journal of Autism and Developmental Disorders,42*(11), 2271-2284. doi:10.1007/s10803-012-1472-5

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist*, *32*(7), 513–531. doi: 10.1037/0003-066x.32.7.513

Brown, N. B., & Dunn, W. (2010). Relationship between context and sensory processing in children with autism. *American Journal of Occupational Therapy, 64*(3), 474-483. http://dx.doi.org/10.5014/ajot.2010.09077

Cardon, T. A., Wilcox, M. J., & Campbell, P. H. (2011). Caregiver perspectives about assistive Technology use with their young children with autism spectrum disorders. *Infants & Young Children,24*(2), 153-173. doi:10.1097/iyc.0b013e31820eae40

Carey, D. M., & Sale, P. (1994). Practical considerations in the use of technology to facilitate the inclusion of students with severe disabilities. *Technology and Disability,3*(2), 77-86. doi:10.3233/tad-1994-3203

Caron, J., Light, J., Davidoff, B. E., & Drager, K. D. (2017). Comparison of the effects of mobile technology AAC apps on programming visual scene displays. *Augmentative and Alternative Communication*,33(4), 239-248. doi:10.1080/07434618.2017.1388836

Cascella, P. W., & Colella, C. S. (2004). Knowledge of autism spectrum disorders among Connecticut school speech-language pathologists. *Focus on Autism & Other Developmental Disabilities, 19*, 245-252. doi: https://doi.org/10.1177/ 10883576040190040601

Case-Smith J., & O'Brien J. C. (2015). *Occupational therapy for children and adolescents.* Maryland Heights, MO: Elsevier Mosby.

Casey, L. B., & Elswick, S. E. (2011). The social workers role in the assessment of autism spectrum disorder. *Children & Schools,33*(3), 176-183. doi:10.1093/cs/33.3.176

Chaiklin, H. (2011). Attitudes, behavior, and social practice. *The Journal of Sociology & Social Welfare,38*(1), 31-54.

Chang, Y., & Locke, J. (2016). A systematic review of peer-mediated interventions for children with autism spectrum disorder. *Research in Autism Spectrum Disorders,27*, 1-10. doi:10.1016/j.rasd.2016.03.010

Chiang, C., Soong, W., Lin, T., & Rogers, S. J. (2008). Nonverbal communication skills in young children with autism. *Journal of Autism and Developmental Disorders,38*(10), 1898-1906. doi:10.1007/s10803-008-0586-2

Chmiliar, L. (2007). Perspectives on assistive technology: What teachers, health professionals, and speech and language pathologists have to say. *Developmental Disabilities Bulletin, 35*(1-2), 1-17.

Christiansen, C., & Baum, C. (1991). *Occupational therapy: Overcoming human performance deficits.* Thorofare, NJ: Slack.

Christiansen, C., Baum, C. M., & Bass-Haugen, J. D. (2005). *Occupational therapy: Performance, participation and well-being* (3rd ed.). Thorofare, NJ: Slack.

Clark, M. L., Austin, D. W., & Craike, M. J. (2014). Professional and parental attitudes toward iPad application use in autism spectrum disorder. *Focus on Autism and Other Developmental Disabilities*, 1088357614537353.

Colby, K. M. (1973). The rationale for computer-based treatment of language difficulties in

nonspeaking autistic children. *Journal of Autism and Childhood Schizophrenia, 3*, 254–260.

Cope, D. (2015). Conducting pilot and feasibility studies. *Oncology Nursing Forum, 42*(2), 196-197. doi:10.1188/15.onf.196-197

Copley, J., & Ziviani, J. (2004). Barriers to the use of assistive technology for children with multiple disabilities. *Occupational Therapy International,11*(4), 229-243. doi:10.1002/oti.213

Costigan, F. A., & Light, J. (2010). A review of preservice training in augmentative and alternative communication for speech-language pathologists, special education teachers, and occupational therapists. *Assistive Technology, 22*(4), 200-212. doi:10.1080/10400435.2010.492774

Cramer, M., Hirano, S. H., Tentori, M., Yeganyan, M. T., & Hayes, G. R. (2011). Classroom-based assistive technology. *Proceedings of the 2011 Annual Conference on Human Factors in Computing Systems - CHI 11*. doi:10.1145/1978942.1978944

Daubert, A., Hornstein, S., & Tincani, M. (2014). Effects of a modified power card strategy on turn taking and social commenting of children with autism spectrum disorder playing board games. *Journal of Developmental and Physical Disabilities,27*(1), 93-110. doi:10.1007/s10882-014-9403-3

Davis, L. (1992). Instrument review: Getting the most from your panel of experts. *Applied Nursing Research, 5*, 194-197.

Derer, K., Polsgrove, L., & Rieth, H. (1996). A survey of assistive technology applications in

schools and recommendations for practice. *Journal of Special Education Technology, 13*, 62-80.

Devon, H. A., Block, M. E., Moyle-Wright, P., Ernst, D. M., Hayden, S. J., Lazzara, D. J., … Kostas-Polston, E. (2007). A psychometric toolbox for testing validity and reliability. *Journal of Nursing Scholarship*, *39*(2), 155–164. https://doi.org/10.1111/j.1547-5069.2007.00161.x

Dietz, A., Quach, W., Lund, S. K., & McKelvey, M. (2012). AAC assessment and clinical-decision making: The impact of experience. *Augmentative & Alternative Communication, 28*, 148–159. doi:10.3109/07434618.2012.704521

Donato, C., Shane, H. C., & Hemsley, B. (2014). Exploring the feasibility of the Visual Language in Autism program for children in an early intervention group setting: Views of parents, educators, and health professionals. *Developmental Neurorehabilitation,17*(2), 115-124. doi:10.3109/17518423.2014.880526

Edyburn, D. L. (2006). Cognitive prostheses for students with mild disabilities: Is this what assistive technology looks like? *Journal of Special Education Technology, 21*, 62-65.

Edyburn, D. L., Higgins, K., & Boone, R. (2005). *Handbook of special education technology research and practice*. Whitefish Bay, WI: Knowledge by Design.

Elder, J. H., Brasher, S., & Alexander, B. (2016). Identifying the barriers to early diagnosis and treatment in underserved individuals with autism spectrum disorders (ASD) and their families: A qualitative study. *Issues in Mental Health Nursing,37*(6), 412-420. doi:10.3109/01612840.2016.1153174

Evans, G. W. (2006). Child development and the physical environment. *Annual Reviews of*

Psychology, 57(1), 423-451. http://dx.doi.org/10.1146/annurev.psych.57.102904.190057

Faucett, H. A., Ringland, K. E., Cullen, A. L., & Hayes, G. R. (2017). (In)visibility in disability and assistive technology. *ACM Transactions on Accessible Computing,10*(4), 1-17. doi:10.1145/3132040

Fittipaldi-Wert, J., & Mowling, C. M. (2009). Using visual supports for students with autism in physical education. *Journal of Physical Education, Recreation & Dance,80*(2), 39-43. doi:10.1080/07303084.2009.10598281

Friend, M. D., & Cook, L. (2010). *Interactions: Collaboration skills for school professionals.* (6th ed.) California State University: Pearson Publishing Inc.

Frost, L. A. & Bondy, A.S. (1996). The Picture Exchange Communication System training manual. Cherry Hill, NJ: Pyramid Educational Consultants, Inc.

Ganz, J.B., Earles-Vollrath, T.L., Heath, A.K., Parker, R.I., Rispoli, N.J., & Duran, J.B. (2012). A meta-analysis of single case research studies on aided augmentative and alternative communication systems with individuals with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 42*, 60–74. doi:10.1007/s10803-011-1212-2.

Gaskin, G., Hoffman, C., & Turner, J. (2015). Aiko & Egor: Animation 4 Autism App. Retrieved May 23, 2019, from https://www.seebeneath.org/

Gierl, M. J., Bulut, O., Guo, Q., & Zhang, X. (2017). Developing, analyzing, and using distractors for multiple-choice tests in education: A comprehensive review. *Review of Educational Research*, *87*(6), 1082–1116. https://doi.org/10.3102/0034654317726529

Gilbert, G. E., & Prion, S. (2016). Making sense of methods and measurement: Lawshe's content

validity index. *Clinical Simulation in Nursing*, *12*(12), 530–531. doi: 10.1016/j.ecns.2016.08.002

Goldstein, H. (2002). Communication intervention for children with autism: A review of treatment efficacy. *Journal of Autism and Developmental Disorders,32*(5), 373-396.

Goldstein, M. J. (1960). The social desirability variable in attitude research. *The Journal of Social Psychology*, *52*(1), 103–108. doi: 10.1080/00224545.1960.9922065

Gustafson, G. S. (2006, April 24). The assistive technology skills, knowledge, and professional development needs of special educators in southwestern Virginia (Unpublished doctoral dissertation). Virginia Polytechnic Institute and State University, Blacksburg VA.

Haney, M. R. (2012). *Understanding children with autism spectrum disorders: Educators partnering with families*. Newbury Park, CA: SAGE.

Haynes, S.N., Richard, D.C.S., & Kubany, E.S. (1995). Content validity in psychological assessment: A functional approach to concepts and methods. *Psychological Assessment, 7*(3), 238-247.

Hoscoe, B. (2014). Assistive technology and the promotion of inclusion for special needs children in public schools: A grant proposal. (Unpublished master's thesis). California State University, Long Beach CA.

Hutinger, P., Johanson, J., & Stoneburner, R. (1996). Assistive technology applications in educational programs of children with multiple disabilities: A case study report on the state of the practice. *Journal of Special Education Technology, 13*(1), 16 - 35.

Jacobsen, D. (2012). Assistive technology for students with disabilities: Resources and

challenges encountered by teachers. (Unpublished doctoral dissertation). University of Northern Iowa, Cedar Falls IA.

Jasmin, E., Couture, M., Mckinley, P., Reid, G., Fombonne, E., & Gisel, E. (2008). Sensori-motor and daily living skills of preschool children with autism spectrum disorders. *Journal of Autism and Developmental Disorders,39*(2), 231-241. doi:10.1007/s10803-008-0617-z

Jeffs, T., Behrmann, M., & Bannan-Ritland, B. (2006). Assistive technology and literacy learning: Reflections of parents and children. *Journal of Special Education Technology, 21*(1), 37-44.

Kanny, E. M., & Anson, D. K. (1998). Current trends in assistive technology education in entry-level occupational therapy curricula. *American Journal of Occupational Therapy*, *52*(7), 586–591. doi: 10.5014/ajot.52.7.586

Kelly, F. J. (1916). The Kansas Silent Reading Tests. *Journal of Educational Psychology*, *7*(2), 63–80. https://doi.org/10.1037/h0073542

Kintsch, A., & DePaula, R. (2002). A framework for the adoption of assistive technology. Retrieved March 30, 2019, from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.124.3726&rep=rep1&type=pdf

Kline, P. (2013). *Handbook of Psychological Testing*. Florence: Taylor and Francis.

Knight, V., Mckissick, B. R., & Saunders, A. (2013). A review of technology-based

interventions to teach academic skills to students with autism spectrum disorder. *Journal of Autism and Developmental Disorders,43*(11), 2628-2648. doi:10.1007/s10803-013-1814-y

Koch, K. (2017). Stay in the box! Embedded assistive technology improves access for students with disabilities. *Education Sciences*, *7*(4), 82. https://doi.org/10.3390/educsci7040082

Kogan, M. D., Strickland, B. B., Blumberg, S. J., Singh, G. K., Perrin, J. M., & Dyck, P. C. (2008). A National profile of the health care experiences and family impact of autism spectrum disorder among children in the United States, 2005-2006. *Pediatrics,122*(6). doi:10.1542/peds.2008-1057

Krosnick JA. Questionnaire design. In: Vannette DL, Krosnick JA, editors. *The Palgrave Handbook of Survey Research*. Cham: Palgrave Macmillan (2018), pp. 439–55

Lahm, E. A., & Sizemore, L. (2002). Factors that influence assistive technology decision making. *Journal of Special Education Technology, 17*(1), 15-26

Lancioni, G., Sigafoos, J., O'Reilly, M., & Singh, N. (2013). Assistive technology: Interventions for individuals with severe/profound and multiple disabilities. *Journal of Child and Family Studies,23*(1), 169-171. doi:10.1007/s10826-013-9723-4

Lawshe, C. (1975). A quantitative approach to content validity. *Personnel Psychology, 28*(4), 563-575. http://dx.doi.org/10.1111/j.1744-6570.1975.tb01393.x

Leonard, H. C., Elsabbagh, M., & Hill, E. L. (2013). Early and persistent motor difficulties in infants at-risk of developing autism spectrum disorder: A prospective study. *European Journal of Developmental Psychology*, *11*(1), 18–35. doi: 10.1080/17405629.2013.801626

Lindsay, S. (2010). Perceptions of health care workers prescribing augmentative and alternative communication devices to children. *Disability and Rehabilitation: Assistive Technology,5*(3), 209-222. doi:10.3109/17483101003718195

Litwin, M. S. (1995). *How to measure survey reliability and validity*. Thousand Oaks, CA: Sage.

Lloyd, M., MacDonald, M., & Lord, C. (2013). Motor skills of toddlers with autism spectrum disorders. *Autism, 17*, 133–146. doi:10.1177/ 1362361311402230.

Lode, C. (1992). How technology assists my daughter to compete in the mainstream of life. *Exceptional Parent, 22*(8), 34, 41.

Lofland, K. (n.d.). The use of technology in treatment of autism spectrum disorders. Retrieved March 18, 2019, from https://www.iidc.indiana.edu/pages/the-use-of-technology-in-treatment-of-autism-spectrum-disorders

Long, T. M., & Perry, D. F. (2008). Pediatric physical therapists' perceptions of their training in assistive technology. *Physical Therapy,88*(5), 629-639. doi:10.2522/ptj.20060356

Lorah, E. R., Parnell, A., Whitby, P. S., & Hantula, D. (2014). A systematic review of tablet computers and portable media players as speech generating devices for individuals with autism spectrum disorder. *Journal of Autism and Developmental Disorders,45*(12), 3792-3804. doi:10.1007/s10803-014-2314-4

Lovaas, O. I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology,55*(1), 3-9. doi:10.1037/0022-006x.55.1.3

Lynn, M. (1986). Determination and quantification of content validity. *Nursing Research, 35*, 382-385.

MacDonald, M., Lord, C., & Ulrich, D. A. (2013). The relationship of motor skills and social communicative skills in school-aged children with autism spectrum disorder. *Adapted Physical Activity Quarterly*, *30*(3), 271–282. doi: 10.1123/apaq.30.3.271

Maenner, M., Shaw, K., Baio, J., Washington, A., Patrick, M., DiRienzo, M., Christensen, D., Wiggins, L., Pettygrove, S., Andrews, J., Lopez, M., Hudson, A., Baroud, T., Schwenk, Y., White, T., Rosenberg, C., Lee, L., Harrington, R., Huston, . . . Dietz, P. (2020). Prevalence of autism spectrum disorder among children aged 8 years — Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2016. *MMWR Surveill Summ 2020;69*(No. SS-4):1–12. DOI: http://dx.doi.org/10.15585/mmwr.ss6904a1

McAllister, K., & Maguire, B. (2012). A design model: The autism spectrum disorder classroom design kit. *British Journal of Special Education*, *39*(4), 201–208. doi: 10.1111/1467-8578.12006

McCanlies, E. C., Fekedulegn, D., Mnatsakanova, A., Burchfiel, C. M., Sanderson, W. T., Charles, L. E., & Hertz-Picciotto, I. (2012). Parental occupational exposures and autism spectrum disorder. *Journal of Autism and Developmental Disorders,42*(11), 2323-2334. doi:10.1007/s10803-012-1468-1

McClannahan, L. E. & Krantz, P.J. (1999). Activity schedules for children with autism. Bethesda, MD: Woodbine House.

McCoach, D. B., Gable, R. K., & Madura, J. P. (2014). *Instrument development in the affective domain: School and corporate applications*(3rd ed.). New York, NY: Springer.

McDaniel, J. (2012, April). No-tech and low-tech AAC for children with autism spectrum

disorders (ASD): A guide for parents. Retrieved from https://vkc.mc.vanderbilt.edu/assets/files/resources/aacasd.pdf

McGregor, G., & Pachuski, P. (1996). Assistive technology in schools: Are teachers ready, able, and supported? *Journal of Special Education Technology,13*(1), 4-15. doi:10.1177/016264349601300102

Mills, C., & Chapparo, C. (2017). Listening to teachers: Views on delivery of a classroom based sensory intervention for students with autism. *Australian Occupational Therapy Journal,65*(1), 15-24. doi:10.1111/1440-1630.12381

Missiuna, C., & Pollock, N. (1991). Play deprivation in children with physical disabilities: The role of the occupational therapist in preventing secondary disability. *American Journal of Occupational Therapy, 45*(10): 882-888. http://dx.doi.org/10.5014/ajot.45.10.882

Mitchell, S., Brian, J., Zwaigenbaum, L., Roberts, W., Szatmari, P., Smith, I., & Bryson, S. (2006). Early language and communication development of infants later diagnosed with autism spectrum disorder. *Journal of Developmental & Behavioral Pediatrics,27*(Supplement 2). doi:10.1097/00004703-200604002-00004

Montana Office of Public Instruction. (2017, August). Special education guide to assistive technology. Retrieved April 3, 2019, from https://opi.mt.gov/Portals/182/Page%20Files/Special%20Education/Guides/Assistive%20Technology%20Guide%202017%20FINAL%202-6-18.pdf

Myers, S. M., & Johnson, C. P. (2007). Management of children with autism spectrum disorders. *Pediatrics,120*(5), 1162-1182. doi:10.1542/peds.2007-2362

Nagib, W., & Williams, A. (2016). Toward an autism-friendly home environment. *Housing*

Studies,32(2), 140-167. doi:10.1080/02673037.2016.1181719

Oh, S.-J., Son, H., Kim, S. W., Lee, K.-S., Choo, M.-S., Kim, S.-O., & Lee, M. S. (2012). Psychometric properties of the Korean version of the Overactive Bladder Questionnaire (OAB-q) in a Korean population. *International Neurourology Journal*, *16*(2), 77. doi: 10.5213/inj.2012.16.2.77

Orcher, L. T. (2005). *Conducting research: Social and behavioral science methods* (1st ed.). Glendale, CA: Pyrczak Pub.

Paparella, T., Goods, K. S., Freeman, S., & Kasari, C. (2011). The emergence of nonverbal joint attention and requesting skills in young children with autism. *Journal of Communication Disorders,44*(6), 569-583. doi:10.1016/j.jcomdis.2011.08.002

Peterson, D. (2017). Parental and teacher perspectives on assistive technology (Unpublished doctoral dissertation). University of Minnesota Twin Cities, Minneapolis MN.

Pickens, J. (2005). Attitudes and perceptions. In Borkowski, N. *Organizational behavior in health care*. Sudbury, MA: Jones and Bartlett.

Plumb, A. M., & Plexico, L. W. (2013). Autism spectrum disorders: Experience, training, and confidence levels of school-based speech-language pathologists*. Language, Speech, and Hearing Services in Schools, 44*(1), 89-104. doi: https://doi.org/10.1044/0161-1461(2012/11-0105)

Portney, L. G., & Watkins, M. P. (2015). *Foundations of clinical research: Applications to Practice* (3rd ed.). Philadelphia, PA: F. A. Davis Company.

Ratcliff, A., & Beukelman, D. (1995). Preprofessional preparation in augmentative and

alternative communication: State-of-the-art report. *Augmentative and Alternative Communication, 11*(2), 61-73. doi:10.1080/07434619512331277149

Ratcliff, A., Koul, R., & Lloyd, L. L. (2008). Preparation in augmentative and alternative communication: An update for speech-language pathology training. *American Journal of Speech-Language Pathology, 17*(1), 48-59. doi:10.1044/1058-0360(2008/005)

Rehabilitation Engineering and Assistive Technology Society of North America. (n.d.). ATP General Info. Retrieved April 3, 2019, from https://www.resna.org/atp-general-info

Reynolds, S., Lane, S. J., & Thacker, L. (2011). Sensory processing, physiological stress, and sleep behaviors in children with and without autism spectrum disorders. *OTJR: Occupation, Participation and Health,32*(1), 246-257. doi:10.3928/15394492-20110513-02

Rickards, G., Magee, C., & Artino, A. R. (2012). You can't fix by analysis what you've spoiled by design: Developing survey instruments and collecting validity evidence. *Journal of Graduate Medical Education,4*(4), 407-410. doi:10.4300/jgme-d-12-00239.1

Ries, E. (2018, July). Physical therapy for people with autism. Retrieved April 3, 2019, from https://www.apta.org/PTinMotion/2018/7/Feature/Autism/

Rispoli, M. J., Franco, J. H., Meer, L. V., Lang, R., & Camargo, S. P. (2010). The use of speech generating devices in communication interventions for individuals with developmental disabilities: A review of the literature. *Developmental Neurorehabilitation,13*(4), 276-293. doi:10.3109/17518421003636794

Rogers, T. B. (1995). *The psychological testing enterprise: An introduction*. Brooks/Cole Pub. Co.

Roizen, N. J., Shalowitz, M. U., Komie, K. A., Martinez, S., Miller, L. A., & Davis, S. (1996).

Acquisition of services recommended by a multidisciplinary medical diagnostic team for children under three years of age evaluated for developmental delays. *Journal of Developmental & Behavioral Pediatrics,17*(6), 399-404. doi:10.1097/00004703-199612000-00005

Rubio, D. M., Berg-Weger, M., Tebb, S. S., Lee, E. S., & Rauch, S. (2003). Objectifying content validity: Conducting a content validity study in social work research. *Social Work Research,27*(2), 94-104. doi:10.1093/swr/27.2.94

Salkind, N. J. (2010). *Encyclopedia of research design.* Thousand Oaks, CA: SAGE Publications, Inc. doi: 10.4135/9781412961288

Schaaf, R. C., Benevides, T. W., Kelly, D., & Mailloux-Maggio, Z. (2012). Occupational therapy and sensory integration for children with autism: A feasibility, safety, acceptability and fidelity study. *Autism,16*(3), 321-327. doi:10.1177/1362361311435157

Scheuermann, B., Webber, J., Boutot, E., & Goodwin, M. (2003). Problems with personnel preparation in autism spectrum disorders. *Focus on Autism & Other Developmental Disabilities, 18*(3), 197-206.

Schinka, J., Velicer, W., & Weiner. (2012). *Handbook of Psychology: Vol 3: Research Methods in Psychology*. Chichester: John Wiley & Sons.

Schuh, J. M.; Eigsti, I. M. (2012). Working memory, language skills, and autism symptomatology. *Behav. Sci*., 2, 207–218.

Schwartz, H., & Drager, K. D. R. (2008). Training and knowledge in autism among speech-language pathologists: A survey. *Language, Speech, and Hearing Services in Schools, 39*(1), 66-77. doi: https://doi.org/10.1044/0161-1461(2008/007)

Shane, H. C., Laubscher, E. H., Schlosser, R. W., Flynn, S., Sorce, J. F., & Abramson, J. (2011). Applying technology to visually support language and communication in individuals with autism spectrum disorders. *Journal of Autism and Developmental Disorders,42*(6), 1228-1235. doi:10.1007/s10803-011-1304-z

Sigafoos, J., Lancioni, G. E., O'Reilly, M. F., Achmadi, D., Stevens, M., Roche, L., Kagohara, D., van der Meer, L., Sutherland, D., Russell, L., Marschik, P., McLay, L., Hodis, F., & Green, V. (2013). Teaching two boys with autism spectrum disorders to request the continuation of toy play using an iPad®-based speech-generating device. *Research in Autism Spectrum Disorders,7*(8), 923-930. doi:10.1016/j.rasd.2013.04.002

Smith, R. O. (2017). Technology and occupation: Past, present, and the next 100 years of theory and practice. *American Journal of Occupational Therapy,71*(6). doi:10.5014/ajot.2017.716003

Sood, D., Lavesser, P., & Schranz, C. (2014). Influence of Home Environment on Participation in Home Activities of Children with an Autism Spectrum Disorder. *The Open Journal of Occupational Therapy*, *2*(3). doi: 10.15453/2168-6408.1082

Steenkamp, J.-B. E., Jong, M. G. D., & Baumgartner, H. (2010). Socially desirable response tendencies in survey research. *Journal of Marketing Research*, *47*(2), 199–214. doi: 10.1509/jmkr.47.2.199

Stokes, S., Wirkus-Pallaske, M., & Reed, P. (2000). Assistive technology tools and strategies resource guide for students with autism spectrum disorder. *Wisconsin Assistive Technology Initiative,* 1-38.

Stokes, S. (2009, February). Assistive technology supports for individuals with autism spectrum

disorder. Retrieved from http://www.wati.org/wp-content/uploads/2017/10/ASDManual-1.pdf

Tegler, H., Pless, M., Johansson, M. B., & Sonnander, K. (2019). Caregivers', teachers', and assistants' use and learning of partner strategies in communication using high-tech speech-generating devices with children with severe cerebral palsy. *Assistive Technology,* 1-9. doi:10.1080/10400435.2019.1581303

Tilden, V., Nelson, C., & May, B. (1990). Use of qualitative methods to enhance content validity. *Nursing Research,39*(3), 172-175.

Todis, B., & Walker, H. M. (1993). User perspectives on assistive technology in educational settings. *Focus on Exceptional Children,26*(3), 1-16. doi:10.17161/foec.v26i3.6888

Tojib, D. R., & Sugianto, L. (2006). Content validity of instruments in IS research. *JITTA: Journal of Information Technology Theory and Application, 8*(3), 31-56.

U.S. Department of Education. (2018). *Program Performance Measures*. https://pdp.ed.gov/OSEP/Home/performancemeasures.

van der Meer, L., Sutherland, D., O'Reilly, M. F., Lancioni, G. E., & Sigafoos, J. (2012). A further comparison of manual signing, picture exchange, and speech-generating devices as communication modes for children with autism spectrum disorders. *Research in Autism Spectrum Disorders,6*(4), 1247-1257. doi:10.1016/j.rasd.2012.04.005

Valicenti-McDermott, M., Hottinger, K., Seijo, R., & Shulman, L. (2012). Age at diagnosis of autism spectrum disorders. *The Journal of Pediatrics,161*(3), 554-556. doi:10.1016/j.jpeds.2012.05.012

Vohra, R., Madhavan, S., Sambamoorthi, U., & Peter, C. S. (2013). Access to services, quality of

care, and family impact for children with autism, other developmental disabilities, and other mental health conditions. *Autism,18*(7), 815-826. doi:10.1177/1362361313512902

Wetherby, A. M. (1986). Ontogeny of communicative functions in autism. *Journal of Autism and Developmental Disorders,16*(3), 295-316. doi:10.1007/bf01531661

Wetherby, A. M., & Prutting, C. A. (1984). Profiles of communicative and cognitive-social abilities in autistic children. *Journal of Speech, Language, and Hearing Research,27*(3), 364-377. doi:10.1044/jshr.2703.364

Wetherby, A. M., & Woods, J. J. (2006). Early social interaction project for children with autism spectrum disorders beginning in the second year of life. *Topics in Early Childhood Special Education,26*(2), 67-82. doi:10.1177/02711214060260020201

Wilson, F., Pan, W., & Schumsky, D. (2012). Recalculation of the critical values for Lawshe's content validity ratio. *Measurement and Evaluation in Counseling and Development,45*(3), 197-210. http://dx.doi.org/10.1177/0748175612440286

Wimpory, D., Nicholas, B., & Nash, S. (2002). Social timing, clock genes and autism: A new hypothesis. *Journal of Intellectual Disability Research,46*(4), 352-358. doi:10.1046/j.1365-2788.2002.00423.x

Wissick, C. A., & Gardner, J. E. (2008). Conducting assessments in technology Needs: From assessment to implementation. *Assessment for Effective Intervention,33*(2), 78-93. doi:10.1177/1534508407311427

Zabala, J. S. (2007). The development and evaluation of quality indicators for assistive technology services. *University of Kentucky Doctoral Dissertations,* 517.

Zingerevich, C., & LaVesser, P. (2009). The contribution of executive functions to participation in

school activities of children with high functioning autism spectrum disorder. *Research in Autism Spectrum Disorders, 3*(2), 429-437. http://dx.doi.org/10.1016/j.rasd.2008.09.002

Appendices

Appendix A: Levels of Assistive Technology and Associated Characteristics

<table>
<tr><th colspan="3">No-tech strategies/solutions</th></tr>
<tr><td colspan="3">Defining characteristics:
Use of teaching strategies or individual (Bouck, 2017)
Utilize existing conditions (Blackhurst, 2001)
Some include related services in this category (Blackhurst, 2001)
Flexible in use as these strategies can be utilized without reliance on other materials (Zabala, 2007)</td></tr>
<tr><td>Improving expressive communication skills</td><td>Improving social skills</td><td>Improving motor skills</td></tr>
<tr><td>Pausing during conversation may provide children with ASD with time to understand that it is their turn to communicate within the interaction, to process what was stated or asked (Stokes, 2009)</td><td>Strategically scheduling social interactions during low-stress times of children’s days and in calming environments can allow for more successful social interactions (Stokes, 2009)
Dedicating a period of time prior to interactions for discussion may better prepare children for the social interactions to come (Stokes, 2009)</td><td>Modeling movements for children with ASD may allow them to increase comprehension skills related to the movements (Chang and Locke, 2016)
Encouraging self-talk during motor activities, such as handwriting, may provide children with necessary auditory feedback to better process information (Assaro-Saddler & Saddler, 2010)</td></tr>
<tr><th colspan="3">Low-tech assistive technology</th></tr>
<tr><td colspan="3">Defining characteristics:
Function without power source (Dell et al., 2008)
Require little training and are lower cost than higher-tech options (Dell et al., 2008)
General examples include adapted spoon handles, Velcro fasteners, large print text, mouth sticks, communication boards (Blackhurst, 2005; McDaniel, 2012)</td></tr>
<tr><td>Improving expressive communication skills</td><td>Improving social skills</td><td>Improving motor skills</td></tr>
<tr><td>Communication boards, particularly the Picture Exchange Communication System (PECS) is an alternative and augmentative</td><td>Turn-taking cards include both a word and image to signify whose turn it is in a social interaction (Stokes, 2009); Daubert, Hornstein, and Tincani</td><td>Pictures cards that depict appropriate complex motor activities, such as sitting on the carpet upon entrance to a classroom, can help children with the</td></tr>
</table>

communication (AAC) system that may be useful in fostering communication skills for children with ASD and involves children giving pictures of desired activities to a communication partner (Wetherby, 1986; Simpson, 2004; Sigafoos et al., 2013)	(2014) introduced turn-taking cards to two children with ASD who played a card game together and found that these cards helped initiate and relinquish turns	sequencing of activities (Stokes, 2009); Fittipaldi and Mowling (2009) used picture cards to depict activities during a physical education class for children with ASD and found that children's ability to perform the task and stay on task increased • **Creating boundaries around a room that are designated for certain activities** can allow children with ASD to better function in their environments (Stokes, Wirkus-Pallaske, & Reed, 2000)
High-tech assistive technology		
Defining characteristics: • Originally associated with computers and computer programs, such as text-to-speech, but also include smartphones and tablets (Edyburn, 2005) • This category may be most appealing to children and/or professionals who provide the services, but are most expensive and require the most training for effective use (Berhmann & Schaff, 2001; Stokes, 2009) • These devices require complex technical support if they malfunction (Jacobsen, 2012) • General examples include eye gaze technology devices and communication devices (Stokes, 2009)		
Improving expressive communication skills	Improving social skills	Improving motor skills
• **Proloquo2Go** is an AAC application that can be downloaded to an iPad and can help children with ASD generalize newly acquired skills by requesting preferred items and devices (Alzrayer, Banda & Koul, 2016) • **Dynavox V** is a device that includes visual scene	• **Aiko & Egor: Animation 4 Autism** is a high-tech application that can be downloaded onto mobile devices and aims to facilitate acquisition of social skills for children with ASD by demonstrating appropriate and positive social interactions in an	• **Accessibility features offered on a computer interface,** such as autocorrect, word prediction, and voice recognition, may be beneficial for children with ASD if they have motor impairments or are having difficulties learning how to type on a

display in which the screen displays an image that resembles a scene within a children's environment, with 'hot spots' that can be touched by the child to generate a related message (Stokes, 2009; Caron, Light, Davidoff, & Drager, 2017)	underwater scenario while containing for interactive activities between children with ASD and their families (Gaskin, Hoffman, & Turner, 2015)	keyboard, and also serve to increase independence in computer activities (Lofland, n.d.; Stokes, 2009)

Appendix B: Content Validation Directions

Directions: Please score each item below on a scale of 0 to 2 where 0 = *not essential,* 1 = *useful but not essential,* and 2 = *essential.* Please also score each item below on a scale of 0 to 2 where 0 = *unclear*, 1 = *unclear but revisions improve clarity*, 2 = *clear*. Please see the definitions for "essential" and "clarity" below.

How to evaluate **essentiality**

The item accurately reflects the domain it falls under

The item is direct and specific

The item includes choices that allow participants to respond appropriately

An aspect of the domain would not be fully represented without including the item

How to evaluate **clarity**

The item is easy to understand

The item is not emotionally loaded

The item does not contain ambiguous language

Appendix C: Assessment of Pre-Professional Students' Attitudes, Self-Efficacy, and Knowledge in Assistive Technology and ASD

Background: The Assessment of Pre-Professional Students' Attitudes, Self-Efficacy, and Knowledge in Assistive Technology and ASD is intended to be distributed to pre-professional students in the following disciplines: occupational therapy, physical therapy, speech and language pathology, social work, special education, and clinical psychology. The purpose of this survey is to better understand the knowledge, attitudes, and self-efficacy that students in each of these disciplines have related to ASD, assistive technology, and assistive technology use in ASD. By better understanding the attitudes, self-efficacy, and knowledge that pre-professional students have, recommendations for coursework, clinical experiences, and continuing education opportunities can be made.

Directions: Please read the definitions below prior to beginning the questionnaire. Once you are ready, please answer each question to the best of your ability.

uniform definition of **assistive technology**

- Any product that supports an individual's ability to optimize their function, independence and participation in their environment (Smith, 2017)
- Everyday technologies, whether simple or complex, become assistive in nature when applied by skilled practitioners

uniform definition of **autism spectrum disorder**

- Medical diagnosis required
- Diagnostic criteria for ASD includes presence of:
    - persistent deficits in social communication and social interaction within multiple contexts
    - restricted and/or repetitive patterns of behaviors, interests, or activities
    - symptoms that are present in early developmental period
    - symptoms that cause significant impairments in areas of functioning
    - disturbances that are not better explained by an intellectual disability or global developmental delay (American Psychiatric Association, 2013)

uniform definition of **attitude**

- Opinions or feelings about a topic that is displayed by behavior

uniform definition of **self-efficacy**

- An individual's belief about their capabilities to produce effects
- Reflection of perceived mastery

uniform definition of **knowledge**

- Facts and/or information acquired by participant through formal and/or informal experiences
- Facts and/or information acquired by participant through education
- Theoretical or practical understanding of a subject

Assessment of Pre-Professional Students' Attitudes, Self-Efficacy, and Knowledge in Assistive Technology and ASD

DEMOGRAPHIC/BACKGROUND INFORMATION

1. What is your age?
   17 years old or younger
   18-24 years old
   25-34 years old
   35 years old or older

2. What educational program are you a part of?
   Master of Science in Occupational Therapy
   Doctorate in Physical Therapy
   Master of Science in Communication Sciences and Disorders
   BA/BS in Special Education: Early Childhood
   BA/BS in Special Education: K4-K12
   Special Education Early Childhood Teaching Certification
   Master of Science in Exceptional Education
   Other (please list):

3. How many semesters have you completed within the program?
   Less than 1 semester
   1 semester
   2 semesters
   3 semesters
   4 semesters
   5 semesters
   6 semesters
   7 semesters
   8 semesters or more

4. What is the highest level of schooling you have completed?
    High school diploma or Graduate Equivalency Degree (GED)
    Associate degree
    Bachelor's degree
    Bachelor's degree + credits
    Master's degree
    Master's degree + credits
    Doctoral degree (PhD, MD, JD or other)
    Other certification (please list):

5. Have you completed any coursework that covered the topic of autism spectrum disorder, as evident by the term "ASD" being present in the course title or catalog description? If yes, describe below listing course numbers, names, and number of credit hours, as well as the institution at which you took them.
    Yes (list)
    No

6. Have you completed any coursework that covered the topic of assistive technology as evident by the term "assistive technology" being present in the course title or catalog description? If yes, describe below listing course numbers, names, and number of credit hours, as well as the institution at which you took them.
    Yes (list)
    No

7. How would you rank your exposure in assistive technology while in your educational program?
    no exposure
    little exposure (mentioned in one or two lectures)
    moderate exposure (project or activity related to assistive technology)
    high exposure (full class dedicated to assistive technology)
    extremely high exposure (more than one class dedicated to assistive technology)

8. Do you have any experiences outside of the classroom with children with ASD, such as work experience, volunteer experience, or personal experience? If yes, describe these experiences below.
    Yes (list)
    No

9. Do you have any experiences outside of the classroom with assistive technology, such as work experience, volunteer experience, or personal experience? If yes, describe these experiences below.
    Yes (list)
    No

10. Have you witnessed assistive technology being used with children with autism spectrum disorder, such as in a clinical or volunteer experience? If yes, please describe the usage below.
    Yes (list)
    No

11. Are you interested in working with school-aged children in the future?
    Yes
    Maybe
    No

<u>ATTITUDES</u>: Please respond with the extent to which you agree or disagree with the following statements.

12. I believe that my profession plays an active role in providing care for children with ASD.
    Strongly disagree
    Disagree
    No opinion
    Agree
    Strongly agree

13. I believe that my profession plays an active role in providing assistive technology services to clients.
    Strongly disagree
    Disagree
    No opinion
    Agree
    Strongly agree

14. I believe that when attempted, no-tech strategies are often effective when used with children with ASD, where no-tech is defined as “the use of teaching strategies or

individuals, without reliance on other materials, to support an individual's ability to optimize their function, independence, and participation in their environment."

Strongly disagree
Disagree
No opinion
Agree
Strongly agree

15. I believe that when attempted, low-tech assistive technology strategies are often effective when used with children with ASD, where low-tech assistive technology is defined as "devices or equipment that require little to moderate levels of training and may be electronic or battery-operated."

Strongly disagree
Disagree
No opinion
Agree
Strongly agree

16. I believe that when attempted, high-tech assistive technology strategies are often effective when used with children with ASD, where high-tech assistive technology is defined as "devices that have digital or electronic components, may be computerized, and require significant training to use them effectively."

Strongly disagree
Disagree
No opinion
Agree
Strongly agree

<u>SELF-EFFICACY:</u> Please respond with the extent to which you agree or disagree with the following statements.

17. I am certain I could apply no-tech assistive technology strategies, such as physical modeling, in practice with children with ASD.

Strongly disagree
Disagree
No opinion
Agree
Strongly agree

18. I am certain I could apply low-tech assistive technology strategies, such as communication boards, in practice with children with ASD.
    Strongly disagree
    Disagree
    No opinion
    Agree
    Strongly agree

19. I am certain I could apply high-tech assistive technology strategies, such as augmentative and alternative communication applications, in practice with children with ASD.
    Strongly disagree
    Disagree
    No opinion
    Agree
    Strongly agree

20. I am certain I could effectively evaluate a student with ASD to determine the best assistive technology system or strategies for their needs.
    Strongly disagree
    Disagree
    No opinion
    Agree
    Strongly agree

21. I am certain I could write appropriate goals and evaluation reports related to assistive technology within a child's individualized education plan (IEP).
    Strongly disagree
    Disagree
    No opinion
    Agree
    Strongly agree

22. I am certain I could teach paraprofessionals, teachers, parents, and other professionals about the assistive technology devices and strategies I recommend for children with ASD.
    Strongly disagree

Disagree
No opinion
Agree
Strongly agree

23. I am certain I could collaborate with other disciplines to provide the best recommendations for assistive technology strategies and devices for children with ASD.
    Strongly disagree
    Disagree
    No opinion
    Agree
    Strongly agree

KNOWLEDGE: Please answer each of the following questions to the best of your ability.

24. Which device is best suited for a non-verbal child with ASD to increase active involvement in class discussions, assuming the child is able to successfully utilize any of the following strategies?
    Low-tech communication board
    Keyboard as mode of communication
    Exercise ball
    Speech-generating device

25. Which of the following is a no-tech strategy that aims to enhance motor skills in children with ASD?
    Picture cards displaying complex motor movements
    Use of keyboard as mode of communication
    Strategic scheduling of interactions
    Modeling movements

26. Which of the following is a low-tech assistive technology strategy that aims to enhance expressive communication skills in children with ASD?
    Pausing during conversation
    Exercise ball
    Stand-alone speech-generating device
    Visual calendar

27. Which of the following is a high-tech device that is best suited for a verbal child with ASD who experiences deficits in interpersonal communication, assuming the child is able to successfully utilize any of the following strategies?
    Manual wheelchair
    Text-to-speech or screen-reading
    Pressure switch
    Social robot

28. Which of the following assistive technology strategies addresses decreased fine motor skills in children with ASD?
    Turn-taking cards
    Communication boards
    Elastic shoelaces
    Visual calendar

29. Which of the following disciplines is **not** involved in the implementation and maintenance of assistive technology in children with ASD?
    Speech language pathology
    Clinical psychology
    Social work
    Lawyer

30. All of the following can be considered assistive technology for increasing children with ASD's ability to engage in gym class activities but one. Which is **not**?
    Physical modeling
    Encouraging self-talk
    Turn-taking cards
    Accessibility features offered on computer interface

31. Which of the following is the name of an augmentative and alternative communication (AAC) device commonly used with children who have ASD?
    Tobii
    Alexa
    Myra
    Siri

32. Which of the following is a low-tech alternative writing strategy that may be helpful for children with ASD who have difficulties with handwriting?

Computer dictation
Typing in word processor
Alternative pencil grip
None of the above

33. Children with ASD may have difficulty processing information while staying stationary. Which of the following movement strategies can be used to allow children with ASD to process information while moving?
    Sitting on a therapy ball
    Standing during class
    Dynamic seat cushion
    All of the above

34. When considering a continuum of placement options and the Least Restrictive Environment (LRE) for students, a student with ASD may have the most challenges in the following placement?
    A self-contained classroom setting with 8 - 10 students with disabilities.
    A co-taught general education classroom that is very structured and the routine for daily activities are very consistent.
    A physical education class with 60 students and free play for 20 minutes out of the 50-minute class.
    An adaptive physical education class with small groups of students.

35. Which of the following is not a true statement about ASD:
    It is generally evident before the age of three
    Asperger syndrome is considered part of the spectrum of autism
    The cause of autism is due to childhood vaccinations
    Communication problems are a major concern

36. When determining related services for a student, the primary consideration should be:
    availability of related services
    cost of related services
    the student's goals, derived from identified areas of need
    priorities of professionals

37. Which of the following is a visual support used to communicate a sequence of events or to reinforce completion of a non-preferred activities:
    social stories
    realia
    first-then boards

task analysis

38. Which of the following strategies involves having a child with ASD watch a video of another child performing a target behavior or skill?
    Video self-modeling
    Physical modeling
    Video modeling
    Turn-taking cards

Appendix D: Screener Survey Questions for Face Validation

What educational program are you a part of?

- Master of Science in Occupational Therapy
- Doctorate in Physical Therapy
- Master of Science in Communication Sciences and Disorders
- BA/BS in Special Education: Early Childhood
- BA/BS in Special Education: K4-K12
- Special Education Early Childhood Teaching Certification
- Master of Science in Exceptional Education
- Other (please list):

Do you have an interest in the field of assistive technology?

- Yes
- No

Do you have an interest in working with kids who have autism spectrum disorder (ASD)?

- Yes
- No

Do you have twenty minutes available to complete this survey and provide feedback on its usability?

- Yes
- No

Note. If participants respond "no" to any of the following three items, they will not be granted access to the assessment. This will ensure face validation feedback is being provided by students who are interested in the field and have a sufficient amount of time to provide meaningful feedback.

Appendix E: Face Validation Items

Approximately how long did it take to complete the questionnaire?

- 5 minutes
- 10 minutes
- 15 minutes
- 20 minutes
- 25 minutes
- 30 minutes

Were the questions simple and easy to understand?

- Not at all
- Moderately
- Extremely

Was the format of the questionnaire easy to understand?

- Not at all
- Moderately
- Extremely

Did the questions flow from one to the next?

- Not at all
- Moderately
- Extremely

If the opportunity arose, would you take this survey again? Why or why not?

- Yes
- No

What aspects of the survey did you find most useful?

- Comment:

What aspects of the survey did you find least useful?

- Comment:

Appendix F: Excerpt of Assessment Items in Qualtrics

I believe that my profession plays a collaborative role in providing services to children with ASD.

Strongly disagree	Disagree	No opinion	Agree	Strongly agree

I believe that my profession plays a collaborative role in providing assistive technology services to clients.

Strongly disagree	Disagree	No opinion	Agree	Strongly agree

No-tech assistive technology is defined as “the use of teaching strategies or individuals, without reliance any external materials, to support an individual’s ability to optimize their function, independence, and participation in their environment.”

I believe that, when attempted, no-tech strategies are effective when used with children with ASD.

Strongly disagree	Disagree	No opinion	Agree	Strongly agree

Appendix G: Excerpt of Face Validation Items in Qualtrics

Approximately how long did it take you to complete the questionnaire?

5 minutes	10 minutes	15 minutes	20 minutes	25 minutes	30 minutes or more

Were the questions simple and easy to understand?

- Not at all
- Moderately
- Extremely

Was the format of the questionnaire easy to understand?

- Not at all
- Moderately
- Extremely

Appendix H: Excerpt of Content Validation Items in Qualtrics

I believe that my profession plays a collaborative role in providing services to children with ASD.

- Strongly disagree
- Disagree
- No opinion
- Agree
- Strongly agree

	0	1	2
Essentiality	○	○	○
Clarity	○	○	○

I believe that my profession plays a collaborative role in providing assistive technology services to clients.

- Strongly disagree
- Disagree
- No opinion
- Agree
- Strongly agree

	0	1	2
Essentiality	○	○	○
Clarity	○	○	○

Appendix I: Face Validation Participant Drop-Off

Item	Participant								
	#1: OT	#2: OT	#3: OT	#4: OT	#5: OT	#6: SLP	#7: SpEd	#8: SpEd	#9: SpEd
Age		X	X	X	X	X		X	X
Program		X	X	X	X	X		X	X
Semesters Completed		X	X	X	X	X		X	X
Highest Level of Education		X	X	X	X	X		X	X
Completed ASD Coursework								X	
Completed AT Coursework								X	
Exposure to AT								X	
Experience with ASD Outside of Class								X	
Experience with AT Outside of class								X	
Exposure to AT use with children with ASD								X	
Interest in working with school-aged kids								X	

I believe that my profession…									

Appendix J: Informal Analysis of Qualitative Face Validation Data

Question	Theme	Quote
Retaking Survey	**Measuring Change**	"Yes I would like to retake the survey at the end of my time as a student to see if my comfort level in my skills/abilities have changed after taking more courses related to ASD" "I think it would be helpful to take it at the beginning of the program and then again towards the end to see progress" "I would like to take the survey again after that [pediatric class] and see if I know/understand the questions better." "Yes, because it allows me to reflect on what I know and can continue to learn about ASD." "Yes - I think that it highlights areas you are not competent in to inform educational opportunities in the future"
	Positive Impact	"It was interesting to me and I am happy to help someone out with their research." "I would take this survey again because it may improve the ability for children with ASD to function better in school and society." "Yes, because I love working with children with ASD so I would love to provide any additional feedback to best support them :) "
	Simplicity	"Yes, it was quick and simple."

		“It was simple and easy to understand. “
Most Useful Aspects	**Multiple Choice Scenarios**	“Presenting different scenarios of AT that could be used to meet the needs of a child.” “The part of the survey that asked me specific questions about my knowledge regarding ASD.” “The "quiz" questions”
	Definitions	“The definitions given before questions were very helpful to understand questions.” “The definitions of specific terms were very helpful. Since I have essentially no experience with assistive technology or ASD, I would not have known what you meant by some of the terms.” “I thought the explanations of no-tech, low-tech, and high-tech were useful.” “The different low-tech vs high tech device choices.”
	Ability to Evaluate Confidence	“Evaluating my confidence in using AT as an educator.” “The ones in which you rate how confident you are in performing certain tasks”
Least Useful Aspects	**Unclear Perspective**	“I didn't know if when I answered questions like "I feel confident in evaluating..." if I was supposed to answer from the perspective I have now or if I was graduated and in my profession.”
	Time-Intensive Item	“The question about which specific class(es) had discussed ASD or assistive technology” “It was easy to fill out, except remembering specific course details from undergrad, so

	maybe warning they should have a copy of their unofficial transcript or academic record."
Perceived Lack of Knowledge	"The questions regarding ASD specifics... just haven't had formal education in these areas so I'm not sure if it helped me. Realizing I didn't feel competent was more empowering." "My lack of knowledge and experience working with children and particularly children with ASD is a disadvantage."

Appendix K: Permission to Reprint PEOP Model

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INCORPORATED

6/2/2020

Cindy Ruedinger
1513 E Hartford Avenue
Milwaukee, WI 53211

Reference #: B166335309
Material Requested: Person-Environment-Occupational Performance (PEOP) model created by Christiansen, Baum & Bass-Haugen displayed in Occupational Therapy: Performance, Participation, and Well-Being (2005).
Usage Requested: Reprint of the above noted graphic within the body of her manuscript for reader reference in thesis
Citation: Christiansen CH, Baum CM, Bass Haugen J. Occupational Therapy: Performance, Participation, and Well-Being. 3rd ed. Thorofare, NJ: SLACK Incorporated; 2005.

Dear Ms. Ruedinger,

Permission is granted for the requested materials and usage listed above, subject to the following conditions:

- Permission is granted for **one-time use only**. Permission does not apply to future editions, revisions, or derivative works.
- Permission is granted for non-exclusive, worldwide use, in the English language, in print and electronic form. Requests for additional formats, languages, or future editions must be submitted separately.
- At no time may the materials appear on a general website and must appear **only** on a password-protected site.
- The material (eg, figure image, table) requested will not be provided by SLACK Incorporated.
- The following credit line must be displayed: CITATION. Reprinted with permission from SLACK Incorporated. See above for citation information.
- The fee for this use is **$0.00 USD**. This offer is valid for 180 days from the date on this letter. If the requestor does not sign, return, and issue payment during this period, then the permission is rescinded.
- Payment is non-refundable. Payment can be made via credit card or check. Checks are payable to SLACK Incorporated, 6900 Grove Rd, Thorofare, NJ 08086, USA. Fill in credit card information below (we accept AmEx, Visa, or MC):

  Card #: _____ Exp Date: _____

  Name on the card: _____ SVC Code: _____

Sincerely,
SLACK Incorporated
Permissions Department

Appendix L: IRB Protocol

IRBManager Protocol Form

NOTE: If you are unsure if your study requires IRB approval, please review the UWM IRB Determination Form.

Instructions: Each Section must be completed unless directed otherwise. Incomplete forms will delay the IRB review process and may be returned to you. Enter your information in the **colored boxes** or place an **"X"** in front of the appropriate response(s). If the question does not apply, write **"N/A."**

SECTION A: Title

A1. Full Study Title: Establishing Content and Face Validity of a Survey to Evaluate the Attitudes, Self-Efficacy, and Knowledge of Pre-Professional Students Related to Assistive Technology for Children with ASD

SECTION B: Study Duration

B1. What is the expected start date? *Data collection, screening, recruitment, enrollment, or consenting activities may not begin until IRB approval has been granted. Format: 07/31/2011*

10/31/2019

B2. What is the expected end date? *Expected end date should take into account data analysis, queries, and paper write-up. Format: 07/05/2014*

12/31/2020

SECTION C: Summary

C1. Write a brief descriptive summary of this study in Layman Terms (non-technical language):

The current study involves establishing both content and face validity of a survey to measure the attitudes, self-efficacy, and knowledge that a variety of pre-professional students have related to assistive technology use in children with ASD. These disciplines include occupational therapy, physical therapy, speech language pathology, special education, social work, and clinical psychology. The first step in this study is to establish content validity through the use of a Qualtrics survey that will be filled out by content experts. Content experts will be made up of both professors and practitioners in each of the professional fields listed above. Based on the ratings given by content validators, necessary changes to the survey will be made and an IRB amendment will be submitted. Once content validity has been established, face validation methodology will begin. Participants for this portion of the study will be pre-professional students in each of the disciplines, and these students must have an interest in working with kids with ASD as well as assistive technology. Students will take the survey in its entirety, and at the end of the survey, they will answer a variety of questions aimed at measuring face validity, or the extent to which the survey appears to measure what it is supposed to. Based on feedback from the face validators, any remaining edits will be made to the instrument. Future research may include distributing the validated survey among a wider population of students across the country.

C2. Describe the purpose/objective and the significance of the research:

This study aims to establish both content validity and face validity of a survey that intends to measure pre-professional students' attitudes, self-efficacy, and knowledge related to assistive technology use in children with autism spectrum disorder (ASD).While the benefit of assistive technology in promoting occupational engagement in children with ASD has been established in the literature, an understanding regarding the amount of education and experience that pre-professional students have related to assistive technology in children with ASD is unclear. This survey is the first instrument created that attempts to measure the knowledge, attitudes, and self-efficacy that students in occupational therapy, physical therapy,

speech language pathology, special education, social work, and clinical psychology have in this particular area. Once content validity and face validity are established, future research may include distributing this survey to a wide geographical population of students to better understand how knowledge, self-efficacy, and attitudes differ across populations.

C3. Cite the most relevant literature pertaining to the proposed research:

Growing research is devoted to understanding how children with ASD perceive their environments. Due to sensory dysfunction, individuals with ASD perceive and interact with their worlds differently. They may be extremely sensitive to some senses and may also be unresponsive to sensations that others find unpleasant, such as extreme heat, cold, and pain (Nagib & Williams, 2017). Impairments in sensory skills can keep children from executing successful adaptive responses to situational demands and prevent them from engaging in meaningful occupations (Jasmin et al., 2009).

In an attempt to improve the quality of life for children diagnosed with ASD, a variety of assistive technology devices, both low and high-tech, were created and adapted to augment their abilities (Faucett et al., 2017). Smith (2017) defines assistive technology as any product that supports an individual's ability to optimize their function, independence and participation in their environment. This means that everyday technologies, whether simple or complex, become assistive in nature when applied by skilled practitioners to increase the participation of individuals with disabilities (Bondoc et al., 2016). Assistive technology can be organized by level of technology, including no-tech, low-tech, and high-tech devices. No-tech devices involve the use of teaching strategies or the individual and do not rely on external materials (Bouck, 2017). Examples of no-tech strategies that can be implemented in interactions with children with ASD include pausing during conversations to signal that it is their turn to speak, and strategically planning social interactions during low-stress times in the child's day (Blackhurst, 2001; Zabala, 2007). Low-tech devices either function without a power source or are independently functioning electronic or battery-operated devices (Dell et al., 2008). An example of a mid-tech device that can be used with children with ASD is a communication board, such as a GoTalk (Jacobsen, 2012). Finally, high-tech assistive technology devices are devices that rely on computer/phone/tablet technologies and require significant support if these devices break (Jacobsen, 2012). Examples of high-tech devices used with children with ASD include augmentative and alternative communication applications and accessibility features offered on a computer (Stokes, 2009).

Before professionals attempt to implement assistive technology strategies in children with ASD, it is important to consider the viewpoint of the child's parents. It is critical to examine parental attitudes related to assistive technology use with their children because these attitudes are typically strong predictors of subsequent parental behaviors and success of uptake of these strategies (Clark, Austin, & Craike, 2014). When prescribing augmentative and alternative communication (AAC) devices to children, the team approach, which involves collaboration of family members, the child, teachers, speech-language pathologists (SLPs), occupational therapists (OTs), and other specialists, is optimal (Angelo, 2000; Kintsh & DePaula, 2002; Batorowicz & Shepherd, 2011).

Occupational therapists are able to utilize and recommend assistive technology strategies to improve a child with ASD's ability to engage in activities, and engage with other professionals to determine the most appropriate form of assistive technology for each child (Case-Smith and O'Brien, 2005; Rispoli, van der Meer, Lang, & Camargo, 2010). No specific research related to physical therapists' role in providing assistive technology exists, however, Long and Perry (2008) found that physical therapists report having 'less-than-adequate' training in assistive technology, as well as a lack of confidence. Speech language pathologists are able to screen children with ASD who present with language and communication difficulties and assess for the need of augmentative and alternative communication as a mode of communication (Lindsay, 2010). Limited research exists to discuss social work's role in assistive technology implementation for children with ASD, however, Getz (2010) shares that social workers are able to facilitate communication between individuals with disabilities and the services that they need and also advocate for funding for assistive technology. Special educators implement a variety of assistive technology devices in the classroom to increase participation, augment communication, and further the development of social skills in children with ASD (Cramer, Hirano, Tentori, Yeganyan, & Hayes (2011). Finally, clinical psychologists' role in assistive technology implementation in children with ASD is not clear in the literature. Meloni, Federici, and Stella (2011) share that clinical psychologists are skilled in addressing contextual factors and personal factors that affect the long-term success of assistive technology delivery, and also play a crucial role in the diagnosis of ASD. Because these disciplines have a link to assistive technology implementation in children with ASD, these practitioners should have some knowledge in this area, and their level of knowledge may impact their self-efficacy and attitudes toward working with this population.

When developing a survey, the first steps include specifying the purpose of each domain within the survey, confirming that there are no existing instruments that perform the same function, and describing the domains and providing definitions (McCoach, Gable, & Madua, 2013). Once these steps are complete, questions can be developed under each domain (Kline, 2013). After a survey has been constructed following those steps, performing validation processes is vital to ensure that the survey created effectively measures what it intends to. Content validation refers to the degree to which aspects of an assessment are relevant to, and representative of, the targeted constructs of that assessment (Haynes, Richard, Kubany, 1995). Establishing content validity is a subjective process where claims of validation are made by a panel of experts (Portney & Watkins, 2015). This is vital to perform prior to distributing the survey as surveys created without performing this step may not measure what they intend to (Richards, Magee, & Artino, 2012). Face validation is another form of validity that indicates whether an assessment appears to measure what it is supposed to. This is considered the weakest form of validity, as there is no standard for judging or determining "how much" face validity an instrument has (Portney & Watkins, 2015). However, this is another important step in survey creation, as respondents may not be motivated to answer questions honestly if they don't view these questions as meaningful and relevant (Portney & Watkins, 2015). To establish face validity, subjective assessments of the instrument will be obtained from individuals who are a part of the desired population to complete the survey (Bolarinwa, 2015; Salkin, 2010).

SECTION D: Subject Population

Section Notes…

- D1. If this study involves analysis of de-identified data only (i.e., no human subject interaction), IRB submission/review may not be necessary. **Please review the UWM IRB Determination Form for more details.**

D1. Identify any population(s) that you will be specifically targeting for the study. Check all that apply: (Place an "X" in the column next to the name of the special population.)			
	Existing Dataset(s)		Institutionalized/ Nursing home residents recruited in the nursing home
	UWM Students of PI or study staff		Diagnosable Psychological Disorder/Psychiatrically impaired
x	UWM Students (but not of PI or study staff)		Decisionally/Cognitively Impaired
	Non-UWM students to be recruited in their educational setting, i.e. in class or at school		Economically/Educationally Disadvantaged
x	UWM Staff or Faculty		Prisoners
	Pregnant Women/Neonates		International Subjects (residing outside of the US)
	Minors under 18 and ARE NOT wards of the State		Non-English Speaking
	Minors under 18 and ARE wards of the State		Terminally ill
x	Other (Please identify): Non-UWM Clinicians		

D2. Describe the subject group and enter the total number to be enrolled for each group. For example: teachers-50, students-200, parents-25, student control-30, student experimental-30, medical charts-500, dataset of 1500, etc. Then enter the total number of subjects below. Be sure to account for expected drop outs. For example, if you need 100 subjects to complete the entire study, but you expect 5 people will enroll but "drop out" of the study, please enter 105 (not 100).

Describe subject group:	**Number:**
UWM Students	30
UWM Staff or Faculty	8
Non-UWM Clinicians	8
TOTAL # OF SUBJECTS:	46
TOTAL # OF SUBJECTS (If UWM is a collaborating site for a multi institutional project):	

D3. For each subject group, list any major inclusion and exclusion criteria (e.g., age, gender, health status/condition, ethnicity, location, English speaking, etc.) and state the justification for the inclusion and exclusion criteria:

UWM Students
- Inclusion criteria: over 18 years old, English speaking, currently enrolled student at UWM

UWM Staff or Faculty
- Inclusion criteria: over 18 years old, English speaking, hold staff position at UWM

Non-UWM Clinicians
- Inclusion criteria: over 18 years old, English speaking

SECTION E: Study Activities: Recruitment, Informed Consent, and Data Collection

Section Notes…
- Reminder, all recruitment materials, consent forms, data collection instruments, etc. should be attached for IRB review.
- The IRB welcomes the use of flowcharts and tables in the consent form for complex/ multiple study activities.

In the table below, chronologically describe all study activities where human subjects are involved.

- In **column A**, give the activity a short name. Please note that Recruitment, Screening, and consenting will be activities for almost all studies. Other activities may include: Obtaining Dataset, Records Review, Interview, Online Survey, Lab Visit 1, 4 Week Follow-Up, Debriefing, etc.
- In **column B**, describe who will be conducting the study activity and his/her training and/or qualifications to complete the activity. You may use a title (i.e. Research Assistant) rather than a specific name, but training/qualifications must still be described.
- In **column C**, describe in greater detail the activities (recruitment, screening, consent, surveys, audiotaped interviews, tasks, etc.) research participants will be engaged in. Address **where**, **how long**, and **when** each activity takes place.
- In **column D,** describe any possible risks (e.g., physical, psychological, social, economic, legal, etc.) the subject may ***reasonably*** encounter. Describe the **safeguards** that will be put into place to minimize possible risks (e.g., interviews are in a private location, data is anonymous, assigning pseudonyms, where data is stored, coded data, etc.) and what happens if the participant gets hurt or upset (e.g., referred to Norris Health Center, PI will stop the interview and assess, given referral, etc.).

A. Activity Name:	B. Person(s) Conducting Activity	C. Activity Description (Please describe any forms used):	D. Activity Risks and Safeguards:
Content Validation Recruitment (see attached recruitment script)	Cynthia Ruedinger (Master's student completing thesis); Dr. Kris Barnekow (professor and researcher at UWM); Professor Michelle Silverman (professor at UWM)	Recruitment of content validators includes collaboration between Cynthia Ruedinger and thesis committee members to identify potential professors and clinicians in each discipline who might fit the given criteria. Recruitment is expected to take between 2-4 weeks, as committee members have already started to identify appropriate individuals for this portion of the study.	Participant information will be safeguarded on password-protected document on password-protected computer.

Obtaining Content Validator Consent (see attached informed consent form for content validators)	Cynthia Ruedinger (Master's student completing thesis)	To obtain consent from content validators, the "abbreviated consent for studies that involve on-line questionnaires that are not anonymous" will be utilized (see attached). This content form will be emailed to the potential content validators, along with a link to the Qualtrics questionnaire. This process will likely take between 1-2 weeks.	Participant consent will take place within Qualtrics and participant information will be stored within Qualtrics software.
Online Content Validation Survey	Cynthia Ruedinger (Master's student completing thesis)	Online content validation survey methodology will be completed using Qualtrics (see attached). This portion of the study is estimated to take 4 weeks. Each content validator will likely need between 30 minutes-1.5 hours to complete the content validation process, depending on how much feedback they provide. Content validation may include two iterations, as changes to the survey will be made based on initial content validator feedback. The survey will be sent back to content validators for another round of scoring, after changes to the survey have been made from their initial feedback. There will only be two total iterations.	The time required to provide feedback regarding content validation may be a risk for some individuals, but participants will be informed regarding how long the survey will take. All data will be stored in Qualtrics and de-identified data will be stored in an encrypted Excel document on a password-

			protected computer.
Face Validation Recruitment (see attached recruitment script)	Cynthia Ruedinger (Master's student completing thesis)	Recruitment of face validators will be completed by sending the survey and recruitment form to the program directors of the following programs at UWM: occupational therapy, physical therapy, speech language pathology, social work, special education, clinical psychology. Program directors will be encouraged to forward details of the study to students in their programs.	Participant information will be safeguarded on password-protected document on password-protected computer.
Obtaining Face Validator Consent (see attached informed consent form for face validators)	Cynthia Ruedinger (Master's student completing thesis)	In the recruitment email that students receive, the "Informed Consent to Participate in Research" will be included (see attached).	Participant consent will take place within Qualtrics and participant information will be stored within Qualtrics software.
Online Face Validation Survey	Cynthia Ruedinger (Master's student completing thesis)	Online face validation survey methodology will be completed using Qualtrics (see attached). This portion of the study is estimated to take 10-12 weeks. Each face validator will likely need between 15-30 minutes to complete the survey and face validation process, depending on how much feedback they provide. Face validation includes both the completion of the survey, as well as providing feedback related to face validity.	The time required to provide feedback regarding face validation may be a risk for some individuals, but participants will be informed regarding how long the survey

			will take. All data will be stored in Qualtrics and de-identified data will be stored in an encrypted Excel document on a password-protected computer.

E2. Explain how the data will be analyzed or studied (i.e. quantitatively or qualitatively) and how the data will be reported (i.e. aggregated, anonymously, pseudonyms for participants, etc.):

Quantitative data will be analyzed in Excel and reported descriptively. The results of the study will be reported as aggregate data for quantitative data and anonymously for qualitative feedback.

SECTION F: Data Security and Confidentiality

Section Notes…

- Please read the IRB Guidance Document on Data Confidentiality for more details and recommendations about data security and confidentiality.

F1. Explain how study data/responses will be stored in relation to any identifying information (name, birthdate, address, IP address, etc.)? Check all that apply.

[__] Identifiable - Identifiers are collected and stored with study data.
[__] Coded - Identifiers are collected and stored separately from study data, but a key exists to link data to identifiable information.
[_x_] De-identified - Identifiers are collected and stored separately from study data without the possibility of linking to data.
[__] Anonymous - No identifying information is collected.

If more than one method is used, explain which method is used for which data.

F2. Will any recordings (audio/video/photos) be done as part of the study?

[__] Yes
[_x_] No [SKIP THIS SECTION]

If yes, explain what activities will be recorded and what recording method(s) will be used. Will the recordings be used in publications or presentations?

F3. In the table below, describe the data storage and security measures in place to prevent a breach of confidentiality.

- In **column A**, clarify the type of data. Examples may include screening data, paper questionnaires, online survey responses, EMG data, audio recordings, interview transcripts, subject contact information, key linking Study ID to subject identifiers, etc.
- In **column B**, describe the storage location. Examples may include an office in Enderis 750, file cabinet in ENG 270, a laptop computer, desktop computer in GAR 420, Qualtrics servers, etc.
- In **column C**, describe the security measures in place for each storage location to protect against a breach of confidentiality. Examples may include a locked office, encrypted devices, coded data, non-networked computer with password protection, etc.
- In **column D**, clarify who will have access to the data.
- In **column E**, explain when or if data will be discarded.

A. Type of Data	B. Storage Location	C. Security Measures	D. Who will have access	E. Estimated date of disposal
Online survey responses	Qualtrics servers	Non-networked computer with password protection	Cynthia Ruedinger and Dr. Kris Barnekow	12/31/2020
Online survey responses	Excel document stored on Cynthia Ruedinger's laptop	De-identified, encrypted spreadsheet on password-protected and unshared computer	Cynthia Ruedinger and Dr. Kris Barnekow	12/31/2020

F4. Will data be retained for uses beyond this study? If so, please explain and notify participants in the consent form.

No.

SECTION G: Benefits and Risk/Benefit Analysis

Section Notes…

- Do not include Incentives/ Compensations in this section.

G1. Describe any benefits to the individual participants. If there are no anticipated benefits to the subject directly, state so. Describe potential benefits to society (i.e., further knowledge to the area of study) or a specific group of individuals (i.e., teachers, foster children).

There are no anticipated benefits to individual participants. However, their contribution will improve the validity of a newly created instrument that may be used in future research to better understand the knowledge, self-efficacy, and attitudes that students in a variety of disciplines have toward assistive technology use in children with ASD. The findings of this survey, once implemented, may impact course content in these programs and/or influence the continuing education opportunities for professionals who may be seeking more guidance in this area of practice.

G2. Risks to research participants should be justified by the anticipated benefits to the participants or society. Provide your assessment of how the anticipated risks to participants and steps taken to minimize these risks (as described in Section E), balance against anticipated benefits to the individual or to society.

There are minimal risks in this study. Risks include time required to complete validation process and breach of confidentiality. To minimize risks, participants will be given the option to stop the validation process whenever they would like, and take breaks as needed. To minimize chance of breach of confidentiality, all identifying information will be kept within Qualtrics software, and de-identified information will be kept in an encrypted Excel document.

SECTION H: Subject Incentives/ Compensations

Section Notes…

- H2 & H3. The IRB recognizes the potential for undue influence and coercion when extra credit is offered. The UWM IRB, as also recommended by OHRP and APA Code of Ethics, agrees when extra credit is offered or required, prospective subjects must be given the choice of an equitable, non-research alternative. The extra credit value and the non-research alternative must be described in the recruitment material and the consent form.
- H4. If you intend to submit to Accounts Payable for reimbursement purposes make sure you understand the UWM "Payments to Research Subjects" Procedure 2.4.6 and what each level of payment confidentiality means **(click here for additional information).**

H1. Does this study involve incentives or compensation to the subjects? For example cash, class extra credit, gift cards, or items.

[__] Yes
[_x_] No [SKIP THIS SECTION]

H2. Explain what (a) the item is, (b) the amount or approximate value of the item, and (c) when it will be given. For extra credit, state the number of credit hours and/or points. (e.g., $5 after completing each survey, subject will receive [item] even if they do not complete the procedure, extra credit will be award at the end of the semester)**:**

H3. If extra credit is offered as compensation/incentive, please describe the specific alternative activity which will be offered. The alternative activity should be similar in the amount of time involved to complete and worth the same number of extra credit points/hours. Other research studies can be offered as additional alternatives, but **a non-research alternative is required**.

H4. If cash or gift cards, select the appropriate confidentiality level for payments (see section notes):

[__] Level 1 indicates that confidentiality of the subjects is not a serious issue, e.g., providing a social security number or other identifying information for payment would not pose a serious risk to subjects.

- For payments over $50, choosing Level 1 requires the researcher to collect and maintain a record of the following: The payee's name, address, and social security number, the amount paid, and signature indicating receipt of payment (for cash or gift cards).
- When Level 1 is selected, a formal notice is not issued by the IRB and the Account Payable assumes Level 1.

- Level 1 payment information will be retained in the extramural account folder at UWM/Research Services and attached to the voucher in Accounts Payable. These are public documents, potentially open to public review.

[__] **Level 2** indicates that confidentiality is an issue, but is not paramount to the study, e.g., the participant will be involved in a study researching sensitive, yet not illegal issues.

- Choosing a Level 2 requires the researcher to maintain a record of the following: The payee's name, address, and social security number, the amount paid, and signature indicating receipt of payment (for cash or gift cards).
- When Level 2 is selected, a formal notice will be issued by the IRB.
- Level 2 payment information, including the names, are attached to the PIR and become part of the voucher in Accounts Payable. The records retained by Accounts Payable are not considered public record.

[__] **Level 3** indicates that confidentiality of the subjects must be guaranteed. In this category, identifying information such as a social security number would put a subject at increased risk.

- Choosing a Level 3 requires the researcher to maintain a record of the following: research subject's name and corresponding coded identification. This will be the only record of payee names, and it will stay in the control of the PI.
- Payments are made to the research subjects by either personal check or cash. Gift cards are considered cash.
- If a cash payment is made, the PI must obtain signed receipts.
- If the total payment to an individual subject is over $600 per calendar year, Level 3 cannot be selected.

If Confidentiality Level 2 or 3 is selected, please provide justification.

N/A

SECTION I: Deception/ Incomplete Disclosure (INSERT "NA" IF NOT APPLICABLE)

Section Notes…

- If you cannot adequately state the true purpose of the study to the subject in the informed consent, deception/ incomplete disclosure is involved.

I1. Describe (a) what information will be withheld from the subject (b) why such deception/ incomplete disclosure is necessary, and (c) when the subjects will be debriefed about the deception/ incomplete disclosure.

N/A

IMPORTANT – Make sure all sections are complete and attach this document to your IRBManager web submission in the Attachment Page (Y1).

Appendix M: IRB Exemption Status

UNIVERSITY of WISCONSIN
UWMILWAUKEE
Department of University Safety & Assurances

Leah Stoiber
IRB Administrator
Institutional Review Board
Engelmann 270
P. O. Box 413
Milwaukee, WI 53201-0413
(414) 229-7455 *phone*
(414) 229-6729 *fax*

http://www.irb.uwm.edu
lstoiber@uwm.edu

New Study - Notice of IRB Exempt Status

Date: November 12, 2019

To: Kris Barnekow, PhD
Dept: Occupational Science and Technology

CC: Cynthia Ruedinger

IRB#: 20.098
Title: Establishing Content and Face Validity of a Survey to Evaluate the Attitudes, Self-Efficacy, and Knowledge of Pre-Professional Students Related to Assistive Technology for Children with ASD

After review of your research protocol by the University of Wisconsin – Milwaukee Institutional Review Board, your protocol has been granted Exempt Status under Category 2 as governed by 45 CFR 46.104(d).

This protocol has been approved as exempt for three years and IRB approval will expire on November 11, 2022. If you plan to continue any research related activities (e.g., enrollment of subjects, study interventions, data analysis, etc.) past the date of IRB expiration, please respond to the IRB's status request that will be sent by email approximately two weeks before the expiration date. If the study is closed or completed before the IRB expiration date, you may notify the IRB by sending an email to irbinfo@uwm.edu with the study number and the status, so we can keep our study records accurate.

Any proposed changes to the protocol must be reviewed by the IRB before implementation, unless the change is specifically necessary to eliminate apparent immediate hazards to the subjects. The principal investigator is responsible for adhering to the policies and guidelines set forth by the UWM IRB, maintaining proper documentation of study records and promptly reporting to the IRB any adverse events which require reporting. The principal investigator is also responsible for ensuring that all study staff receive appropriate training in the ethical guidelines of conducting human subjects research.

As Principal Investigator, it is also your responsibility to adhere to UWM and UW System Policies, and any applicable state and federal laws governing activities which are independent of IRB review/approval (e.g., FERPA, Radiation Safety, UWM Data Security, UW System policy on Prizes, Awards and Gifts, state gambling laws, etc.). When conducting research at institutions outside of UWM, be sure to obtain permission and/or approval as required by their policies.

Contact the IRB office if you have any further questions. Thank you for your cooperation, and best wishes for a successful project.

Respectfully,
Leah Stoiber
Leah Stoiber
IRB Administrator

Appendix N: Equivalent Text Descriptions

Table 1.

Essential Description: Table depicting the three levels of assistive technology (no, low, high-tech) on the left, with associated defining characteristics and examples to the right.

Table 2.

Essential Description: Table depicting specific strategies associated with each level of assistive technology. Table is divided into three sections for each level with a strategy on the left, and an "x" in a cell indicating a relationship with the following: "Improves expressive communication skills", "improves social skills", and "improves motor skills".

Table 3.

Essential Description: Table showing four professionals on the left and minimum degree requirements on the right.

Table 4.

Essential Description: Table showing demographics of face validation participants organized by variable (age, highest degree, etc.), number of participants with a given response, and percentage of participants with a given response.

Table 5.

Essential Description: Table displaying demographic information for content validation experts, with the following information from left to right: expert number, age in years, domain of expertise, professional affiliation, professional degree(s), and years of relevant experience.

Table 6.

Essential Description: Table displaying item-level results of first and second rounds of content validation, with item description on the left, then Round 1 data (number of experts rating item clear, content validity ratio (CVR) for clarity, number of experts rating item essential, CVR for essentiality), then Round 2 data, and the CVR for clarity and essentiality on the far right.

Table 7.

Essential Description: Table displaying subscale and instrument content validation results after first and second rounds using the content validity index (CVI). On the left side of the table are the components of the assessment (overall tool, attitudes, self-efficacy, knowledge) and to the right of that are the CVI values and total number of items.

Table 8.

Essential Description: Table depicting quantitative results of face validation portion of the study, organized by variable (time to complete, questions easy to understand, etc.), number of participants with a given response, and percentage of participants with a given response.

Table 9.

Essential Description: Table displaying item-level pilot data results with domain on the left, question and associated responses to the right, and number of participants and percentage of participants with a given response.

Figure 1.

Brief Description: Figure of Person-Environment-Occupational Performance (PEOP) Model, which includes two sets of two interlocking circles that all intersect in the middle, resulting in five distinct areas (person factors, environment factors, occupation, performance, and occupational performance and participation).

Essential Description: Image shows interactions among person/intrinsic (physiological, cognitive, spiritual, neurobehavioral, psychological) factors in a circle on the left, environment/extrinsic (social support, social and economic systems, culture and values, built environment and technology, natural environment) factors in a circle on the right, occupation, and performance, which all intersect and result in occupational performance and participation in the center of the image.

Figure 2.

Brief Description: Flowchart showing process of the development phase of the assessment including development of domains, review of literature, creating initial items, receiving feedback, and organization of completed assessment.

Essential Description: Flowchart showing entire process of the development phase of the assessment, including five steps connected by arrows. First step states “Define domains”. Second step states “Review literature regarding how to measure domains”. Third step states “Create initial items based off of literature”. Fourth step states “Send initial items to experts for feedback and proliferation”. Fifth and final step states “Organize by domain and prepare for content validation”.

Figure 3.

Brief Description: Flowchart showing process of round 1 of the content validation process, including how many items required no edits, how many required revising, and how many items were removed.

Essential Description: Flowchart showing entire process of round 1 of the content validation process, with number of content validators (12) in the top right corner. Initial items (27) is in

top center, with arrows leading to number of items (2) that required no edits based on set criteria, number of items (19) that required edits based on set criteria, and number of items (6) that were removed based on set criteria. Items with no edits necessary and items that were revised have arrows that connect to the total number of remaining items (21). The content validity index (CVI) of remaining items is found directly below, with CVI=0.579. Remaining items also connect with items added (10), with a total number of updated items of 31.

Figure 4.

Brief Description: Flowchart showing process of round 2 of the content validation process, including how many items were included in the final version of the assessment and how many items were removed.

Essential Description: Flowchart showing entire process of round 2 of the content validation process, with number of content validators (10) in the top right corner. Initial items (31) is in the top center, with arrows leading to number of items included in the final assessment (28) based on set criteria, and number of items removed (3) based on set criteria. Below items included in final version of survey is CVI=0.939.

Figure 5.

Brief Description: Flowchart showing participant flow through face validation process, including number of students in each discipline who clicked on the link to the survey, how many were eligible/ineligible, and how many did/did not complete all items.

Essential Description: Flowchart showing participant flow through entire face validation process, starting with 28 students who clicked on the link to the Qualtrics survey. 11 occupational therapy (OT) students, 4 physical therapy (PT) students, 5 speech language

pathology (SLP) students, and 8 special education (SpEd) students clicked on the link. From there, 10 OT students, 4 PT students, 4 SLP students, and 6 SpEd students were eligible to participate (25 total). Of all eligible students, 5 OT students, 4 PT students, 4 SLP students, and 3 SpEd students completed the face validation process in its entirety.

Figure 6.

Brief Description: Figure depicts results of quantitative results of face validation portion of the study with pie charts showing distribution of responses for the following five items: amount of time to complete assessment, whether format was easy to understand, whether questions were easy to understand, whether questions flowed well, and if participants would take the survey again.

Essential Description: Image shows five separate pie charts that reflect results of quantitative face validation items. Top right pie chart shows distribution of responses for amount of time needed to complete assessment, with majority (43.75%) of respondents sharing it took them 15 minutes. Top left pie chart shows distribution of responses for whether format was easy to understand, with majority (81.25%) of respondents sharing it was extremely easy to understand. Bottom right pie chart shows distribution of responses for whether questions were easy to understand, with 50% of respondents sharing questions were extremely easy to understand, and other 50% sharing questions were moderately easy to understand. Bottom right pie chart shows distribution of responses for whether questions flowed well, with majority (68.75%) of respondents sharing questions flowed extremely well. Bottom center pie chart shows distribution of responses for whether participants would take survey again, with majority (93.75%) of participants sharing that they would.

Appendix A.

Essential Description: Table organizes information associated with defining characteristics of levels of assistive technology (no, low, high) and associated characteristics specifically related to improving expressive communication skills, improving social skills, and improving motor skills. Table is organized into three sections for each level of technology, with defining characteristics on top, and three columns for each characteristic below.

Appendix F.

Brief Description: Screenshot from Qualtrics of a set of three items included in the face validation/pilot portion of the study.

Essential Description: Screenshot of series of three items included in face validation/pilot portion of study taken from Qualtrics. Item prompt is on top, and below each item is a series of five responses running horizontally, including “strongly disagree”, “disagree”, “no opinion”, “agree”, and “strongly agree.” First item reads, “I believe that my profession plays a collaborative role in providing services to children with ASD.” Second item reads “I believe that my profession plays a collaborative role in providing assistive technology services to clients.” Third item provides a definition of no-tech assistive technology prior to the prompt which reads, “I believe that, when attempted, no-tech strategies are effective when used with children with ASD.”

Appendix G.

Brief Description: Screenshot from Qualtrics of a set of three questions in the face validation portion of the study.

Essential Description: Screenshot of series of three questions included in face validation portion of the study taken from Qualtrics. Question prompt is on top, and below is a series of responses to choose. First question reads, “Approximately how long did it take you to complete the questionnaire?” with available responses running horizontally across the page including 5, 10, 15, 20, 25, and 30 minutes. Second question reads, “Were the questions simple and easy to understand?” with available responses running vertically down the page to include “not at all”, “moderately”, and “extremely.” Third question reads, “Was the format of the questionnaire easy to understand?” with available responses running vertically down the page to include “not at all”, “moderately”, and “extremely.”

Appendix H.

Brief Description: Screenshot of series of two items included in content validation portion of the study.

Essential Description: Screenshot of series of two items included in content validation portion of the study taken from Qualtrics. Item prompt is on top with associated response options below. The selection options for content validators is below the item and item responses, where raters select responses for both essentiality and clarity. Response options are “0”, “1”, and “2” for essentiality and clarity, which run horizontally. First item reads “I believe that my profession plays a collaborative role in providing services to children with ASD,” and second item reads, “I believe that my profession plays a collaborative role in providing assistive technology services to clients.”

Appendix I.

Essential Description: Table showing participant drop-off during the face validation process. Item descriptions are on the left side of the table, with participants on the right side. Participants are identified using their program affiliation and with an assigned number. An "x" is placed in each cell corresponding to the items that the participants completed, with blank cells indicating no response or drop-off. Of the 9 students who dropped out, 6 dropped off when asked to provide course numbers for completed ASD coursework.

Appendix J.

Essential Description: Table showing results from informal analysis of qualitative data gathered during the face validation process. The questions posed are on the left, with the themes found in the middle of the table, and direct quotes shared on the right side of the table.

Appendix K.

Brief Description: Screenshot of PDF sent by SLACK Incorporated indicating permission to reprint Person-Environment-Occupational Performance (PEOP) Model for reader reference.

Essential Description: Screenshot of PDF sent from SLACK Incorporated to Cindy Ruedinger on 6/2/2020 with permission to reprint the Person-Environment-Occupational Performance (PEOP) Model created by Christiansen, Baum, and Bass-Haugen in 2005. Permission is granted for one-time use within the body of the manuscript of this thesis.

Appendix M.

Brief Description: Screenshot of PDF sent by UW-Milwaukee Institutional Review Board (IRB) with Notice of Exemption Status.

Essential Description: Copy of PDF sent from UW-Milwaukee IRB Administrator indicating notice of exempt status (Category 2) for my thesis study. The letter notes that IRB approval will expire on November 11, 2022.