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A review of the literature on effective interventions for children and youth with Autism Spectrum Disorders (ASD)

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Abstract: **This study provides a review of the literature on effective interventions for children and youth with Autism Spectrum Disorders (ASD), focusing on evidence-based interventions. Describe effective interventions, including what grade level(s) the interventions would be applicable to, as well as what level of autism (mild, moderate, severe) the intervention would be most appropriate for. Highlight interventions using technology/assistive technology, pointing out the gaps in the research.**

Keywords: **Autism, ASD, interventions, literature review, evidence-based interventions.**

1. INTRODUCTION: EFFECTIVE INTERVENTIONS

Wallace and Rogers (2010) founded out that most effective interventions for children with developmental disorders, autism is one of these disorders, usually and generally include the following components: 1) parents involvement and training; 2) individualization to meet every child needs; and 3) early and intensive introduction of interventions. “Children with autism appear to be more likely to benefit from interventions that are initiated at an early age, that are intensive and long lasting (at least 1 year), that target various developmental areas, and that include parents, who can facilitate the generalization process of learned skills. Developers of future autism programs should therefore include these factors in their interventions” (Levy, Ae-Hwa, & Olive, 2006, p. 60). In fact, the need for early interventions has increased as the gap between available interventions and the age of identification widens (Goldstein & Naglieri, 2013). Goldstein and Naglieri (2013) pointed out that while there is many interventions of children with autism have presented effective outcomes in the field of autism, “challenges remain in the early intervention of ASD” (p. 60).

When talking about interventions of children with Autism Spectrum Disorders, ASD, there are some considerations that should be kept in mind. For example, students with autism require intervention programs that meet their needs, address their weaknesses, and emphasize their strengths. In addition, interventions designed for students with ASD have to be designed based on special challenges that students with ASD present (National Research Council, 2001). Also, the National Research Council (2001) recommended that interventions for a child with ASD should start as early as possible, sometimes even prior to a formal diagnosis, even if there is a suspicion of ASD (Downs & Downs, 2010). Moreover, the primary education and treatment for students with ASD should be implemented at school, home, and in community settings (National Research Council, 2001).

The use of the term evidence-based practice started in the 1960s in England as the evidence-based medicine movement began (Wong, Odom, Hume, Cox, Fettig, Kucharczyk, Brock, Plavnick, Fleury, & Schultz (2014); Reichow, Volkmar, & Cicchetti, 2008; Odom, Collet-Klingenberg, Rogers, & Hatton, 2010). In special education, with autism specifically, evidence-based interventions have multiple definitions science individuals with autism receive their education in two different settings, regular and special education classrooms (Reichow, Doehring, Cicchetti, & Volkmar, 2011). Odom et al. (2010) stated that “evidence-based practices (EBPs) are the basis on which teachers and other service providers are required to design educational programs for learners with autism spectrum disorders (ASD)”(p .275). Using education

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practices or interventions that have showed a scientific evidence of effectiveness when using with children with autism becomes a significant feature of their educational programs (Odom et al., 2010; Cook, Tankersely, CooK, & Landrum, 2008). In addition, "evidence-based practice includes consideration of the best available research evidence in the context of individual characteristics and professional expertise (see Figure 1.2)" (Missouri Autism Guidelines Initiative, 2012, p. 6).

Figure 1: (Missouri Autism Guidelines Initiative, 2012, p. 6)

In the United States, polices like No Child Left Behind (NCLB) and Individuals with Disabilities Education Act (IDEA) require special education teachers to use evidence-based practices and interventions (Odom, Collet-Klingenberg, Rogers, & Hatton, 2010; Wang, & Spillane, 2009; Cook, Tankersely, CooK, & Landrum, 2008). Despite that, there are no universal and agreed-on standards to identify evidence-based interventions and practices so far (Odom et al., 2010). Also, there are a few studies has been done on the topic of evidence-based interventions for children with autism (Wallace & Rogers, 2010). In fact, there is still a gap between what is implemented in school and real-life settings and what is done in research studies. Moreover, since every child with autism has different learning needs and interventions of students with autism should be individualized, the gap between research and practice is hard to be closed (Reichow, Doehring, Cicchetti, & Volkmar, 2011).

The National Autism Center report (2009), which reviewed 775 studies of interventions or treatments for students with ASD below 22 years of age, determined that there are four types of interventions for students with ASD. The first type includes established treatments or interventions, which show beneficial effects and are based on well-controlled research. Examples of established interventions are behavioral interventions, social stories and video-modeling. The second type of ASD interventions are emerging interventions, which are based on studies that have produced favorable results and outcomes when used with students with ASD. The Picture Exchange Communication System (PECS), Treatment and Education of Autistic

and related Communication-Handicapped Children (TEACCH), and technology-based interventions are examples of emerging interventions (National Autism Center, 2009). The other two treatments or interventions are respectively named unestablished and ineffective treatments. Since research has not provided positive results or outcomes for using these two treatment types, they will not be discussed here and the focus will be on examples of established and emerging treatments or interventions.

Behavioral interventions. Odom, Collet-Klingenberg, Rogers, and Hatton (2010) stated that behavioral interventions are commonly used with individual with autism. Children with developmental disabilities and autism share a common concern, which is having problem behaviors. These children are at serious risk to manifest problem behaviors when they are not introduced with behavioral interventions. Actually, their social, educational, and community skills and opportunities will be affected if they do not receive behavioral interventions (Horner, Carr, Strain,Todd, & Reed, 2002). Goldstein and Naglieri (2013) pointed out that "behavioral interventions attempt to elicit positive responses from children

as they develop skill sets" (p. 62). Modern behaviorism was introduced by Skinner in the early 1900s in ordered to address behavioral issues of children with autism (Goldstein & Naglieri, 2013).

"Behavioral interventions are systematically applied interventions based on an analysis of antecedents (events prior to a behavior) and consequences (events occurring after a behavior). The purpose of these interventions is to improve socially significant behaviors, including reading, academics, social skills, communication, and adaptive living skills, to a meaningful degree and to demonstrate that the interventions are responsible for the improvement in behavior". (Goldstein & Naglieri, 2013, p. 306).

Examples of behavioral interventions are reinforcement, prompting, shaping, fading, and applied behavior analysis (ABA) (Goldstein & Naglieri, 2013). The last intervention, ABA, is very popular intervention of children with autism. The ABA is mainly trying to decrees inappropriate behaviors and increase positive behaviors in order to improve children with autism different skills (Centers for Disease Control and Prevention, 2012). According to The National Autism Center report (2009), behavioral interventions have provided favorable outcomes with all age groups and most diagnostic groups.

Social stories intervention. Wang and Spillane (2009) stated that Social Stories literature has recommended the use of Social Stories with children with autism as an effective intervention. The use of social stories as a classroom-based intervention has been effective with students with ASD (Zager, 2005). Children with autism have difficulties in the social functions and that is considered as a core characteristics (Bellini, Peters, Benner, & Hopf, 2007; Case-Smith, & Arbesman, 2008; Wang, & Spillane, 2009). They have difficulties in communicating and sustaining relationships with others. Those difficulties could lead these children with autism to ending up with poor academic achievement, problem behaviors, and social rejections (Bellini, Peters, Benner, & Hopf, 2007). Social Stories was developed by Carol Gray in 1993, to provide relevant social skills instruction. Social stories address social situations that are difficult to understand. Social stories interventions provide illustrations for specific social situation. This type of intervention is used to improve students' with ASD social skills and adaptive behaviors. Social Stories help students with ASD to interpret difficult social situations (Zager, 2005).

"Social Stories are written instructions presented in a story format that are aimed at teaching a child a particular social (or behavioral) concept. The stories are intended to be individualized to the social or behavioral needs of the child, and multiple stories are often used to instruct on a wide variety of skills" (Goldstein & Naglieri, 2013, p. 209). The intervention includes six sentence types: perspective, descriptive, directive, affirmative, cooperative, and control (Okada, Ohtake, & Yanagihara, 2008; Schreiber, 2011). Also, teachers, therapists, psychologists, or parents can write Social Stories sentences for their children (Zager, 2005). According to The National Autism Center report (2009), Social Stories have showed favorable outcomes with age groups from 6 to 14 years-old and autistic disorder and Asperger diagnostic groups.

Video-modeling intervention. Video-modeling intervention has produced effective outcomes with students with ASD. It takes advantage of students' with ASD visual strengths (Goldstein & Naglieri, 2013; Mechling, Gast, & Seid, 2009; Bimbrahw, Boger, & Mihailidis, 2012). In addition, "video is an increasingly popular, economical, readily available, user-friendly technology that can prove beneficial for children with autism" (Goldsmith & LeBlanc, 2004, p. 169). In the video-modeling intervention the student performs a task after watching a recorded video of the skills for that specific task. This intervention allows the student to repeat a task or skill many times. Also, it displays a task to the student with ASD with clear details. Tasks or skills that have multiple components, such as toileting, transition, food preparation, and purchasing, can be explained much more easily to a student with ASD by using the video-modeling intervention (Mechling et al., 2009). Actually, video-modeling has also shown positive effects to be used as school and community settings intervention for students with ASD (Sansosti & Powell-Smith, 2008). Several literature studies indicated that video-modeling intervention could help effectively to improve social skills, teach daily life skills, and increase task fluency (Goldsmith & LeBlanc, 2004; Kashinath, 2012; Goldstein & Naglieri, 2013). According to The National Autism Center report (2009), video-modeling intervention has showed favorable outcomes with age groups from 3 to 18 years old and autistic disorder and most diagnostic groups.

Picture exchange communication system intervention (PECS). PECS interventions is a picture-based and communicating system that used popularly with children with autism to teach them the functional Communication (Jurgens, Anderson, & Moore, 2009; Goldstein & Naglieri, 2013). Goldstein and Naglieri (2013) pointed out that, in

PECS intervention, children with autism are required to exchange picture symbols in order to communicate with each others. In 1985, Andrew Bondy and Lori Frost developed the Picture Exchange Communication System (PECS). PECS was developed to help students with social communication disorders and students with ASD to improve their communication skills. PECS differs from other communication interventions in three major elements:

"(a) it does not require prerequisite skills; (b) it was designed to address the lack of motivation for social reinforcement; and (c) it immediately teaches initiating, instead of teaching responding before initiating (Bondy & Frost, 1994)" (Tien, 2008, p .62).

In fact, interventions that use visual symbols such as pictures, have got much attention in the last several years as an effective way to work with students with ASD (National Research Council, 2001). According to The National Autism Center report (2009), Picture Exchange Communication System (PECS) intervention has demonstrated favorable outcomes with age groups from the first year to 9 years old and autistic disorder and pervasive developmental disorder — not otherwise specified (PDD-NOS) diagnostic groups.

Treatment and education of autistic and communication handicapped children (**TEACCH**). TEACCH is a program for children with autism that provides educational, clinical, and training services for children with autism and their families. The main program of TEACCH is located at the University of North Carolina at Chapel Hill. TEACCH was established by Eric Schopler during the beginning of 1970s. This intervention has been offered to thousands of children with autism form all level skills and ages (Treatment and Education of Autistic and Communication Handicapped Children Autism Program, 2006). Peerenboom (2003) stated that the three main components of TEACCH are parental collaboration, structured teaching, and early diagnosis. Therefore, parents are the cornerstone and play the main role of the TEACCH program. TEACCH minimizes children with autism's deficits such as the shortage of communication skills by using visual prompts and structured teaching and environments (Panerai, Ferrante, & Zingle, 2002). On the other hand, children with autism have a powerful visual memory, so TEACCH focuses on getting benefits from the strong visual memory. Kusmierski and Henckel (2002) confirm that TEACCH takes advantage of children with autism's strengths such as visual learning. For instance, a student with autism can communicate with a teacher by using a communication board, so the student can order what he or she wants by posting related pictures on the communication board.

In fact, TEACCH is one of the most effective interventions for children with autism (Panerai, Ferrante, & Zingle, 2002). Kurt and Parsons (2009) pointed out that much literature indicates successful outcomes of TEACCH such as the improving in communication skills and reducing of disturbing behaviors. It is also a worldwide used approach and an international program. TEACCH has been used in Kuwait, United Kingdom, Italy, and France (Tsang, Shek, Lam, Tang, & Cheung, 2006; Treatment and Education of Autistic and Communication Handicapped Children Autism Program, 2006). This intervention has been used for over 20 years with children with autism and their families (Keel, Mesibov, & Woods, 1997). According to The National Autism Center report (2009), TEACCH intervention has demonstrated favorable outcomes with age groups from the first year to 18 years old and autistic disorder and pervasive developmental disorder — not otherwise specified (PDD-NOS) diagnostic groups.

Technology-based interventions. Goldstein and Naglieri (2013) stated that:

"the term "assistive technology" appears in the Individuals with Disabilities Education Amendment (2004) and refers any item, piece of equipment, or product system that is used to increase, maintain, or improve the functional capability of an individual with special needs. Assistive technology (AT) devices can be electronic or nonelectronic. Nonelectronic strategies typically include low-cost and easy-touse equipment, such as dry-erase boards, laminated photographs, photo albums, natural aided language boards (Cafiero 2001), and so forth. Electronic technology devices can range from simple electronic devices, such as tape recorders, voice output devices, timers, and calculators to more complex and costly, such as computers, digital cameras, video cameras, and complex voice output devices" (p. 312).

Goldsmith and LeBlanc (2004) and Lancioni and Singh (2014) acknowledged that technology-based interventions are usually useful when used with individual with autism. Previous studies have demonstrated good effects when using many technologies with individual with autism (Goldsmith & LeBlanc, 2004). In fact, technology is compatible with individuals' with autism learning style. Research has found out that some of Individuals with autism may learn more quickly when using the technology than with traditional instruction. Also, they are more motivated when using the technology (Goldstein et al., 2013). Francis, Mellor and Firth (2009) pointed out that individuals with autism now have

more opportunities to find new visual assistive aids due to the increase in technology platforms' numbers. "Specifically for individuals with ASD, handheld electronic devices offer a way to present information visually, in a predictable and sequential manner" (Knight, McKissick, & Saunders, 2013, p. 2646). Individuals with autism often rely on external stimulus prompts in order to terminate, initiate, or maintain a behavior (Goldsmith & LeBlanc, 2004). Technology-based interventions are sometimes used as a temporary instructional aid and can be removed once behavioral changes have been met. On the other hand, others can be used indefinitely as assistive tool (Goldsmith & LeBlanc, 2004).

Assistive Technology is often used in special education to increases opportunities for students with special needs (Ennis-Cole & Smith, 2011). Ennis-Cole and Smith, (2011) stated that "It has the potential to benefit individuals at all levels within the spectrum because of its diverse applications, ease-of-use, and ability to address all areas of deficit–communication, social skills, and academics." (p. 88). Technologies could improve individuals' with autism various skills such as social, communication, and other skills (Goldstein & Naglieri, 2013; Ennis-Cole & Smith, 2011; Goldsmith & LeBlanc, 2004). In addition, individuals with autism could be able to achieve relevant self-determinations' level and engage actively with the use of appropriate assistive technologies. Technology could help individuals with autism to overcome their serious limitations. They could "gain greater access to their daily environment and related choice events, with important personal and social implications" (Lancioni, Sigafoos, O'Reilly, & Singh, 2012). Finally, "the use of technology to teach students with ASD is not a new concept. In fact, technology has been used to teach students with ASD for over 35 years" (Knight, McKissick, & Saunders, 2013, p. 2629). However, Lancioni et al. (2012) pointed out that paralleling effective interventions with technology can be considered as an emerging field.

Computer-based intervention. Mechling, (2007) states that the variety and multiple uses of assistive technology (AT) hold promising ways to meet diverse individuals' needs. Computer-based intervention has been an increasing focus of researchers and is one example of an AT. Using computers in the instructional process with students with ASD is considered a new area in research in the last few years. In fact, the computer-based intervention is commonly used with students with autism to teach them different skills (Knight, McKissick, & Saunders, 2013). Also, computers act as a motivational factor with students with ASD (Sansosti & Powell-Smith, 2008; Mirenda, 2001). Computer-based interventions that use handheld devices, laptops, and computers can work for many students with autism as conditioned reinforcers because the students are very motivated by computers (Goldsmith & LeBlanc, 2004).

Computer-based interventions have been used with children with autism to acquire various skills (Bimbrahw, Boger, & Mihailidis, 2012; Mechling, Gast, & Krupa, 2007). For instance, Bosseler and Massaro (2003) indicated that computer-based instruction is considered as an emerging popular method to expand the vocabulary of students with special needs. Also, computers have been used in schools as a new approach to teach students with ASD language and vocabulary skills. In fact, computer-controlled applications have the advantage of providing texts with supportive sources such as images and sounds at the same time (Bosseler & Massaro, 2003). Integrating these sources with a written definition improves students' ability to learn and memorize target vocabulary. The integration of sound and visual supports is an efficient method for facilitating learning and improving language and vocabularies (Bosseler & Massaro, 2003). Moreover, computer- based interventions could help in training social skills (Chen, 2012). "The use of computer-based system compared to paper-based systems such as picture cards, photograph albums, and lists, may hold some distinct advantage" (Mechling, 2007, p. 265). In addition, when comparing computer-based interventions to traditional methods, computer-based interventions show positive effects such as reduction of inappropriate behaviors and an increase in learning, attention, and motivation (Goldsmith & LeBlanc, 2004).

Bosseler and Massaro (2003) found that students with ASD face difficulties in generalizing and applying acquired skills to real world settings. In addition, students with ASD have difficulties when they deal with new settings that include people who did not participate in the initial training. However, intensive training can help students with ASD to overcome those difficulties and be able to generalize acquired skills. Effective intensive training may contain the use of computer-based tools such as portable devices and tablets with other effective interventions such as social stories, video modeling, pictures, and PECS. Hagiwara and Myles (1999) stated that use of a multimedia approach, such as computer-based instruction, visual symbols, and social stories, with students with autism presented possible positive effects.

Combined effective interventions with technology. Social stories have been integrated into computer-based and multimedia formats. For example, Microsoft PowerPoint is being used to teach students with special needs by integrating activity schedules. In fact, research on this kind of integration provided favorable results even though results varied

among students with ASD (Goldsmith & LeBlanc, 2004). Sansosti and Powell-Smith (2008) studied the effectiveness of integrating and combining social stories and video modeling intervention via computers. They found that there might be a beneficial method for meeting social skills deficits among students with ASD. The integration of video modeling in portable devices such as iPod, Apple mp3, and video players has also been studied (Cihak, Fahrenkrog, Ayres, & Smith, 2009). In fact, students' independent transitions increased when they used handheld devices (Mechling, 2011). Moreover, three studies have compared results of integrating pictures into a portable device. The Palmtop personal computer, a portable device that has multimedia input and output with a touch screen has been studied and found to be more effective than manually using pictures on cards (Mechling, 2007).

Mechling, Gast, and Seid (2009) pointed out that the "use of electronic self-prompting devices by persons with ASD holds promise as a means for increasing students' independence while decreasing their reliance on prompt delivery by teachers, other adults, or peers" (p. 1420). That is, students with ASD may be able to know when to do a task without relying on others by using those types of electronic self-prompting devices. In fact, a portable computer-based system has many advantages compared to a cassette player. For instance, it (a) provides the chance of repeating steps, (b) offers visual supports to auditory instructions of a task, and (c) has a controlling option over visual and auditory prompts (Mechling, 2007).

Technology like Personal Digital Assistance (PDA) and smart phones may be beneficial for individuals with autism (Gentry, Wallace, Kvarfordt, & Lynch, 2010). "In parallel with the increasing availability of suitable handheld platforms such as personal digital assistants and mobile telephones over the past 15 years, there has been a trend to develop aids based on digital technologies that are more discrete and socially acceptable" (Francis, Mellor & Firth, 2009, p. 57). Goldsmith and LeBlanc (2004) indicated that the use of electronic devices such as cell phones and Personal Digital Assistance (PDA) becomes more economically participial and socially valid intervention for individuals with autism (Goldsmith & LeBlanc, 2004). In addition, mobile devices like iPads and others can affect communication, transition, language, and academic skills of students with autism and other developmental disabilities (Hart & Malian, 2013; Clark, Austin, & Craike, 2014). These technologies are likely to play a significant role in children's with autism treatment. (Clark, Austin et al., 2014). In fact, iPad, iPod, and other high-tech Assistive Technology tools becomes more popular used with children with autism to acquire social, appropriate behaviors, language, and academic skills (Ennis-Cole & Smith, 2011).

Gaps in Research about Technology and Autism

Research on the topic of using technology with individuals with autism has pointed out many significant gaps and needs. For instance, Goldsmith and LeBlanc (2004) stated that although technology-based interventions can be useful with children with autism and there is increasing literature supported the effectiveness of using them, there is still need for comparative research. In addition, Gentry, Wallace, Kvarfordt, and Lynch (2010) pointed out that research about the effectiveness of the use of Assistive Technology (AT) with individuals with autism is still in infancy and future research is more needed to investigate the promising capabilities of AT. Moreover, there is a critical need to conduct more research about the effectiveness of using iPad, iPhone, and other smartphones and tablets with individuals with autism. In fact, research on this topic is still limited and emerging (Knight, McKissick, & Saunders, 2013; Clark, Austin, & Craike, 2014). "Another important research area is the assessment of attitudes of caregivers, family members, and the individuals toward different assistive technologies" (Lancioni, Sigafoos, O'Reilly, & Singh, 2012, p. 98). In fact, there has been little research about parents' attitudes toward the use of iPad with children with autism. It is so critical to examine parental attitudes toward the use of iPad with children with autism because "attitudes are typically a strong predictor of subsequent behavior"(Clark et al., 2014, p .2). Finally, there is no study about parents' beliefs about autism in general in Arab countries, including Saudi Arabia (Alqahtani, 2012).

Parents' Role in Interventions for Students with ASD

Parents are the cornerstone of intervention and education for students with ASD. According to Zager (2005), "a commonly held belief among professionals was that the needs of the child with ASD were so great that parents could not be expected to manage the child without extensive professional intervention" (p. 113). This was one of many misconceptions and assumptions about families and parents of students with ASD. Another misconception is that parents are the cause of their child's ASD (there is no evidence of this) (Zager, 2005). Actually, parents and families are an

essential part of providing services and education to students with disabilities. The Individual with Disabilities Education Act (IDEA) supports the importance of parents of students with disabilities in the education process. In addition, families must be active participants in their students' Individual Education Plans (IEP).

Currently, families and parents are considered as the best persons who know and can judge their students with disabilities (Zager, 2005). Also, "the best long-term advocate" for students with ASD is family (Zager, 2005, p. 115). A student's development can be supported and improved effectively if parents have teaching skills and used them with their children at home during daily living activities. Zager (2005) declares that involving parents in their children's education process is important because students spend the majority time of a given day at home with their parents. Thus, learning opportunities will increase if parents are involved in their child's program and intervention can then be implemented in real world settings. Parents of students with ASD have participated in many interventions for their children with ASD. For instance, parents are involved in writing Social Stories for their children with ASD, in addition to the stories written by teachers, therapists, and others professionals (Zager, 2005). According to the National Research Council (NRC) (2001), the main form of current interventions for children with ASD are based on education of parents, students, and teachers.

Parents' involvement, participation, collaboration, and interaction. Ozonoff and Cathcart (1998) declared that there were three common features of effective treatments: (a) "the use of structured behavioral and educational approaches, (b) training parents to implement the program at home, and (c) enrollment in the treatment program prior to age 5" (p. 25). According to Ozonoff and Cathcart (1998), several studies have shown that the feelings of stress and depression can be reduced and feelings of competence can be increased after having a home intervention. Parents of children/adolescents with ASD are a significant component of any intervention. They can help maintain the gains of the intervention, such as the reduction of stress and increase of appropriate skills of children/adolescents with ASD (Diggle & McConachie, 2009). In addition, Stahmer, Schreibman, and Cunningham (2010) stated that active participation and involvement of parents of students with ASD to insure effective interventions is a recommended and important component. Recently, research on family variables and how they interact with interventions has just begun (Stahmer et al., 2010).

Interactions between parents and education professionals are a significant component in the field of special education. One reason for this is the required involvement of parents in their children's education by the Individual with Disabilities Education Improvement Act (IDEIA, 2004) (Stoner, Bock, Thompson, Angell, Angell, Heyl, & Crowley, 2005; Yell, 2012). The collaboration between parents and practitioners is a significant component in any intervention for students with ASD. For example, Stahmer, Schreibman, and Cunningham (2010) indicated that if practitioners and parents collaborate with each other to identify target behaviors and to determine the way that the treatment can be applied they can impact the reduction of problem behaviors for children/adolescents with ASD. Also, this collaboration can increase the confidence of parents after reducing their stress. In fact, there are a few researches that have been done to investigate the interaction between parents and education professional from perspectives of parents (Stoner et al., 2005).

Parents' attitudes, perceptions, and opinions. According to Stahmer, Schreibman, and Cunningham (2010), there are many factors that may affect the effectiveness and delivery of the treatment, such as parental attitudes and age, level of education and stress and others. Positive expectations and attitudes of parents are important elements when working with children/adolescents with autism. Stahmer et al. (2010) stated that "the practitioner can, and should help a parent to have more positive expectations about what the parent can do to increase child outcome, which can increase their feelings of self-efficacy" (Stahmer et al., 2010, p. 237). Moreover, parents' opinions and satisfaction data are so important because they help in improving current services as well as convincing professionals, policy makers, and administrations about the effectiveness of early interventions. Also, evaluating early intervention programs by assessing the parents' satisfaction and perceptions has been considered as "a widely recommended method" (Kohler, 1999, p. 150). In fact, Kasari and Sigman (1997) indicated that future research should examine parents' perceptions about their children/adolescents' outcomes to improve all interventions. As can be seen from the research, parents' perceptions and opinions toward the effectiveness of a treatment are critical so it is important to study their perceptions about any interventions to be used at home to improve the lives of children and youth with ASD (Green, Pituch, Itchon, Choi, O'Reilly, Sigafoos, 2005).

Culture of parents. Ennis-Cole, Durodoye, and Harris (2013) observed that technology has been used by parents across cultural groups to entertain and educate children with autism spectrum disorder (ASD). Professionals who work with the families of children with ASD should pay attention to the cultural backgrounds of these families, given that linguistic and cultural backgrounds affect how students with ASD use technology (e.g. Augmentative and Alternative Communication

devices (AAC)). For instance, some colors and symbols could be considered appropriate by one culture may not work for another, and may in fact be offensive or rude. The cultural backgrounds of the parents affect how students with ASD use technology (Ennis-Cole & et al., 2013).

Parents' cultural backgrounds impact their decisions regarding interventions (Ennis-Cole, Durodoye, & Harris, 2013; Tincani, Travers, & Boutot, 2010; Mandell & Novak, 2005). According to Tincani et al. (2010), using technology of evidence-based practices with student with ASD is "insufficient without understanding the important role that diversity plays in helping persons with ASD" (p. 81) In addition, Tincani et al. (2010) founded that cultural background affects how parents respond to their children with ASD. African American mothers, for example, were found to have fewer negative feelings toward their children with ASD than did Caucasian mothers. An interpretation of that could be that these African American mothers look differently on their children's impairment because of cultural beliefs. Thus, the key to developing a successful intervention is to fully consider diverse family systems (Tincani, Travers, & Boutot, 2010).

In addition, the cultural backgrounds of parents shape their beliefs about autism and intervention outcomes (Ennis-Cole, Durodoye, & Harris, 2013; Tincani, Travers, & Boutot, 2010; Mandell & Novak, 2005). For instance, Dyches, Wilder, Sudweeks, Obiakor, and Algozzine (2004) reported that some Latino parents see a child with autism as a gift from God—an opportunity to become better people. Another example would be that "African American children diagnosed with autism are less likely to receive regular medical and diagnostic services than their White counterparts" (Gourdine, Baffour, & Teasley, 2011, p. 460). Also, White Americans are more likely to use professional and traditional interventions, while African Americans may seek recommendations from friends and members of their church before seeking professional interventions (Ennis-Cole, Durodoye, & Harris, 2013).

Tincani, Travers, and Boutot (2010) noted that few systematic studies have addressed cultural issues and diverse family systems and the impact of parental culture on successful interventions. In fact, there is a strong need for additional studies on language and cultural issues affecting students with ASD (Ennis-Cole, Durodoye, & Harris, 2013). Ennis-Cole et al. (2013) and Tincani et al. (2010) wrote of the need to tailor interventions to the cultural backgrounds of parents of a child with ASD. Such interventions require the active and direct involvement of parents. Finally, Dyches, Wilder, Sudweeks, Obiakor, and Algozzine (2004) noted:

"most research has failed to identify students with autism according to culture, limited data are available to help researchers and practitioners ensure that appropriate services are provided to these students. Such limitations may reflect a lack of awareness of cultural issues (Wilder, Jackson, & Smith, 2001) and of ways that those issues affect students with autism and their families. In addition, such missing information clearly compromises the quality of the field of professionals who work with multicultural students with autism." (p. 220)

Teachers' Role, Preparation, and Training

Dyches, Wilder, Sudweeks, Obiakor, and Algozzine (2004) indicated that the diverse cultural experiences and values of students with ASD are significant considerations for teachers in improving the lives of their students. Students with ASD and their families have many different needs that require flexibility on the part of teachers and other professionals (Ennis-Cole, Durodoye, & Harris, 2013). Thus, teachers of students with ASD must consider cultural identity, given its effect on the student. Finally, Oakley, Howitt, Garwood, and Durack (2013) suggested the use of varying teaching styles to meet the needs and abilities of individual students with ASD.

Previous research demonstrated that teacher preparation and training is the weakest element in the development of effective programming and services for ASD students and their families (Hart & Malian, 2013; Razali, Toran, Kamaralzaman, Salleh, & Yasin, 2013). Scheuermann, Webber, Boutot, and Goodwin (2003) founded limited formal data regarding the preparation of personnel to work with autistic students. For example, it is not known how many autism preparation programs are now available or how many autism specialists are trained annually. In fact, there are numerous challenges in teacher preparation for autism, one of which is having high-qualified teachers (Scheuermann et al., 2003).

Growing rates of autism mean increased demand for well-trained teachers who can effectively teach these students (Hart & Malian, 2013; Razali, Toran, Kamaralzaman, Salleh, & Yasin, 2013). On other hand, past studies indicated that there is a lack of preparedness of teachers (Loiacono & Feeley, 2009). According to Scheuermann, Webber, Boutot, and Goodwin (2003), "there is a large body of knowledge about the most effective curriculum and strategies for teaching these students.

Unfortunately, relatively few teachers are aware of these strategies, and most have not mastered them. Teachers and others who work with these students need to be well trained and supported through a variety of resources." (p. 198) Providing training and field experience for teachers of students with ASD can positively impact teacher expectations, perceptions, understanding, and knowledge of ASD students (Loiacono & Valenti, 2010). Surprisingly, few researchers focus on issues of teacher perceptions (Syriopoulou-Delli, Cassimos, Tripsianis, & Polychronopoulou, 2012).

The use of technology, such as an iPad, in a classroom with ASD students does not guarantee effective learning support because of the many considerations in integrating these new technologies (Malley, Jenkins, Welsey, Donehower, Rabuck, & Lewis, 2013). Teachers, for example, play an important role in determining which mobile technology will work for each student (Mintz, 2013). One of the most important considerations is training teachers to use the technology. Malley et al. (2013) found that teachers indicated that they would use integrated technology to improve student outcomes if they were trained to do so. To be well prepared a teacher should also know when and why to use technology.

Special education teachers should "carefully consider each mode of communication (verbal, gestural, and graphic) for each of their students with ASDs and have an understanding that the use of one does not preclude the use of another" (Loiacono & Feeley, 2009, p. 17). In one study, teachers were found to be highly accepting and to strongly approve of the positive outcomes achieved in an iPad intervention with moderate and severely disabled students (Malley, Jenkins, Welsey, Donehower, Rabuck, & Lewis, 2013). Moreover, teachers have reported that an iPad intervention helped them to achieve objectives that they could not achieve with traditional instruction methods. Teachers also indicated a positive effect on student engagement with an iPad. Finally, Malley et al., (2013) reported "teachers had a strong interest in expanded use of iPads in classroom instruction." (p. 13)

2. SUMMARY OF LITERATURE REVIEW

Children and youth with the ASD have various deficits in communication, social, academic, and adaptive behavior skills. A child may have high-functioning or low-functioning autism. Students with high-functioning autism or Asperger Syndrome (HFA/AS) are more able to learn and improve certain skills than are students with low-functioning autism. There are many effective interventions that can meet the needs of students with HFA, such as social stories, video modeling, and picture exchange communication system (PECS). Incorporating these effective interventions with computer-based applications and software holds promise for students with ASD. Moreover, using portable electronic devices such as tablets and smartphones may also decrease a student's reliance on others and overcome the limitations of computer-based interventions. Finally, parents play a critical role in the interventions for students with ASD. As such parents are a critical factor in any intervention using portable electronic devices with students with ASD. Thus, parents' attitudes, opinions, or perceptions toward using portable devices with their children/adolescents are an important component of this study.

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