PARENTS’ ATTITUDES TOWARD THE USE OF TECHNOLOGY AND PORTABLE DEVICES WITH CHILDREN WITH AUTISM SPECTRUM DISORDER (ASD) IN SAUDI ARABIA

By

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To the Faculty of Washington State University:

The members of the Committee appointed to examine the dissertation of SAAD YAHYA ATHBAH find it satisfactory and recommend that it be accepted.

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Abstract

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The use of technology such as portable electronic devices with children with autism spectrum disorders (ASD) is gaining increased research attention. The purpose of this study was twofold and guided by these questions: (1) What are the attitudes of parents of children with ASD toward the use of technology, specifically portable devices like iPad? and, (2) From a parent perspective to what extent do Saudi Arabian children with ASD use these technology and portable devices? In order to explore these questions, a mix of quantitative and qualitative research methods were employed in this study. Background research was reviewed by using many and different database and journals. Survey methods were used to collect data on the parents’ attitudes. Qualitative interview methods were used to explore parents’ attitudes about technology and ASD. The results of this study indicate that parents agreed about the positive possible benefits of technology and portable electronic devices related to their children’s various skills in different settings. This study supports the use of technology and portable electronic devices with children with ASD as a promising approach and intervention. Implications for future research and limitations of this study are discussed.
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DEDICATION

This work is dedicated to my lovely family, my wife and daughter, and great parents who have been patient with and emotionally supportive to me. They always remember me in their prayers, hearts, and minds. I apologize to them for being busy with my studies and hope that they will accept this work as a gift from me. Also, I dedicate this work to my brothers and sisters for supporting and praying for me in spite of the long distance between us. This work is dedicated to my uncle, Dr. Abdullrahman Alathbah, who was always supportive to me emotionally and provided me with wise academic advises since the beginning of my master’s degree until this moment. Finally, this study is dedicated to one of my best friend, Omar Alhowikan, who just passed away during and before we both finished our PhD journey. I hope we will see each other again in the paradise.
CHAPTER ONE

INTRODUCTION

Background

Autism Spectrum Disorder (ASD) has received increased attention from physicians, researchers, parents, and educational specialists in recent years. One reason for this is the growth in ASD diagnoses. The Centers for Disease Control and Prevention (CDC) (2014) estimated that roughly 1 in 68 children in the United States have ASD. Because of the primary common skill deficits and developmental learning difficulties associated with ASD it is considered a complex developmental disorder. Hetzroni and Tannous (2004) have shown that children with ASD have difficulty developing language and communication skills. Deficits in joint attention skills are also common in children with ASD. Many children with ASD are not able to make eye contact with others even when asking for something they need (Tsao & Odom, 2006). Moreover, children with ASD have difficulty with many adaptive behaviors, such as being safe, getting dressed, and using the toilet.

Tsao and Odom (2006) noted that children with ASD have difficulty developing and maintaining social relationships. These difficulties in social competence result from other deficits and difficulties such as language development and joint attention. Bass and Mulick (2007) found that the difficulties children with ASD have with social competence and joint attention lead to problems in social play skills. Social play skills are significant in improving children’s social and cognitive skills. Deficits in social play skills can affect communication, imagination, and ongoing social interactions.
These social skill difficulties may be addressed with early, intensive, interventions (Strain & Danko, 1995). One type of interventions is technology-based treatment. According to the National Autism Center (2009), technology-based treatment is considered as an established treatment with effective and beneficial effects when used with children with ASD. Technology-based treatment includes computer-based technology, where specific software is used on a computer, laptop, tablet, or smartphone. Teachers are more frequently using computers with children with ASD as an instructional tool (Bosseler & Massaro, 2003).

According to a study by Yaw, et al. (2011), computer-based instruction increased motivation and decreased problem behaviors in children with ASD when compared to personal instruction. Such assistive technologies offer promise for improving the communication and social skills of children with ASD (Reichle, 2011). Lightweight and portable electronic devices (e.g. tablets and smartphones) are easier for children with ASD to use throughout the day, at home, and in school (Sennott & Bowker, 2009). These portable devices utilize many computer software programs, applications, and designs.

Children with ASD are not treated in a vacuum. It is critically important when considering any intervention that we involve families, and parents in particular. Orsmond and Seltzer (2007) found that families and siblings with a child with ASD encounter greater challenges than families with children with different special needs. Rao and Beidel (2009) added that the behavior, communication, and social problems of a child with ASD can create stress for the entire family. “In fact, the delayed and/or atypical ways in which young children with ASD interact with parents, peers, and siblings represent one of the defining characteristics of autism” (Strain & Danko, 1995, p. 2). As a
result, children tend to spend less time with a sibling with ASD. According to Orsmond and Seltzer (2007), “past research has shown that siblings of young children with ASD spend less time with and have a less close relationship with their brother or sister than do siblings of children with DS [Down Syndrome]” (p. 693). Parents can help their children with ASD overcome stress and develop good relationships with family members. This can be done if parents are included in the child’s ASD interventions and treatments.

**Autism and Saudi Arabia**

Saudi Arabia is a developing, Middle Eastern country on the Asian continent. The population of Saudi Arabia is approximately 29 million people; most of them are under 21 years of age (Alqahtani, 2012). Saudi Arabia is bordered by Yemen in the south; Kuwait, Iraq, and Jordan to the north; the Red Sea in the west; and Oman, United Arab Emirates, Qatar, and the Arabian Gulf to the east. Islam is the dominant religion. The country occupies most of the Arabian Peninsula, is home to the world’s largest sand desert, and possesses more oil than any other country. In fact, the main driver of the Saudi Arabian economy is oil. The Saudi Arabian Ministry of Education of was established in 1953 and education is free. Special education began soon after. According to Al-Faiz (2006) “the commencement of special education in Saudi Arabia was initiated in the 1960s, and developed in stages parallel to those in the United States” (p. 2). In addition, education in Saudi Arabia is considered a fundamental right of people with special needs, not a privilege, as stated in the Royal Decree of the Rights of Individuals with Disabilities (RDRID) (Al-Faiz, 2006; Alothman, 2001; Alqahtani, 2012; Alquraini, 2011).
ASD has become more prevalent throughout the world over the past decade due to increased awareness, better diagnostic criteria, and other factors (Al-Gadani, El-Ansary, Attas, & Al-Ayadhi, 2009). ASD cases are increasing in Saudi Arabia as well (Alqahtani, 2012; Al-Salehi, Al-Hifthy, & Ghaziuddin, 2009). For every 120 of the world’s children, one is diagnosed with ASD according to Elsabbagh, Divan, Koh, Kim, Kauchali, Marcín, & Fombonne (2012). However, around the world, there is a great diversity in the amount and quality of provided services and the number of children who need them. This discrepancy is widest in developing countries (Elsabbagh et al. 2012). It is estimated that eighteen in every 10,000 people in Saudi Arabia have been diagnosed with ASD (El-Ansary, & Al-Ayadhi, 2012; Murshid, 2011). Yet, only 925 students with ASD in Saudi Arabia (ages 5 to 18) are receiving services through the educational system (Ministry of Education, 2012). The prevalence of ASD in Saudi Arabia is slightly higher than in other developing countries. It was estimated (method is unknown) that 42,500 individuals have ASD in 2002, while many individuals with ASD remain undiagnosed (Alqahtani, 2012; Al-Salehi, Al-Hifthy, & Ghaziuddin, 2009; Al-Wakeel, Al-Ghanim, Al-Zeer, & Al-Nafjan, 2014; Al-Yafeel, Al-Ayadhi, Haq, & El-Ansary, 2011; Halepoto & Al-Ayadhi, 2014; Murshid, 2011; Murshid, 2005; Yazbak, 2004). Most reports on the prevalence of ASD were introduced by the Saudi Autistic Society, established in 2003. These reports were distributed in flyers and brochures (Murshid, 2005). Unlike the US, few reports have been done on the prevalence of ASD in the Middle East and Saudi Arabia (Al-Salehi, Al-Hifthy, & Ghaziuddin, 2009; Dababnah & Parish, 2013). In Saudi Arabia, the rate of ASD is higher in males than females (Hussein,
Taha, & Almanasef, 2011) with a ratio of 4:1, comparable to that of the United States (Murshid, 2011).

The literature review of ASD in the Middle East, particularly Saudi Arabia, indicated that little is known about ASD in this region and only a few studies have been done on the subject (Al-Faiz, 2006; Al-Salehi, Al-Hifty, & Ghaziuddin, 2009; Al-Salehi & Ghaziuddin, 2009; Hussein, Taha, & Almanasef, 2011). Most studies in the Middle East and Saudi Arabia have been based in the western industrialized countries, such as the United States (Al-Salehi, Al-Hifty, & Ghaziuddin, 2009). Previous research has focused on inclusion or special educational services for students with ASD in Saudi Arabia. Al-Faiz (2006) pointed out that “it is important to conduct research to help improve the overall knowledge in Saudi Arabia about autism and its educational needs” (p. 5). Publications addressing ASD in the Arab world, including Saudi Arabia, are “under-represented” (Al-Salehi & Ghaziuddin, 2009, p. 227; Hussein et al., 2011). Most ASD research in Saudi Arabia has been done in medical and clinical fields. For instance, one study of 49 patients in Saudi Arabia found that “females were older than males at the time of referral” (Hussein et al., 2011, p. 2). Little research has been done on increasing the awareness of ASD among professionals in developing countries (Al-Salehi, Al-Hifty, & Ghaziuddin, 2009). Another gap in the literature is in the beliefs of Saudi Arabian parents regarding ASD. Up to this date, there is no research has been done in Saudi Arabia about parents’ beliefs and attitudes toward ASD. Finally, there is a need for research to identify the gaps between the ASD knowledge of parents and professionals in Saudi Arabia (Alqahtani, 2012).
Statement of the Problem

Research on the use of technology by individuals with ASD has many significant gaps. Goldsmith and LeBlanc (2004) observed that while technology-based interventions can be effective for children with ASD, and these interventions have had increasing support in the literature, there remains a need for comparative research. In addition, Gentry, Wallace, Kvarfordt, and Lynch (2010) pointed out that research on the effectiveness of Assistive Technology (AT) for individuals with ASD is in its infancy and more research is needed. Moreover, there is a critical need for research on the effectiveness of iPads, iPhones, and other smartphones and tablets for individuals with ASD. Research on this topic is 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 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 iPads with children with ASD. It is critical to examine these attitudes because they “are typically a strong predictor of subsequent behavior” (Clark et al., 2014, p .2). Finally, there is no study about parents’ general beliefs regarding ASD in Arab countries, including Saudi Arabia (Alqahtani, 2012).

This study is significant and will contribute to the field of autism, particularly in Saudi Arabia. No studies have been done on parents’ attitudes toward the use of technology for Saudi Arabian children with ASD. The results of this study will be sent to the Special Education Department of the Saudi Arabian Ministry of Education. This study will provide Saudi Arabian officials with significant data regarding parents’
perspectives on the use of technology by children with ASD. It will be a first step toward studying this topic and applying the knowledge to Saudi Arabian children with ASD. This study will focus attention on the use of technology and portable devices like iPads by children with ASD in Saudi Arabia.

Research Questions

This study is conducted to examine the following research questions: (1) What are the attitudes of parents of children with ASD toward the use of technology, specifically portable devices like iPad? and, (2) From a parent perspective to what extent do Saudi Arabian children with ASD use these technologies and portable devices? In order to explore these questions, a mix of quantitative and qualitative research methods were employed in this study.
CHAPTER TWO
LITERATURE REVIEW

Prevalence of Autism Spectrum Disorder (ASD)

The number of children with Autism Spectrum Disorder (ASD) grew by approximately 173% over the past decade (Sansosti & Powell-Smith, 2008). In fact, ASD is the fastest growing developmental disability category in the United States (Zager, 2005, p. 162). One reason for this growth is the increased awareness of ASD in parents, teachers, and others. In addition, the diagnosis of ASD has become more accurate and children are being diagnosed earlier. Finally, ASD is now better defined (Downs & Downs, 2010; Sansosti & Powell-Smith, 2008; Zager, 2005). Globally, one in every 120 children is diagnosed with ASD (Elsabbagh, Divan, Koh, Kim, Kauchali, Marcín, & Fombonne, 2012). Several studies have observed that ASD occurs in a 4:1 male to female ratio (Al-Gadani, El-Ansary, Attas, & Al-Ayadhi, 2009; Murshid, 2011). However, no difference has been observed in the rate of ASD prevalence reported among a specific race, socioeconomic status, or education level of parents (Murshid, 2011, p. 1627). In fact, ASD disorder is found in all ethnic, racial, and socioeconomic groups (Al-Faiz, 2006; Matthews, Booth, Taylor, & Martin, 2011).

Autism and Autism Spectrum Disorder (ASD)

Autism is a developmental disorder that is first observed very early in life and affects the development of essential behaviors and skills, such as communication, imagination, social interaction, and relationship development (National Research Council, 2001). Symptoms usually manifest by the age of three (Al-Salehi, Al-Hifthy, &
Ghaziuddin, 2009; Al-Wakeel, Al-Ghanim, Al-Zeer, & Al-Nafjan, 2014; Murshid, 2011). “Autism is best characterized as a spectrum of disorders that vary in severity of symptoms, age of onset, and associations with other disorders (e.g., mental retardation, specific language delay, epilepsy)” (National Research Council, 2001, p. 11). Moreover, the manifestation of various characteristics can change over time in one or many individuals. Although social deficits are common in children with autism, these children do not necessarily share specific, common, social deficits (National Research Council, 2001). “A child with autism looks physically just like any other child but has distinctive behavior patterns. For example, these children may enjoy rocking or spinning either themselves or other objects and may be happy repeating the same activity for a long period of time” (Alothman, 2001, p. 1).

Contributions by Leo Kanner, Hans Asperger, and Michael Rutter have shaped the current clinical conception of autism. Kanner Syndrome or classical autism is “the prototypical ASD, representing the PDD [Pervasive Developmental Disorder] subtype that involves the most severe social-communicative impairments and the greatest number and range of clinical characteristics” (Zager, 2005, p. 6). Kanner Syndrome’s essential features “are most closely captured” by the Diagnostic and Statistical Manual (DSM-IV) and International Classification of Disease (ICD-10) (Zager, 2005, p. 6). In 1943, Leo Kanner described a unique neurodevelopmental problem that follows changes in the routines, environment, and close relationships of people with autism. Kanner termed this early infantile autism. In his description of this neurodevelopmental problem, Kanner included many secondary characteristics such as repetitive behaviors, language and speech abnormalities, unusual sensitivities, and abnormal cognitive development.
In 1944, Hans Asperger, a German Viennese physician, described four children with significant social impairments. These children had some linguistic skills and strong problem-solving skills. Asperger’s study, published only in German originally, was known to few professionals in the field before the 1980s.

Autism was considered a psychotic condition and many children with autism were diagnosed with childhood schizophrenia prior to publication of the Diagnostic and Statistical Manual-third edition (DSM-III) in 1980. The DSM-III used diagnostic criteria that reflected Kanner’s original criteria (Zager, 2005). Later, the term pervasive developmental disorders (PDD) was introduced as an umbrella term for autism and other disorders with similar social impairments while varying in repetitive behaviors and manifestation of communication delay (National Research Council, 2001). This diagnostic term includes Asperger’s, autistic disorder, and pervasive developmental disorder-not otherwise specified (PDD-NOS), according to the fourth edition of DSM (DSM-IV). “Collectively, these disorders are referred to as autism spectrum disorder (ASD)” (Bertrand, Mars, Boyle, Bove, Yeagin-Allsopp, & Decoufle, 2001, p. 1155; Zager, 2005, p. 7). For the remainder of this paper, the terms autism and ASD will be used interchangeably. There are three major characteristics of ASD, “(a) qualitative impairments in social interaction; (b) communication impairments; and (c) restricted, repetitive, stereotyped behavior, interests, and activities” (Alothman, 2001; Zager, 2005, p. 7).
Causes of Autism Spectrum Disorder (ASD)

The cause of Autism Spectrum Disorder (ASD) is unknown (Al-Ayadhi, 2005; El-Ansary, & Al-Ayadhi, 2012; Alothman, 2001; Murshid, 2011), however, a number of theories have been put forward. Al-Ayadhi (2005) suggested that ASD could result from genetic, neural, and immune factors, which are still under investigation. Other studies have linked ASD to both environmental and genetic factors (El-Ansary & Al-Ayadhi, 2012; Murshid, 2011). “Genetic factors such as a family history of speech delay, learning disability, or other developmental disorder have also come to the forefront as possible correlates to autism” (Alothman, 2001; p. 13). However, no specific gene has been identified as the cause of ASD (Alothman, 2001; p. 13).

Types of Autism Spectrum Disorder (ASD)

Alothman (2001) described several types of ASD:

1. “Pervasive Developmental Disorder-Not Otherwise Specified (commonly referred to as atypical autism). The diagnosis of PDD-NOS is made when a child does not meet the criteria for a specific diagnosis, but has severe and pervasive impairment in specified behaviors.

2. Asperger's Disorder. A disorder characterized by impaired interactions, restricted interests and activities, no clinically significant delay in language, and testing at average to above average intelligence (Autism Society of America, 1999; Attwood, 2000).

3. Rett's Disorder. A progressive disorder which, to date, has occurred only in
girls, and includes a period of normal development followed by a loss of previously acquired skills, and a loss of purposeful use of the hand replaced with repetitive hand movements beginning at one to four years of age.

4. Childhood Disintegrative Disorder. This disorder is characterized by normal development for at least the first two years, with a subsequent significant loss of previously acquired skills” (p. 12-13).

Some children with ASD may manifest symptoms aligned with a single type of ASD. Alternately, some children with ASD may show symptoms of more than one type. Moreover, while some of these types depend on gender, such as Rett Syndrome, some of these types are common more than others (Alothman, 2001).

**Diagnostic features.** Diagnosing Autism Spectrum Disorder (ASD) is difficult due to the complexity and variability of ASD characteristics and symptoms. For example, the degree of associated cognitive impairment varies. Another difficulty is the wide range of associated developmental disabilities such as cognitive impairments, mental retardation, learning disabilities, and other behavioral deficits. However, ASD can be identified or distinguished from other disabilities by looking to “the presence of a distinctive impairment in the nature and quality of social and communicative development” (Zager, 2005, p. 1). The most common feature contributing to the diagnosis of ASD is the deficit in producing spoken language (Bosseler & Massaro, 2003).

**Classification of children with ASD.** Children with Autism Spectrum Disorder (ASD) can be classified as high-functioning autism or Asperger Syndrome (HFA/AS), or
lower-functioning children with autism. Children with high-functioning autism have difficulties with social skills, such as listening and responding to teachers or others, requesting information from others, interacting with others when playing with them, making eye contact, and starting and maintaining conversations (Sansosti & Powell-Smith, 2008). On the other hand, children with Asperger Syndrome (AS) usually have higher intelligence quotients (IQ) and expressive language similar to that of typically developing children (Myles, 2005). In fact, autism symptoms range from severe impairment to mild delay (Haimour & Obaidat, 2013).

Characteristics and Instructional Needs of Children with ASD

For children with Autism Spectrum Disorder (ASD), education should include academic learning as well as instruction in social, language, adaptive, and communication skills and techniques to reduce distracting behaviors. Because no two students with ASD are alike, instructional programs should be advised by and based on each student’s IEP (Individual Educational Plan) (Silverberg, 2014, p. 129). Students with ASD often have difficulty completing scheduled tasks independently (even though many of these students have strong cognitive skills) because they struggle with memorization, planning, and organization (Gentry, Wallace, Kvarfordt, & Lynch, 2010). In fact, the most important characteristics of children with ASD are:

1. “Failing to develop social relationships.

2. Failing to develop communicative language.

3. Difficulty in social communication.
4. Slow development or lack of physical, social, and learning skills” (Alothman, 2001, p. 11).

Communication skills needs. According to the National Research Council (NRC) (2001), two major communication deficits are found in children with Autism Spectrum Disorder (ASD), the lack of joint attention skills, and an inability to use symbols. Joint attention is the ability to coordinate attention between objects and people. The NRC also points out that children with ASD usually fail to point to others, get another child’s attention, or share emotional moments with others. Also, according to NRC (2011), the second communication deficit is that children with ASD have difficulties with symbol use of conventional meaning of word or gestures. Education that includes support for social, language, adaptive, and communication skills can help students with ASD to complete educational tasks independently and improve personal responsibility. In addition, educational goals for students with ASD should be established based on their deficits (e.g., nonverbal communication, language development, and cognitive disability) (National Research Council, 2001).

Social skills needs. Children with Autism Spectrum Disorder (ASD) may have many social deficits. Zager (2005) observed that the central deficit of children with ASD is an inability to develop and maintain relationships with others. In fact, children with ASD encounter difficulties when they need to respond to others or interpret their own needs effectively in their social world. Instead of learning from their own social experiences, as typically developing children do, children with ASD need direct social skills instruction.
Behavioral skills needs. These children may have many behavioral deficits. Zager (2005) reported that inappropriate and atypical behaviors, reactions, and perceptions are common in children with ASD. They are often hypersensitive to visual, auditory, tactile, and olfactory stimuli (Al-Faiz, 2006; Murshid, 2011; Zager, 2005). For instance, when children with ASD are exposed to even low intensity sound or light, they may become uncomfortable, agitated, or distressed. Children with ASD usually dislike changes in daily routines (Al-Faiz, 2006; Alothman, 2001; Zager, 2005). This can result in children experiencing social difficulties. In addition, children with ASD may demonstrate repetitive stereotyped behaviors, such as head shaking, hand flapping, and jumping. However, it is important to note that there is no common behavioral symptom across all children with ASD, as they represent a range of characteristics along a mild to severe continuum.

Academic skills needs. Children with Autism Spectrum Disorder (ASD) vary in their academic abilities. There are children with ASD who have severe cognitive impairment. The programs for children with lower cognitive ability usually focus on functional academic, self-help skills, and language development. On the other hand, there are children with ASD who are HFA/AS and they need to have modifications in the curriculum and instructional process that meet their specific needs (Zager, 2005).

Challenges of Families of Children with ASD

Families of children with Autism Spectrum Disorder (ASD) encounter many challenges and often frustrating experiences (Bayat, 2007; Hoogsteen & Woodgate,
Dyches, Wilder, Sudweeks, Obiakor, and Algozzine (2004) noted “these difficulties may be greater among children with ASD than among those with other developmental disabilities” (p. 211-212). Parents of a child with ASD encounter challenges both at home and in the community (DePape & Lindsay, 2014). Children with ASD frequently have associated problems such as functional speech and cognitive disabilities. Together, these coexisting disabilities can be overwhelming for the families of autistic children.

Dyches, Wilder, Sudweeks, Obiakor, and Algozzine (2004) pointed out the difficulties parents experience in teaching basic life skills (e.g., communication, staying safe, preparing for adulthood). Parents can find the challenging behaviors of the child with ASD stressful and endless (Diggle & McConachie, 2009; Guthrie, Swineford, Nottke, & Wetherby, 2013; Ludlow, Skelly, & Rohleder, 2011). These behaviors affect the family’s sense of wellbeing and ability to cope. These families face social and educational challenges as well. Parents have reported that the most difficult challenge in raising a child with ASD is often found in the social sphere (Ludlow et al., 2011). Many can feel socially isolated due to their child’s behavioral problems, others’ judgments of their parenting, and the stigma of having a child with ASD (Dababnah & Parish, 2013; Ludlow et al., 2011; Matthews, Booth, Taylor, & Martin, 2011). Parents have reported that “educational and social service supports are not efficient and that they are forced to rely largely on support from within the family or from friends” for help with their child with ASD (Ludlow et al., 2011, p. 719). Alothman (2001) asserted that to overcome the educational challenges of children with ASD, effective interventions for behavioral problems must first be found.
One of the first challenges parents of children with ASD face is finding support for assessment and diagnosis. The second begins when parents seek services and interventions for their child. They start to think about the type of interventions required for their child. They begin considering their role in the intervention process. These challenges put pressure on their relationships with their other children, at work, on financial resources, and with the child with ASD (Dababnah & Parish, 2013; Lee, Harrington, Louie, & Newschaffer, 2008). Identifying these challenges helps professionals understand how best to deliver appropriate interventions and services (Lee et al., 2008).

Another challenge for these families is a lack of environmental support (Ludlow, Skelly, & Rohleder, 2011). Parents have difficulty communicating with their children with ASD and other difficulties like self-care challenges (Matthews, Booth, Taylor, & Martin, 2011). Depression and other medical, emotional, and psychological challenges are experienced by these parents. (Matthews, Booth, Taylor, & Martin, 2011; Rao & Beidel, 2009; Greeff & Walt, 2010; Dababnah & Parish, 2013).

Family function can be affected. (Rao & Beidel, 2009). Having a child with ASD affects family routines and puts stress on the personal time of the parents. Sometimes, these stresses lead to divorce (Greeff & Walt, 2010). Overall, parents of children with ASD have more work-family difficulties than do typical parents (Matthews, Booth, Taylor, & Martin, 2011). Parents of a child with ASD are at “higher risk of experiencing a host of negative outcomes” (Alothman, 2001; Dababnah & Parish, 2013; Matthews, Booth, Taylor, & Martin, 2011, p. 626).
The research on the effects of a child with ASD on his/her siblings shows mixed results. Some siblings are positively affected and have increased positive self-concept, while others have more behavioral problems and depression (Rao & Beidel, 2009).

Several studies pointed out that “parents of children with ASD not only report increased levels of stress compared to parents of children without disabilities, but also report more stress compared to parents of children with some other type of disability or chronic illnesses” (Matthews, Booth, Taylor, & Martin, 2011, p. 627). Altiere & Kluge (2009) found that “a child with autism presents unique challenges and stressors for the family because of the ambiguity of diagnosis, the severity and duration of the disorder, and problems with the child’s lack of adherence to social norms” (p. 83). Parental stress can affect the success of early interventions (Osborne, McHugh, Saunders, & Reed, 2008). These parents need support and help form others to overcome the challenges of caring for a child with ASD (Hall & Graff, 2011). It is important to point out that a number of studies found that mothers were generally more stressed than fathers of children with ASD (Ludlow, Skelly, & Rohleder, 2011; Hall & Graff, 2011).

To conclude, Neely, Amatea, Echevarria-Doan, and Tannen (2012) wrote:

“the concerns families face during their child’s infancy and early childhood include the following: (a) identifying that the child has a problem and gaining a clear diagnosis, (b) coping with family members’ emotional reactions to the disorder, (c) helping families make treatment decisions, and (d) developing a support system. We then describe three additional
circumstances families often face when their child with ASD enters a formal school setting. These include (a) creating new routines and roles, (b) developing relationships with new service providers, and (c) advocating for appropriate services” (p. 214).

Studies of parents of children with ASD have primarily been done in urban areas. Little is known about the challenges that rural parents of children with ASD experience in parenting their children (Hoogsteen & Woodgate, 2013). Mandell, Novak, & Zubritsky (2005) found that in urban areas children with ASD were diagnosed earlier than in rural communities. Finally, these challenges vary depending on the needs and characteristics of each child and each family.

Effective Interventions for Autism

Wallace and Rogers (2010) found that effective interventions for children with developmental disorders, including ASD, typically have the following components: 1) parental involvement and training; 2) individualization to meet each child’s needs; and 3) early and intensive introduction. “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 ASD programs should therefore include these factors in their interventions” (Levy, Ae-Hwa, & Olive, 2006, p. 60). In fact, the need for early intervention has increased as the gap between available interventions and the age of identification widens (Goldstein & Naglieri, 2013). Goldstein and Naglieri (2013) noted that although many interventions
have been effective for ASD, “challenges remain in the early intervention of ASD” (p. 60).

Interventions should be based in the special challenges faced by children with ASD (National Research Council, 2001). These children require intervention programs that meet their needs, address their weaknesses, and emphasize their strengths. The National Research Council (2001) recommends that interventions for children with ASD start early—prior to formal diagnosis if there is a suspicion of ASD (Downs & Downs, 2010). Moreover, education and treatment for ASD should be implemented at school, at home, and in the community (National Research Council, 2001).

The use of the term “evidence-based practice” began in the 1960s in England with the rise of evidence-based medicine (Odom, Collet-Klingenberg, Rogers, & Hatton, 2010; Reichow, Volkmar, & Cicchetti, 2008; Wong, Odom, Hume, Cox, Fettig, Kucharczyk, Brock, Plavnick, Fleury, & Schultz, 2014). In special education generally, and the field of autism specifically, evidence-based interventions have multiple definitions because individuals with ASD are educated in two different settings—regular and special education classrooms (Reichow, Doehring, Cicchetti, & Volkmar, 2011). Odom et al. (2010) observed 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 Disorder (ASD)” (p. 275). Using education practices or interventions that have shown scientific evidence of effectiveness with children with ASD has become a significant feature of their educational programs (Cook, Tankersely, Cook, & Landrum, 2008; Odom et al., 2010). In addition, “evidence-based practice includes consideration of the best available research in the context of individual
characteristics and professional expertise” (see Figure 1.1) (Missouri Autism Guidelines Initiative, 2012, p. 6).

![Diagram](image)

**Figure 1.1 (Missouri Autism Guidelines Initiative, 2012, p. 6)**

In the United States, polices such as No Child Left Behind (NCLB) and the Individuals with Disabilities Education Act (IDEA) require special education teachers to use evidence-based practices and interventions (Cook, Tankersely, Cook, & Landrum, 2008; Odom, Collet-Klingenberg, Rogers, & Hatton, 2010; Wang, & Spillane, 2009). Yet, to date, there are no universally agreed-upon standards for identifying evidence-based interventions and practices (Odom et al., 2010), and few studies of evidence-based interventions for children with ASD have been conducted (Wallace & Rogers, 2010). Thus, there remains a gap between real-world implementations and research. Because every child with ASD has different educational needs and requires individualized intervention, closing this gap has been difficult (Reichow, Doehring, Cicchetti, & Volkmar, 2011).
The National Autism Center (2009) reviewed 775 studies of interventions and treatments for students with ASD and divided the interventions into four types. The first type includes established interventions shown to be beneficial in well-controlled studies. Examples include behavioral interventions, Social Stories, and video-modeling. The second type, emerging interventions, includes studies that have produced favorable results and outcomes for students with ASD. These include the Picture Exchange Communication System (PECS), technology-based interventions, and the Treatment and Education of Autistic and related Communication-Handicapped Children (TEACCH) program (National Autism Center, 2009). The final two types of intervention, “unestablished” and “ineffective,” have not been shown to have positive outcomes and will not be discussed here.

**Behavioral interventions.** Odom, Collet-Klingenberg, Rogers, and Hatton (2010) found that behavioral interventions are frequently used with individuals with ASD. Children with developmental disabilities and ASD 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) noted 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 and is used now to address behavioral issues of children with ASD (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 include reinforcement, prompting, shaping, fading, and applied behavior analysis (ABA) (Goldstein & Naglieri, 2013). Applied behavior analysis decreases inappropriate behaviors and increases positive behaviors and is a popular intervention for children with ASD (Centers for Disease Control and Prevention, 2012). According to a report by The National Autism Center (2009), behavioral interventions have had favorable outcomes with all age groups and within most diagnostic groups.

**Social stories intervention.** Wang and Spillane (2009) indicated that Social Stories literature has recommended the use of Social Stories with children with ASD 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 ASD have difficulties in the social functions and that is considered as one of the core characteristic of ASD (Bellini, Peters, Benner, & Hopf, 2007; Case-Smith, & Arbesman, 2008; Wang, & Spillane, 2009). Students with ASD have difficulties in communicating and sustaining relationships with others. Those difficulties could lead these children with ASD to end 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). Teachers, therapists, psychologists, and parents can write Social Stories (Zager, 2005). According to The National Autism Center report (2009), Social Stories have produced favorable outcomes for children with ASD ages 6 to 14, and are particularly appropriate in the Asperger diagnostic group.

**Video-modeling intervention.** Video-modeling is an effective intervention that takes advantage of the visual strengths of students with ASD (Bimbrahw, Boger, & Mihailidis, 2012; Goldstein & Naglieri, 2013; Mechling, Gast, & Seid, 2009). It is “an increasingly popular, economical, readily available, user-friendly technology that can prove beneficial for children with autism” (Goldsmith & LeBlanc, 2004, p. 169). In video modeling, students are asked to perform a task after watching a detailed video of the skills for that specific task. Students may repeat a task or skill as often as they choose. Tasks or skills that have multiple components, such as toileting, transitions, food
preparation, and purchasing can be explained much more easily to a student with ASD through video-modeling (Mechling et al., 2009). Video-modeling has been shown to be effective for students with ASD in school and community settings (Sansosti & Powell-Smith, 2008). A number of studies have found that video-modeling is effective in improving social skills, teaching life skills, and improving task fluency (Goldsmith & LeBlanc, 2004; Goldstein & Naglieri, 2013; Kashinath, 2012). According to The National Autism Center (2009), video-modeling has produced favorable outcomes in 3 to 18 year olds in most ASD diagnostic groups.

**Picture exchange communication system intervention (PECS).** This popular intervention is a picture-based system used to teach functional communication skills to students with ASD (Goldstein & Naglieri, 2013; Jurgens, Anderson, & Moore, 2009). In PECS intervention, children with ASD communicate by exchanging picture symbols (Goldstein & Naglieri, 2013). It was developed in 1985 by Andrew Bondy and Lori Frost to help improve the communication skills of students with social communication disorders and ASD. Three major elements separate PECS from other communication interventions:

“(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” (Tien, 2008, p. 62).

Visual symbol interventions have received much attention in recent years for their effectiveness with students with ASD (National Research Council, 2001). According to The National Autism Center (2009), PECS has produced favorable outcomes for children
ages one to nine years old. It is particularly appropriate for children in the autistic disorder and pervasive developmental disorder-not otherwise specified (PDD-NOS) diagnostic groups.

**Treatment and education of autistic and communication handicapped children (TEACCH).** This program, based at the University of North Carolina at Chapel Hill, provides educational, clinical, and training services to children with ASD and their families. It was established by Eric Schopler in the early 1970s and has since been offered to thousands of children with ASD at all skill levels and ages (Treatment and Education of Autistic and Communication Handicapped Children Autism Program, 2006). The three main components of TEACCH are parental collaboration, structured teaching, and early diagnosis (Peerenboom, 2003). The role of parents is key in the TEACCH program. Communication skills and other deficits of children with ASD are minimized using visual prompts and structured teaching and environments (Panerai, Ferrante, & Zingle, 2002). The program leverages the powerful visual memory of children with ASD. With TEACCH, for example, a student with ASD could post pictures to a communication board to express a desire to the teacher.

The TEACCH program is one of the most effective interventions for children with ASD (Panerai, Ferrante, & Zingle, 2002). Kurt and Parsons (2009) noted the extensive record of successful TEACCH outcomes in the literature (e.g., improved communication skills, reductions in disturbing behaviors). TEACCH is used internationally (including Kuwait, the United Kingdom, Italy, France) and has been in existence for more than twenty years (Keel, Mesibov, & Woods, 1997; Tsang, Shek, Lam, Tang, & Cheung, 2006; Treatment and Education of Autistic and Communication Handicapped Children
Autism Program, 2006). According to The National Autism Center (2009), TEACCH has been successful with children ages one to eighteen and is most appropriate for the autistic and pervasive developmental disorder-not otherwise specified (PDD-NOS) diagnostic groups.

**Technology-based interventions.** Goldstein and Naglieri (2013) wrote:

“the term ‘assistive technology’ appears in the Individuals with Disabilities Education Amendment (2004) and refers to 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-to use equipment, such as dry-erase boards, laminated photographs, photo albums, natural aided language boards (Cañiero 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) found that technology-based interventions are useful for individuals with ASD. This finding is supported by other studies reporting effective results from using a variety of technologies with individuals with ASD (Goldsmith & LeBlanc, 2004). Technology is compatible with the learning style of individuals with ASD. Some individuals with ASD may learn more quickly using technology than with traditional instruction and are often more motivated when using technology (Goldstein et al., 2013). Francis, Mellor, and Firth (2009) noted
more new visual assistive aids are available due to the increase in number of technology platforms. “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 ASD often rely on external prompts 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 a behavioral change goal has been met. Other such interventions can be used indefinitely as assistive tools (Goldsmith & LeBlanc, 2004).

Assistive Technology (AT) is often used to increase opportunities for students with special needs (Ennis-Cole & Smith, 2011). Ennis-Cole and Smith, (2011) observed that AT “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 offer improvement in social, communication, and other skills for individuals with ASD (Ennis-Cole & Smith, 2011; Goldsmith & LeBlanc, 2004; Goldstein & Naglieri, 2013). These individuals can achieve self-determination and learn to engage actively using appropriate assistive technologies. Assistive technology allows these individuals to “gain greater access to their daily environment and related choice events, with important personal and social implications” (Lancioni, Sigafoos, O'Reilly, & Singh, 2012). AT has been used to teach students with ASD for more than 35 years (Knight, McKissick, & Saunders, 2013, p. 2629). However, Lancioni et al. (2012) noted that paralleling effective interventions using technology is an emerging field.
**Computer-based intervention.** Mechling, (2007) observed that the variety and multiple uses of assistive technology (AT) promise to meet the needs of diverse individuals. 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 of research. Computer-based intervention is commonly used with students with ASD to teach a variety of skills (Knight, McKissick, & Saunders, 2013). Computers can also serve as a motivational tool for students with ASD (Mirenda, 2001; Sansosti & Powell-Smith, 2008). Handheld devices, laptops, and computers can work for many students with ASD as conditioned reinforcers (Goldsmith & LeBlanc, 2004).

Computer-based interventions have been used with children with ASD to acquire various skills (Bimbrahw, Boger, & Mihailidis, 2012; Mechling, Gast, & Krupa, 2007). For instance, Bosseler and Massaro (2003) reported that computer-based instruction is an emerging method for expanding the vocabulary of students with special needs. Students with ASD have begun to use computers to improve language and vocabulary skills. Computer-controlled applications have the advantage of simultaneously providing text with supportive resources such as images and sounds (Bosseler & Massaro, 2003). Integrating these resources with a written definition improves students’ ability to learn and memorize target vocabulary. The integration of sound and pictures is an efficient method for facilitating learning and improving language and vocabulary (Bosseler & Massaro, 2003). Computer-based interventions have been useful in teaching social skills as well (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). Computer-based interventions offer the ability to reduce inappropriate behaviors and improve learning, attention, and motivation and compare favorably to more traditional interventions (Goldsmith & LeBlanc, 2004).

Bosseler and Massaro (2003) found that students with ASD face difficulties in generalizing and applying acquired skills to real world settings. They also struggle with new settings and unfamiliar people. However, intensive training can help students with ASD to overcome these difficulties and learn to generalize acquired skills. Effective training may combine computer-based tools such as portable devices and tablets with interventions such as Social Stories, video modeling, pictures, and PECS. Hagiwara and Myles (1999) reported that multimedia instruction including computer-based, visual symbols, and Social Stories could be helpful for students with ASD.

**Combining effective interventions with technology.** Social Stories have been integrated into computer-based and multimedia formats. For example, Microsoft PowerPoint with integrated activity schedules is being used to teach students with special needs. Although results varied, overall, this type of integration has been shown to be successful for students with ASD (Goldsmith & LeBlanc, 2004). Sansosti and Powell-Smith (2008) studied the effectiveness of integrating and combining Social Stories and video modeling via computers. They reported a potential benefit from this 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). Students’ independent transitions increased when they used handheld devices (Mechling, 2011). Three studies have compared results of integrating pictures into a portable device. The Palmtop personal
computer, a portable device with multimedia input and output and a touch screen, has been found to be more effective than printed pictures on cards (Mechling, 2007).

Mechling, Gast, and Seid (2009) noted 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, with the help of electronic self-prompting devices, students with ASD may know when to do a task without having to rely on others. A portable computer-based system, for example, has advantages over a cassette player; the computer (a) offers repeating steps, (b) provides visual support with auditory instructions for a task, and (c) has a controlling option over visual and auditory prompts (Mechling, 2007).

Technologies such as a personal digital assistant (PDA) or a smart phone may also be beneficial for individuals with ASD (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). As electronic devices (e.g. smart phones, PDAs) become more economical, they become a more valid intervention for individuals with ASD (Goldsmith & LeBlanc, 2004). Similarly, mobile devices (e.g. iPads) can support communication, transition, language, and academic skills of children with ASD and other developmental disabilities (Hart & Malian, 2013; Clark, Austin, & Craike, 2014). These technologies are likely to play a significant role in the treatment of children with ASD (Clark, Austin et al., 2014). As iPads, iPods, and other high-tech AT
tools become more popular, they will increasingly be used to help children with ASD acquire social skills, appropriate behaviors, language, and academic skills (Ennis-Cole & Smith, 2011).

**Gaps in Research in Technology and Autism**

Research on the use of technology for individuals with ASD has many significant gaps. Goldsmith and LeBlanc (2004) observed that the literature increasingly shows that technology-based interventions can be useful with children with ASD, but there remains a need for comparative research. Research on the effectiveness of AT for individuals with ASD is in its infancy and further research is needed to investigate the promising capabilities of these technologies (Gentry, Wallace, Kvarfordt, & Lynch, 2010). There is a critical need for research on the effectiveness of smartphones and tablets for use with individuals with ASD. This is an emerging field (Clark, Austin, & Craike, 2014; Knight, McKissick, & Saunders, 2013). “Another important research area is the assessment of attitudes of caregivers, family members, and individuals toward different assistive technologies” (Lancioni, Sigafoos, O'Reilly, & Singh, 2012, p. 98). Little research has been done on parental attitudes toward the use of tablets by children with ASD. This is a critical topic because “attitudes are typically a strong predictor of subsequent behavior” (Clark et al., 2014, p.2). Finally, no research has investigated parental beliefs and attitudes about ASD in Arab countries, including Saudi Arabia (Alqahtani, 2012).

**The Role of Parents in Interventions for Children with ASD**

Parents are the cornerstone of intervention and education for children 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 children 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 children with disabilities. The Individual with Disabilities Education Act (IDEA) supports the importance of parents of children with disabilities in the education process. In addition, families must be active participants in their children’ Individual Education Plans (IEP).

Currently, families and parents are considered as the best persons who know and can judge their children with disabilities (Zager, 2005). Also, “the best long-term advocate” for children with ASD is family (Zager, 2005, p. 115). A child’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 children spend the majority time of a given day at home with their parents. Thus, learning opportunities will increase if parents are involved in their children’s program and intervention can then be implemented in real world settings. Parents of children 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, children, and teachers.

**Parental involvement, participation, collaboration, and interaction.** Ozonoff and Cathcart (1998) noted 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 feelings of stress and depression can be reduced and feelings of competence increased by home interventions. Parents are a significant factor in any intervention. They can, for example, help maintain the gains from an intervention (Diggle & McConachie, 2009). Stahmer, Schreibman, and Cunningham (2010) observed that active participation by parents of children with ASD is recommended. Yet, little research has been done on family variables and their influence on interventions (Stahmer et al., 2010).

Interactions between parents and educators are important in special education, in part because of the requirement by the Individual with Disabilities Education Improvement Act (IDEIA, 2004) that parents be involved in their child’s education. (Stoner, Bock, Thompson, Angell, Angell, Heyl, & Crowley, 2005; Yell, 2012). Stahmer, Schreibman, and Cunningham (2010) asserted that collaboration between practitioners and parents to identify target behaviors and to determine how to apply treatment can reduce problem behaviors for children with ASD. This collaboration can increase the confidence of parents as well as reduce stress. Few studies have examined interactions between parents and educators from the parents’ perspective (Stoner et al., 2005).
**Parental attitudes, perceptions, and opinions.** Many factors such as parental attitudes, age, education, and stress levels influence the success and delivery of treatments (Stahmer, Schreibman, & Cunningham, 2010). Positive expectations on the part of parents are important when working with children and adolescents with ASD. Stahmer, et al. (2010) observed 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 to improve current services as well as convincing professionals, policy makers, and administrations about the effectiveness of early interventions. Evaluating early intervention programs by assessing parental satisfaction and perceptions is widely recommended (Kohler, 1999, p. 150). Kasari and Sigman (1997) noted that future research should examine parental perceptions of outcomes to improve all interventions. As can be seen from the research, parental perceptions and opinions regarding the effectiveness of a treatment are critical.

**Culture of the 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 children with ASD use technology (e.g. Augmentative and Alternative Communication devices (AAC)). For example, 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 have been shown to affect how children with ASD use technology (Ennis-Cole & et al., 2013).

Cultural background affects the decisions parents make regarding interventions (Ennis-Cole, Durodoye, & Harris, 2013; Mandell & Novak, 2005; Tincani, Travers, & Boutot, 2010). According to Tincani et al. (2010), using technology for evidence-based practices with children 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) found 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, in developing a successful intervention it is essential to fully consider diverse family systems (Tincani, Travers, & Boutot, 2010).

The cultural backgrounds of parents shape their beliefs about ASD and intervention outcomes (Ennis-Cole, Durodoye, & Harris, 2013; Mandell & Novak, 2005; Tincani, Travers, & Boutot, 2010). Dyches, Wilder, Sudweeks, Obiakor, and Algozzine (2004) reported that some Latino parents see a child with ASD as a gift from God—an opportunity for the parents to become better people. “African American children diagnosed with ASD are less likely to receive regular medical and diagnostic services than their White counterparts” (Gourdine, Baffour, & Teasley, 2011, p. 460). Caucasian 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. There is a strong need for further study of language and cultural issues affecting children 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) noted 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, given its effect on the student, teachers of students with ASD must consider cultural identity. Finally, Oakley,
Howitt, Garwood, and Durack (2013) suggested the use of varied 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 students with ASD and their families (Hart & Malian, 2013; Razali, Toran, Kamaralzaman, Salleh, & Yasin, 2013). Scheuermann, Webber, Boutot, and Goodwin (2003) found limited formal data regarding the preparation of personnel to work with students with ASD. For example, it is not known how many ASD preparation programs are now available or how many ASD specialists are trained annually. Many challenges remain in teacher preparation for ASD, one of which is having enough high-qualified teachers (Scheuermann et al., 2003).

Growing rates of ASD mean increased demand for well-trained teachers who can effectively teach these students (Hart & Malian, 2013; Razali, Toran, Kamaralzaman, Salleh, & Yasin, 2013). On the other hand, studies have found many teachers are unprepared (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 have focused on issues of teacher perceptions (Syriopoulou-Delli, Cassimos, Tripsianis,
The use of technology, such as an iPad, in a classroom with students with ASD does not guarantee effective learning support because of the many considerations in integrating these new technologies (Malley, Jenkins, Wesley, 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 ASD and have an understanding that the use of one does not preclude the use of another” (Loiacono & Feeley, 2009, p. 17). In a study by Malley et al., teachers were found to be highly accepting and to strongly approve of the positive outcomes achieved in an iPad intervention with students who were moderately to severely disabled (Malley, Jenkins, Wesley, 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)
Summary of Literature Review

Children and youth with ASD have various deficits in communication, social, academic, and adaptive behavioral skills. A child with ASD may be high- or low-functioning. Children with high-functioning ASD, or Asperger Syndrome (HFA/AS), are more able to learn and improve certain skills than are children who are low-functioning and have ASD. A number of effective interventions exist to meet the needs of children with HFA; these include Social Stories, video modeling, and Picture Exchange Communication System (PECS). Incorporating these effective interventions with computer-based applications and software holds promise for children with ASD. Moreover, portable electronic devices such as tablets and smartphones may decrease a child’s reliance on others and help to overcome the limitations of computer-based interventions. Finally, parents are critical to the success of any intervention, including interventions using portable electronic devices. Thus, parents’ attitudes, opinions, or perceptions toward using portable devices with their children/adolescents are an important to consider when examining these portable devices as interventions, or with any intervention.
CHAPTER THREE

METHODS

Research on the use of technology and specifically portable devices like iPads and other tablets with students with Autism Spectrum Disorder (ASD) is still in its initial stages. Therefore we know very little about these devices and whether or not parents of students with ASD are knowledgeable about or use these technological devices, what their attitudes towards this type of technology are, or if parents see these devices as helpful or useful. This study explored a variety of factors related to parents and their knowledge and use of portable devices (e.g., iPads, tablets, smartphones, etc.). The study participants were drawn from the population of parents with children with ASD in Saudi Arabia. The survey that was used in this study contains items that collected data from parents about their attitudes toward and use of portable electronic devices in their home, at the child’s school, and in-daily life as instructional or educational tools to improve the skills (e.g., academic, communication, social) of students with ASD. Variables affecting parental attitudes toward the use of this technology were identified. According to Alqahtani (2012), the beliefs of parents regarding ASD have not been studied in Arab countries, including Saudi Arabia, so the beliefs of the parents in this study were also investigated.

Thus, this study was guided by the following research questions: (1) What are the attitudes of parents of children with ASD toward the use of technology (specifically portable devices like iPads)? and, (2) To what extent do Saudi Arabian children with ASD use these technology and portable devices? In order to explore these questions a
quantitative survey research method and a qualitative interview method were used in this study. The follow-up interviews with a small group of parents were designed to collect more open-ended, qualitative information. According to Cohen, Manion, and Morrison (2007), “surveys are useful for gathering factual information, data on attitudes and preferences, beliefs and predictions, behavior and experiences – both past and present” (p. 207). Thus, this type of research is helpful in examining and exploring parents’ attitudes/knowledge about the use of technology by their children with ASD.

Participants

The sample population of the current study includes parents of children with ASD in Saudi Arabia. A convenient sampling approach was used due to the lack of accurate statistics on the number of children with ASD in the Saudi Arabia. The sample was drawn by distributing a Qualtrics® Web-based survey to parents via different Internet platforms such as Twitter® and Facebook® accounts of autism organizations in Saudi Arabia, emails, WhatsApp®, and others. The projected estimate for numbers of participants was about 100 to 150 parents of children with ASD.

Instruments

Database and journals. ERIC and PsycINFO database were used to conduct the review of the literature. Examples of journals from which articles were reviewed include Special Education Technology, Autism and Developmental Disorders, Focus on Autism and other Developmental Disabilities, Positive Behavior Interventions and others. The majority of the reviewed articles were recently published during the period within 2001 to 2014. Also, examples of search terms that were used included autism, technology,
The survey. Clark, Austin, and Craike’s (2014), and Cardon, Wilcox, and Campbell’s (2011) instruments were used with some modifications and adaptations to suit the culture and context of Saudi Arabia. The survey was a web-based survey to be uploaded to Qualtrics®. Web-based surveys are increasingly popular and have been extensively studied in the literature (Creswell, 2014). These surveys are economical and permit rapid data collection. “Electronic surveys and communications will probably revolutionize the use and applications of survey research in the future” (Creswell, 2012, p. 377). The survey used in this study included an initial page of background information (e.g., purpose of the study, statement of informed consent, and estimated completion time) as well as instructions for completing the survey. Following that information, the survey had five sections: (1) demographic information, (2) portable devices use, (3) attitudes towards technology and portable devices, (4) behavior towards technology and portable devices, and a (5) follow up section.

The first section included demographic information (15 items) such as gender of parents and children with ASD, marital status, educational level, occupation, annual income, number of children, ages of child with ASD, and ASD severity.

In the second section, parents were asked about their and their children with ASD household’s portable devices and technology uses (21 items). Some items were yes/no questions and one was a multiple choice. Other items asked for a response on a five or four point Likert-type scale (e.g., not at all, beginner, average, very good, expert; or
strongly disagree, disagree, agree, strongly agree). Example items in section two included:

- Have you used any technology (e.g. a computer, portable device, videotaping, smart board, personal digital assistant device, or etc.) with your child with ASD?
- Please indicate where your child with ASD has access to a portable device (multiple responses permitted).
- Rate the skills of your child with ASD in using portable devices’ applications.
- Please indicate which of the following applies to your household portable device use.
- Rate (your) skills in using portable devices.
- Rate (your) skills in using portable devices’ applications.

The third section included 22 items regarding parents’ attitudes towards technology using a four point Likert-type scale (strongly disagree, disagree, agree, or strongly agree). Item examples included:

- Technology complicates people’s lives.
- Technology makes more work than it saves.
- Technology just makes things more complex.
- Technology seems to be getting more complicated.
- I can do more things using technology.
- Portable devices’ applications complicate people’s lives.
- Portable devices’ applications make more work than it saves.

- Portable devices’ applications just make things more complex.

- Portable devices’ applications seems to be getting more complicated.

- I can do more things using technology.

The fourth section included 19 items about behaviors toward the use of technology and portable devices by parents and their children with ASD. There were two open-ended questions about naming portable device applications that the parent uses most with her/his child and also other portable device applications that her/his child with ASD uses most. Also, there were forced-choice items and one multiple-choice item. Other items required a response from the parents along a Likert-type scale using such terms as strongly disagree, disagree, agree, strongly agree, or none, a little, some, and a lot. Examples of the items in this section include:

- Please indicate how long your child has been using portable devices:
  
  o Has never used a portable device
  
  o Approximately 1-6 months
  
  o Approximately 6-12 months
  
  o Approximately 12-18 months
  
  o Approximately 18-24 months
  
  o Longer than 24 months

- Indicate how many days your child with ASD has used a portable device in the past 5 days:
- Over the past 5 days, please estimate how much time your child with ASD spent using educational portable devices’ applications:

- How much information have you received about portable devices like iPads:

- Check all that applies in which you have received training about portable devices like iPads:
o Attended conferences, local expos or fairs
o Library
o Teachers
o Therapists
o Internet

The last section was basically a request to parents for a follow-up interview. There was only one yes/no question in this section:

- As a parent of child with ASD, I give the researcher of this study the permission to contact me for a follow-up interview in the future:
  o Yes. If yes, please provide your email or phone number.
  o No

**Interviews.** The researcher attempted to get parents to participate in phone interviews. In these phone interviews, the researcher wanted to explore the survey items in more detail with parents. Table 1 shows the guiding interview questions that were used in this study.

Table 1

<table>
<thead>
<tr>
<th>Guiding Interview Questions</th>
</tr>
</thead>
</table>

1- Please tell me about your believes about autism.
a. Interviewer will ask for clarifications, will provide additional prompts, and will ask the parent to expand on interesting or significant comments.

2- Please tell me about any challenges that you and your family face as you experience life with your child with ASD in lives you’re your child with autism.
   - Also, what are some of the positive things that you experience with your child with ASD?

3- What do you think about the current services for children with autism in Saudi Arabia?
   - For example, are you satisfied with autism services in the schools? In health settings? In the community?
   - If you are not satisfied with the services, please tell me how they could be increased and/or improved?
   - What would make your life, your family’s life, and your child with autism’s life better?

4- Overall, what do you think about the use of technology and portable devices with children with autism?

**Piloting the survey.** The survey instrument of this study was tested first before distributing the final survey of this study. The survey was pilot-tested with about 14 parents of children with ASD in Saudi Arabia. The reason for doing this pilot test was to look for initial evidence of the usefulness of the instrument and to determine the reliability and validity of the survey. All feedback from those 14 parents of children with ASD were considered and taken in mind.
**Validity and reliability of the instruments.** Validity of this study was measured in different ways. For instance, the literature review was used to measure and support the content validity. The substantive validity was also be measured by expert review of native language speakers in English and Arabic. The Rasch model was used to test the survey’s structural validity. Also, the K-fold test/retest was utilized in this study to measure the reliably of the instrument of this study.

Three special education professors in Washington State University reviewed the English version of this study instrument. Then, the researcher will translate the survey into the Arabic language by using the forward-translation method (Hambelton & Kanjee, 1995). In addition, the researcher of this study sent the translated instrument to four experts in special education in Saudi Arabia to ensure that the translation is accurate and clear (Statistics Canada, 2010). Finally, the survey items were edited based on those professionals’ feedback.

**Construct validity.** Four experts reviewed the survey in order to provide agreement about the relevance of the survey topics. Every expert had Ph.D. in special education and an extensive background in special education (Lamb, Annetta, Meldrum, & Vallett, 2012). The reviewer agreement was calculated by conducting the following equation:

\[ d = I_D / \sum_{l=0}^n I_{A-D} \]

The agreement analysis was conducted for all sections and items. Also, the construct validity coefficient was applied to measure the construct validity. The cutoff accepted score to measure the construct validity coefficient is .70 or above (Lamb, Annetta, Meldrum, & Vallett, 2012).

**Validity evidence.** The Messick’s (1998) framework of showing evidence was used
for this study. Table 2 shows the summary of validity evidence considered for the survey used in this study (Lamb, Vallett, & Annetta, 2014).

Table 2

<table>
<thead>
<tr>
<th>Type of Validity</th>
<th>Sources of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Literature review, examination and rating by expert reviewers of the item-construct appropriateness.</td>
</tr>
<tr>
<td>Substantive</td>
<td>Examination and rating by expert reviewers of the item-construct appropriateness, Rasch analysis.</td>
</tr>
<tr>
<td>Structure</td>
<td>Fit to the Rasch model, internal consistency reliability.</td>
</tr>
</tbody>
</table>

**Instrument reliability.** The K-fold test-retest method was used in this study to estimate the reliability of the constructs. Items that indicated a narrow range of personal measures and items had lower values. Also, higher values were indicators for a broad range of personal measures and items. Items that showed low reliability in the pilot study were revised.

**Data Collection, Organization, and Analysis**

First, the survey was sent to Washington State University’s Institutional Review Board (IRB) in order to get approval for conducting the study in Saudi Arabia. After the Institutional Review Board (IRB) review and approval, the survey was formatted and organized using the Qualtrics® website. Qualtrics® provides a customized link to the study survey on the website. The Qualtrics® link was posted on the Twitter® and Facebook® accounts of autism organizations in Saudi Arabia, sent to parents using emails and WhatsApp®, and other social media platforms. Completion of the survey was taken as an agreement to participate in the study. This form of consent was noted on the first page in the study description. In addition, participants were informed that the survey
takes ten to fifteen minutes to complete and that they were free to exit the survey at any time. After two weeks of starting data collection, the research resent the survey to parents as a reminder via the same social networks. At the end of the data collection period, the researcher determined whether the response rate was adequate before beginning data analysis. Low response rate is always a concern in web-based surveys (Creswell, 2012).

The researcher organized data based on the variables. The variables were coded according to the scales used. For example, some of the items fall along this continuum: 1= strongly disagree, 2= disagree, 3= neither agree nor disagree, 4=Agree, 5=strongly Agree and would be coded using frequency counts and percentages. In addition, yes and no questions were coded as 1 and 0 respectively, with frequency and percent also employed.

Descriptive statistics, such as frequencies and percentages, was used in this study as appropriate. Descriptive statistics were displayed by using tables. Also, a multiple regression analysis was conducted to examine the extent to which demographic variables predict parents’ attitudes toward the use of technology and portable devices with their children with affected the responses to the other survey items. One-way Analysis of Variance (ANOVA) was used in this study to examine the relationship between demographic variables and parents’ attitudes toward technology and portable devices, the use of portable devices, and behavior toward technology and iPad. Finally, the researcher used a thematic analysis and coded common themes and patterns that emerged after interviewing many parents of children with ASD in Saudi Arabia.
The parent interviews were analyzed with a focus on identifying patterns of responses by parents. The researcher used the thematic analysis and coded common themes and patterns that emerged. The parents were asked at the end of the quantitative survey if they would be willing to participate in a more open-ended interview via telephone.
CHAPTER FOUR

RESULTS

The purpose of this study was to explore parents’ attitudes toward the use of technology and portable devices with children with Autism Spectrum Disorder (ASD) in Saudi Arabia. The survey used in this study was distributed online through social media platforms Twitter®, Facebook®, and WhatsApp®. Two hundred and eighteen surveys were returned, of which 170 surveys were completed. According to Shih and Fan (2013), average response rates for surveys distributed by social media are approximately 6%. In this study, the response rate was excellent 77%. The survey included five sections, demographic information, portable devices use, attitudes toward technology and portable devices, behaviors toward technology and iPads, and a follow up section. Nineteen parents volunteered to be interviewed by phone, indicating their willingness to do this at the end of the survey (10 females, 9 males).

In this chapter the survey findings (quantitative data) were analyzed using the Statistical Package for Social Sciences (SPSS version 22) and are presented in three sections, with the fourth section of this chapter describing the qualitative interview results. First, descriptive statistics including percentages and frequency are described for all survey items. In the second section a description of the multiple regression analysis is included. The multiple regression analysis was conducted to examine the extent to which demographic variables including gender and age, marital status, level of education, occupation, current region of residence, family monthly income, number of children, age and gender of child with ASD, severity of ASD, ability to speak, and type of school,
predict parents’ attitudes toward the use of technology and portable devices with their children the extent to which responses to the other survey items were affected. In the third section, the results of the one-way Analysis of Variance (ANOVA) are described focusing on the examination of the relationship between demographic variables and parents’ attitudes toward technology and portable devices, the use of portable devices, and behavior toward technology and iPad. In the fourth section of this chapter, the results from the parent interviews are reported. Some parents of children with ASD from Saudi Arabia were interviewed to give parents a chance to provide more detailed information about their beliefs and perspectives toward ASD, services in Saudi Arabia for children with ASD, and use of technology and portable devices with these children.

**Descriptive Results for Survey Items**

The distributed survey included four major sections:

- Demographic information;
- Portable device use;
- Attitudes toward technology and portable devices; and
- Behavior toward technology and the iPad.

The following section reports the responses of parents of children with ASD to all survey items.

**Demographic information.** Parents were asked to respond to a variety of demographic variables including gender, age, marital status, education, current occupation, geographic location, income, number of children, age and gender of the child with ASD, severity of the child’s ASD, and type of school.
**Parent’s background.** Sixty-five of the respondents were male parents (38%) while the most respondents were female (105/170, 62%). Of the male respondents, 42% were between the ages of 30 and 39, while 46% of female respondents fell into the same range (78/170). Most respondents were married (97%) (Table 3).

Table 3

Parents’ Background

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Frequency (n)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>65</td>
<td>38.2</td>
</tr>
<tr>
<td>Female</td>
<td>105</td>
<td>61.8</td>
</tr>
<tr>
<td>Fathers’ age less than 20</td>
<td>7</td>
<td>4.1</td>
</tr>
<tr>
<td>Fathers’ age range: 20 to 29</td>
<td>9</td>
<td>5.3</td>
</tr>
<tr>
<td>Fathers’ age range: 30 to 39</td>
<td>72</td>
<td>42.4</td>
</tr>
<tr>
<td>Fathers’ age range: 40 to 49</td>
<td>53</td>
<td>31.2</td>
</tr>
<tr>
<td>Fathers’ age more than 50</td>
<td>29</td>
<td>17.1</td>
</tr>
<tr>
<td>Mothers’ age less than 20</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>Mothers’ age range: 20 to 29</td>
<td>41</td>
<td>24.1</td>
</tr>
</tbody>
</table>
Mothers’ age range: 30 to 39 78 45.9
Mothers’ age range: 40 to 49 44 25.9
Mothers’ age more than 50 6 3.5

Marital status

Married 164 96.5
Separated 5 2.9
Single parent 1 .6

n=170

High school and undergraduate degrees were the most common levels of education (Table 4). About one third of male participants (34%) reported having an undergraduate degree, while 22% had completed only high school. Forty-three percent of the female parents had undergraduate degrees (73/170). Nearly one fourth of female parents (24%) reported high school as the highest level of education. Slightly less than one third of the participants were fulltime parents (55/170) and 27% (46/170) worked in education. Fulltime parents and education were the most frequently cited occupations; other occupations included business/accounting, health care/medical, hospitality, office/administration, retail/sales, trades, and others.

Table 4

Highest Level of Education Completed by Parents
<table>
<thead>
<tr>
<th>Parents’ Highest Level of Education</th>
<th>Frequency (n)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary school</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Female</td>
<td>14</td>
<td>18</td>
</tr>
<tr>
<td>Intermediate school</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Female</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>High school</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>37</td>
<td>22</td>
</tr>
<tr>
<td>Female</td>
<td>41</td>
<td>24</td>
</tr>
<tr>
<td>Collage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>28</td>
<td>16</td>
</tr>
<tr>
<td>Female</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>Undergraduate degree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>57</td>
<td>34</td>
</tr>
<tr>
<td>Female</td>
<td>73</td>
<td>43</td>
</tr>
<tr>
<td>Graduate degree</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Male

Female

n=170

**Family background.** The most common number of children reported was four, at 22% of the families surveyed, (38/170) While 21 and 20.6 percent of the participants had 3 and 2 children, respectively. One family had more than ten children (including the child with ASD). Most families lived in the central and western regions of Saudi Arabia (72%). Sixty-one parents of children with ASD (36%) reported living in central Saudi Arabia. Another 36% lived in western Saudi Arabia (61/170). Nine percent of the families reported living outside of Saudi Arabia (Table 5).

Table 5

Current Region of Residence

<table>
<thead>
<tr>
<th>Families’ Current Place of Residence</th>
<th>Frequency (n)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>61</td>
<td>36</td>
</tr>
<tr>
<td>North</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>South</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>West</td>
<td>61</td>
<td>36</td>
</tr>
<tr>
<td>East</td>
<td>16</td>
<td>9</td>
</tr>
</tbody>
</table>
Outside Saudi Arabia

<table>
<thead>
<tr>
<th>Income Range</th>
<th>Frequency (n)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 4,999 SR</td>
<td>27</td>
<td>16</td>
</tr>
<tr>
<td>5,000 to 9,999 SR</td>
<td>43</td>
<td>25</td>
</tr>
<tr>
<td>10,000 to 14,999 SR</td>
<td>53</td>
<td>31</td>
</tr>
<tr>
<td>15,000 to 19,999 SR</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>20,000 to 24,999 SR</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>25,000 to 29,999 SR</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>More than 30,000 SR</td>
<td>11</td>
<td>6</td>
</tr>
</tbody>
</table>

n=170

Family monthly household incomes ranged from 10,000 to 14,999 SR (53/170) for 31% of the participants (53/170). Forty-three participants had incomes from 5,000 to 9,999 SR (25%). Another twenty-seven parents reported monthly household incomes below 4,999 SR (Table 6).

Table 6

Family Monthly Household Income

Children with ASD. Most of the children with ASD were male (134/170, 79%)
and 21% were female. Seven of the children with ASD were under 3 years old (4%),
while sixty-five were 3 to 5 years old (38%). The largest age group of children with ASD
was 6 to 11 years old (43%). Twenty of the children with ASD were 12 to 18 years old
(12%). Only five of the children with ASD were older than 18 years (3%).

Table 7

Ages and Genders of the Children with ASD

<table>
<thead>
<tr>
<th>Ages and Genders of the Children with</th>
<th>Frequency (n)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>134</td>
<td>79</td>
</tr>
<tr>
<td>Female</td>
<td>36</td>
<td>21</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 3 years</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>3 to 5 years</td>
<td>65</td>
<td>38</td>
</tr>
<tr>
<td>6 to 11 years</td>
<td>73</td>
<td>43</td>
</tr>
<tr>
<td>12 to 18 years</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>More than 18 years</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

n=170
Equal numbers of participants reported mild (41%) and moderate (41%) levels of severity of ASD in their children. Only three percent of the participants reported having a child with severe ASD. More than half of the parents, 55%, indicated that their children with ASD were non-verbal (55%, 94/170). Forty-six percent of the children with ASD attended private schools (78/170). Nearly one quarter of the children with ASD in this study (24%) attended government schools (41/170). Finally, 30% of the participants reported that their children with ASD were home schooled (51/170) (Table 8).

Table 8

Background Information of Children with ASD

<table>
<thead>
<tr>
<th>Background Information</th>
<th>Frequency (n)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severity of ASD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>69</td>
<td>41</td>
</tr>
<tr>
<td>Moderate</td>
<td>69</td>
<td>41</td>
</tr>
<tr>
<td>Severe</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Not sure</td>
<td>27</td>
<td>16</td>
</tr>
<tr>
<td>Type of School</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home schooled</td>
<td>51</td>
<td>30</td>
</tr>
<tr>
<td>Government</td>
<td>41</td>
<td>24</td>
</tr>
</tbody>
</table>
Use of portable devices. In this section of the survey, parents were asked to respond to questions about how their children with ASD used technology. Questions included which technologies the child used, the child’s skill-level with technology, and the child’s perspective on technology (Table 9). For instance, most parents (85%) reported having used technology (e.g., a computer, portable device, video camera, etc.) with their child with ASD (144/170). The most commonly used technology among children with ASD was the iPad. More than half of the parents (56%) reported having multiple portable devices in the home (95/170). Thirty percent of parents reported that their children with ASD had access to their own portable device (51/170) and only five parents reported having no portable devices (3%). Most parents (91%) indicated that their children with ASD had greater access to a portable device at home; only 8% of parents reported that their children with ASD had access to a portable device at school (14/170).

Table 9
Technology and Portable Devices Use

<table>
<thead>
<tr>
<th>Technology and Portable Device Use</th>
<th>Frequency (n)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you used technology with your child with ASD?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>144</td>
<td>85</td>
</tr>
<tr>
<td>No</td>
<td>26</td>
<td>15</td>
</tr>
</tbody>
</table>
Which of the following applies to your household *portable device* use?

I do not own a portable device. 5 3

I own one portable device. 81 48

There are multiple portable devices in my home. 95 56

I share a portable device with another family member. 86 51

My child with ASD has access to her/his own portable device. 51 30

Where does your child with ASD access a portable device or devices?

At home 155 91

At school 14 8

At an early intervention program 14 8

During therapy sessions 11 6

At a relative’s/friend’s house 48 28

n=170

A majority of parents (79%) reported that school programs had no portable devices or assistive technologies for their children with ASD. Parents who reported that
technologies were used in school programs (21%) cited the iPad as the most frequently used technology. Most parents reported that their children with ASD used portable devices for games (75%) and watching videos (71%). Thirty-eight percent of parents indicated that their children with ASD used portable devices for learning. Sixty-eight percent of parents reported that using a portable device with their children with ASD had improved their children’s recreation skills; this was the highest number of responses. A quarter of parents reported no improvement in their child’s skills from using portable devices.

Table 10

Technology and Portable Devices Use

<table>
<thead>
<tr>
<th>Technology and Portable Devices Use</th>
<th>Frequency (n)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were any technologies or portable devices used in your child's school?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>35</td>
<td>21</td>
</tr>
<tr>
<td>No</td>
<td>135</td>
<td>79</td>
</tr>
<tr>
<td>Does your child with ASD use portable devices for any of the following?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>Learning</td>
<td>64</td>
<td>38</td>
</tr>
<tr>
<td>Games</td>
<td>128</td>
<td>75</td>
</tr>
<tr>
<td>Watching videos or YouTube</td>
<td>120</td>
<td>71</td>
</tr>
</tbody>
</table>
Surfing the Web

Using a portable device at home, school, and/or in daily living activities has improved my child’s skills in the following areas:

<table>
<thead>
<tr>
<th>Area</th>
<th>7</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social</td>
<td>29</td>
<td>17</td>
</tr>
<tr>
<td>Academic</td>
<td>35</td>
<td>21</td>
</tr>
<tr>
<td>Communication</td>
<td>47</td>
<td>28</td>
</tr>
<tr>
<td>Behavioral</td>
<td>35</td>
<td>21</td>
</tr>
<tr>
<td>Adaptive</td>
<td>21</td>
<td>12</td>
</tr>
<tr>
<td>Daily life</td>
<td>37</td>
<td>22</td>
</tr>
<tr>
<td>Recreation</td>
<td>116</td>
<td>68</td>
</tr>
<tr>
<td>None</td>
<td>42</td>
<td>25</td>
</tr>
</tbody>
</table>

n=170

Skills in using portable devices and applications. Parents were asked to rate their skills in using portable devices and exactly half (50%) of them rated their skills as very good. Ten percent of parents considered themselves expert, and only five percent reported having no skills. Nearly half of the parents (45%) reported having very good skills in using portable device applications (77/170). Eight percent of parents said they were expert in using portable device applications and only five percent indicated that they had no skills.
Nearly one third of parents (28%) reported that their children with ASD had very good skills with portable devices (Table 11). Seven percent of parents said that their child with ASD was an expert user of portable devices. Thirty-four percent of parents indicated that their children with ASD had no skills in using portable devices. More than a quarter of the parents (28%) reported that their child with ASD had very good skills in using portable device applications. About a quarter of parents (24%) indicated that their children with ASD had no skills in using portable device applications. Ten parents described their child with ASD as an expert user.

Table 11

Level of Skills of Parents and Children with ASD in Percent

<table>
<thead>
<tr>
<th>Skills Survey Items</th>
<th>N</th>
<th>B</th>
<th>A</th>
<th>V</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parents’ skills with</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portable devices</td>
<td>5</td>
<td>9</td>
<td>26</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>Portable device applications</td>
<td>5</td>
<td>10</td>
<td>31</td>
<td>45</td>
<td>8</td>
</tr>
<tr>
<td>Skills of children with ASD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using portable devices</td>
<td>20</td>
<td>18</td>
<td>26</td>
<td>28</td>
<td>7</td>
</tr>
<tr>
<td>Using portable device applications</td>
<td>24</td>
<td>21</td>
<td>22</td>
<td>28</td>
<td>6</td>
</tr>
</tbody>
</table>

*Note. N=None; B=Beginner; A=Average; V=Very good; E=Expert.*
**Parental perspectives on the use of portable devices.** Parents were asked about their perspectives and attitudes toward the use of portable devices with their children with ASD using a Likert-type scale (Table 12). Regarding bath skills, most disagreed or strongly disagreed (52% and 25.3 respectively) that portable devices helped their child improve in this area. Fifty-one percent of parents reported that portable devices did not improve the morning routine (e.g., getting up, getting dressed, brushing teeth, etc.) of their child with ASD. Nearly one fourth of parents (24.7%), however, felt that such devices improved these skills. Similarly, more than half of parents (56%) reported that using a portable device with their children with ASD did not improve the bedtime routine. Mealtime skills were not improved by using portable devices according to 55% of parents. However, play skills were improved by a portable device, according to 50% of the parents. The transportation skills of children with ASD were not improved according to more than half of the parents (53.5%).

Fifty-two percent of parents reported that using a portable device with their children with ASD improved their family routines skills (e.g., doing chores, preparing meals, watching TV, etc.). Portable devices did not improve the skills required for physical activities (e.g., riding a bike, water play/swimming, manipulating toys, etc.) according to 55% of parents. Half of all parents (50%) agreed that using a portable device with their children with ASD improved skills associated with visiting friends and relatives, eating out, shopping, and going to amusement parks. Nearly half of the parents (46%) agreed that their children with ASD could use portable devices without help. Forty percent of parents agreed that their children with ASD needed to be trained first before independently using portable devices.
Table 12

Parents’ Perspectives on the Use of Portable Devices in Percent

<table>
<thead>
<tr>
<th>Parents’ Perspectives</th>
<th>Strongly Agree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve bath skills</td>
<td>25.3</td>
<td>52.4</td>
<td>18.8</td>
<td>3.5</td>
</tr>
<tr>
<td>Improve morning</td>
<td>22.4</td>
<td>51.2</td>
<td>24.7</td>
<td>1.8</td>
</tr>
<tr>
<td>routine skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improve bedtime routine</td>
<td>22.4</td>
<td>55.9</td>
<td>20.0</td>
<td>1.8</td>
</tr>
<tr>
<td>Improve mealtime skills</td>
<td>20.6</td>
<td>55.3</td>
<td>21.8</td>
<td>2.4</td>
</tr>
<tr>
<td>Improve play skills.</td>
<td>15.9</td>
<td>21.2</td>
<td>50.0</td>
<td>12.9</td>
</tr>
<tr>
<td>Improve daily</td>
<td>24.1</td>
<td>53.5</td>
<td>18.8</td>
<td>3.5</td>
</tr>
<tr>
<td>transportation skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improve the child/family routines skills</td>
<td>18.8</td>
<td>52.4</td>
<td>24.1</td>
<td>4.7</td>
</tr>
<tr>
<td>Improve physical activities skills</td>
<td>17.1</td>
<td>55.3</td>
<td>22.9</td>
<td>4.7</td>
</tr>
<tr>
<td>Improve skills related to family visits, eating out, shopping, visiting</td>
<td>20</td>
<td>50</td>
<td>26.5</td>
<td>3.5</td>
</tr>
</tbody>
</table>
amusement parks

My child can use portable devices without help

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>18.8</th>
<th>45.9</th>
<th>26.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>My child needs to be</td>
<td>10.0</td>
<td>26.5</td>
<td>40.6</td>
<td>22.9</td>
</tr>
<tr>
<td>trained before</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>independently using</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>portable devices</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Attitudes toward technology and portable devices.** In this section, parents were asked about their attitudes toward technology, portable devices, and applications using a Likert-type scale (Table 13). The majority of parents (89%) strongly agreed that technology made people’s lives better. Most (59.4%) disagreed that technology complicated people’s lives. Most also strongly agreed (44.1%) or agreed (48.2%) that they could do more things using technology. Sixty-one percent of parents disagreed that technology made more work than it saved. Similarly, a majority of parents (67.1%) disagreed that technology just made things more complex. Many parents of children with ASD (61.2%) agreed that although the technology was changing constantly, they were able to keep up. More than half of parents (52.9%) disagreed that technology seemed to be getting more complicated. Most strongly agreed (20.6%) or agreed (61.2%) that the amount of technology information on the Internet was overwhelming. Most parents
strongly agreed (35.9%) or agreed (55.3%) that their children with ASD liked using technology (e.g., computers, portable devices, or video games).

The majority of parents strongly agreed (22.9%) or agreed (63.5%) that portable device applications made people’s lives better. Many parents (65.9%) disagreed that portable device applications complicated people’s lives. Sixty-seven percent of parents disagreed that they could do more things using portable device applications. Sixty-five percent of parents disagreed that portable device applications made more work than they saved. Most parents strongly agreed (16.5%) or agreed (69.4%) that portable device applications simplified their lives. Also, most parents (68.8%) disagreed that portable device applications just made things more complex. More than half of the parents (59.4%) did not feel that portable device applications seemed to be getting more complicated. Most parents strongly agreed (51.2%) or agreed (17.1%) that portable device applications helped them with their children with ASD. Many parents of children with ASD (57.1%) agreed that they found the amount of information about portable device applications available on the Internet was overwhelming. Fifty-seven percent of parents disagreed that changes in portable device applications happened so quickly that they felt out of their depth. Nearly all parents (97%) strongly agreed (63.5%) or agreed (33.5%) that they found a great deal of useful information about portable devices on the Internet. Finally, most parents strongly agreed (62.4%) or agreed (25.3%) that they felt they were skilled in using portable devices (Table 13).

Table 13

Parents’ Attitudes toward Technology and Portable Device Applications in Percent
## Parents’ Attitudes Survey

<table>
<thead>
<tr>
<th>Items</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology makes people’s lives better.</td>
<td>2.4</td>
<td>8.8</td>
<td>57.1</td>
<td>31.8</td>
</tr>
<tr>
<td>Technology complicates people’s lives.</td>
<td>10.6</td>
<td>59.4</td>
<td>24.7</td>
<td>5.3</td>
</tr>
<tr>
<td>I can do more things using technology.</td>
<td>0</td>
<td>7.6</td>
<td>48.2</td>
<td>44.1</td>
</tr>
<tr>
<td>Technology makes more work than it saves.</td>
<td>11.8</td>
<td>61.2</td>
<td>21.2</td>
<td>5.9</td>
</tr>
<tr>
<td>Technology just makes things more complex.</td>
<td>13.5</td>
<td>67.1</td>
<td>15.3</td>
<td>4.1</td>
</tr>
<tr>
<td>Although technology is changing all the time, I find I can keep up with it.</td>
<td>1.2</td>
<td>24.1</td>
<td>61.2</td>
<td>13.5</td>
</tr>
<tr>
<td>Technology seems to be getting more complicated.</td>
<td>5.9</td>
<td>52.9</td>
<td>34.1</td>
<td>7.1</td>
</tr>
<tr>
<td>I find the amount of information about technology available on the Internet is</td>
<td>1.2</td>
<td>17.1</td>
<td>61.2</td>
<td>20.6</td>
</tr>
</tbody>
</table>
overwhelming.

<table>
<thead>
<tr>
<th>I find that changes in technology happen so quickly that I always feel out of my depth.</th>
<th>2.9</th>
<th>51.2</th>
<th>41.2</th>
<th>4.7</th>
</tr>
</thead>
</table>

My child with ASD likes using technology (e.g., computers, portable devices, or playing video games).

<table>
<thead>
<tr>
<th>My child with ASD likes using technology (e.g., computers, portable devices, or playing video games).</th>
<th>4.7</th>
<th>4.1</th>
<th>55.3</th>
<th>35.9</th>
</tr>
</thead>
</table>

Portable device applications make people’s lives better.

<table>
<thead>
<tr>
<th>Portable device applications make people’s lives better.</th>
<th>.6</th>
<th>12.9</th>
<th>63.5</th>
<th>22.9</th>
</tr>
</thead>
</table>

Portable device applications complicate people’s lives.

<table>
<thead>
<tr>
<th>Portable device applications complicate people’s lives.</th>
<th>8.8</th>
<th>65.9</th>
<th>21.8</th>
<th>3.5</th>
</tr>
</thead>
</table>

I can do more things using portable device applications.

<table>
<thead>
<tr>
<th>I can do more things using portable device applications.</th>
<th>0</th>
<th>9.4</th>
<th>67.1</th>
<th>23.5</th>
</tr>
</thead>
</table>

Portable device applications make more work than they save.

<table>
<thead>
<tr>
<th>Portable device applications make more work than they save.</th>
<th>7.1</th>
<th>65.3</th>
<th>24.1</th>
<th>3.5</th>
</tr>
</thead>
</table>

Portable device applications simplify my life.

<p>| Portable device applications simplify my life. | .6 | 13.5 | 69.4 | 16.5 |</p>
<table>
<thead>
<tr>
<th>Portable device applications</th>
<th>9.4</th>
<th>68.8</th>
<th>17.1</th>
<th>4.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portable device applications seem to be getting more complicated.</td>
<td>5.3</td>
<td>59.4</td>
<td>27.1</td>
<td>8.2</td>
</tr>
<tr>
<td>Portable devise applications really help me with my child with ASD.</td>
<td>5.9</td>
<td>25.9</td>
<td>51.2</td>
<td>17.1</td>
</tr>
<tr>
<td>I find the amount of information about portable device applications available on the Internet is overwhelming.</td>
<td>1.2</td>
<td>27.6</td>
<td>57.1</td>
<td>14.1</td>
</tr>
<tr>
<td>I find that changes in portable device applications happen so quickly that I always feel out of my depth.</td>
<td>3.5</td>
<td>57.1</td>
<td>30.6</td>
<td>8.8</td>
</tr>
<tr>
<td>I find a great deal of useful information about portable devices on the Internet.</td>
<td>.6</td>
<td>2.4</td>
<td>63.5</td>
<td>33.5</td>
</tr>
</tbody>
</table>
I feel that I am skilled in using portable devices.

**Behaviors toward the iPad and technology in general.** In this section, parents were asked about their behaviors related to portable devices and portable device applications (Table 14). Forty-four percent of parents reported that their children with ASD had been using portable devices for more than 2 years, while 13% of parents indicated that their children with ASD had never used any portable device. Nearly half of all parents (47.6%) indicated that in the past five days their children with ASD used portable devices all the five days. More than a third of parents (34.1%) estimated that their children with ASD spent less than one hour over the past five days using portable devices. The majority of parents (72%) reported that they had received a lot, or some, information about portable devices such as iPads. Only twelve parents indicated that they had not received any information about portable devices. Forty-five percent reported that they had some or a lot of training on portable devices such as iPads. No training was received for portable devices such as iPads as reported by 54% of parents. A slightly smaller percentage, 46%, of parents reported that they had received training on portable devices from the Internet.

Forty-two percent of parents indicated that they felt competent in some situations but not in others when using portable device such as iPads with their children with ASD. Twenty-eight parents did not feel at all competent in using portable devices such as iPads with their children with ASD. Physical activities such as play were the most commonly
reported (67%) settings where portable devices were used by their children with ASD. Thirty-four percent of parents reported that learning activities at childcare or school were another common setting for portable device use. Most parents (78%) reported being able to provide portable devices for their children with ASD. Parents indicated that prices of available portable devices were expensive (46%) and fair (42%).

Table 14
Parents’ Behaviors toward Portable Devices

<table>
<thead>
<tr>
<th>Parents’ Behaviors toward Portable Devices</th>
<th>Frequency (n)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicate how long your child with ASD has been using portable devices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has never used a portable device</td>
<td>22</td>
<td>13</td>
</tr>
<tr>
<td>Approximately 1-6 months</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Approximately 6-12 months</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>Approximately 12-18 months</td>
<td>23</td>
<td>14</td>
</tr>
<tr>
<td>Approximately 18-24 months</td>
<td>27</td>
<td>16</td>
</tr>
<tr>
<td>Longer than 24 months</td>
<td>74</td>
<td>44</td>
</tr>
</tbody>
</table>

Indicate the number of days your child with ASD has used a portable device in the past 5 days

| Not at all                        | 31           | 18 |


Over the past 5 days, please estimate how much time your child with ASD spent using a portable device

<table>
<thead>
<tr>
<th>Days</th>
<th>Hours</th>
<th>Less than one hour</th>
<th>1-2 hours</th>
<th>3-4 hours</th>
<th>5-6 hours</th>
<th>7-8 hours</th>
<th>9-19 hours</th>
<th>More than 10 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>One day</td>
<td>13</td>
<td>13</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two days</td>
<td>19</td>
<td>19</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three days</td>
<td>16</td>
<td>16</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four days</td>
<td>10</td>
<td>10</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Five days</td>
<td>81</td>
<td>81</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How much information have you received about portable devices such as iPads?
None

A little

Some

A lot

How much training have you had on portable devices such as iPads?

None 48 28

A little 46 27

Some 51 30

A lot 25 15

Check all that apply regarding where you have received training in portable devices such as iPads

Attended workshops 14 8

Attended conferences, local expos, or fairs 6 4

Library 4 2

Teachers 13 8

Therapists 15 9
How competent do you feel in using portable devices such as iPads with your child with ASD?

Not at all competent 28 16
Competent in some situations, but not in others 72 42
Overall, somewhat competent in all areas 45 26
Very competent 25 15

Please check all of the activities and routines where your child currently uses portable devices such as iPads

During physical or play activities 114 67
For daily caregiving routines such as getting up, going to bed, bath time, or mealtimes 33 19
For socializing and communicating with her/his brothers and sisters, relatives, neighbors, or friends during informal activities 30 18
For learning activities at childcare, school, etc. 57 34

As a parent of a child with ASD, I can afford to provide a portable device such as an iPad for my child with ASD.
More than half of the parents (52%) reported that their children with ASD had not used any therapeutic or educational applications in the past five days (Table 15). Thirty-seven percent of parents indicated that a portable device application was used by their children with ASD for purposes other than education or therapy in the past 5 days (for example, entertainment, play, reward/reinforcement). The majority of parents (68%) estimated that their children with ASD spent less than one hour over the past five days. Thirty-nine percent of parents estimated that their children with ASD spent less than one hour over the past five days using portable device applications for entertainment.

Table 15

Parents’ Behavior toward Portable Device Applications (1)
Parents’ Behavior Toward Portable Device Applications

<table>
<thead>
<tr>
<th>Frequency (n)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>How many days were portable device applications of a therapeutic or educational nature used by your child with ASD in the past 5 days?</strong></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>89</td>
</tr>
<tr>
<td>One day</td>
<td>23</td>
</tr>
<tr>
<td>Two days</td>
<td>17</td>
</tr>
<tr>
<td>Three days</td>
<td>17</td>
</tr>
<tr>
<td>Four days</td>
<td>6</td>
</tr>
<tr>
<td>Five days</td>
<td>18</td>
</tr>
<tr>
<td><strong>How many days were portable device applications used by your child with ASD for purposes other than education or therapy in the past 5 days (for example, entertainment, play, reward/reinforcement)?</strong></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>37</td>
</tr>
<tr>
<td>One day</td>
<td>16</td>
</tr>
<tr>
<td>Two days</td>
<td>28</td>
</tr>
<tr>
<td>Three days</td>
<td>20</td>
</tr>
<tr>
<td>Four days</td>
<td>6</td>
</tr>
<tr>
<td>Five days</td>
<td>63</td>
</tr>
<tr>
<td><strong>Over the past 5 days, please estimate how much time your child with ASD spent using educational portable device applications?</strong></td>
<td></td>
</tr>
<tr>
<td>Less than one hour</td>
<td>115</td>
</tr>
<tr>
<td>1-2 hours</td>
<td>36</td>
</tr>
<tr>
<td>3-4 hours</td>
<td>12</td>
</tr>
</tbody>
</table>
Forty-three percent of parents agreed that they were confident in their abilities to select educational and therapeutic portable device applications for their children with ASD (Table 16). Forty-seven percent agreed that they were aware of the range of portable device applications available for their children with ASD. In addition, forty-seven percent of parents agreed that they were aware of the educational and therapeutic advantages of portable device applications use in ASD. Finally, forty percent of parents agreed that they felt comfortable increasing the amount of time their children with ASD spends using portable device applications of an educational or therapeutic nature.

<table>
<thead>
<tr>
<th>Time Range</th>
<th>Count 1</th>
<th>Count 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-6 hours</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>7-8 hours</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9-19 hours</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>More than 10 hours</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Over the past 5 days, please estimate how much time your child with ASD spent using portable device applications for entertainment?

<table>
<thead>
<tr>
<th>Time Range</th>
<th>Count 1</th>
<th>Count 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than one hour</td>
<td>66</td>
<td>39</td>
</tr>
<tr>
<td>1-2 hours</td>
<td>51</td>
<td>30</td>
</tr>
<tr>
<td>3-4 hours</td>
<td>24</td>
<td>14</td>
</tr>
<tr>
<td>5-6 hours</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>7-8 hours</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>9-19 hours</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>More than 10 hours</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

n=170
Table 16

Parents’ Behaviors toward Portable Device Applications in Percent (2)

<table>
<thead>
<tr>
<th>Parents’ Behaviors toward Portable Device Applications</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am confident in my ability to select educational and therapeutic portable device applications for my child with ASD.</td>
<td>4.7</td>
<td>34.7</td>
<td>42.9</td>
<td>17.6</td>
</tr>
<tr>
<td>I am aware of the range of portable device applications available for my child with ASD.</td>
<td>6.5</td>
<td>36.5</td>
<td>47.1</td>
<td>10.0</td>
</tr>
<tr>
<td>I am aware of the educational and therapeutic advantages of portable device applications for use with ASD.</td>
<td>4.1</td>
<td>32.9</td>
<td>47.1</td>
<td>15.9</td>
</tr>
</tbody>
</table>
I would feel comfortable increasing the amount of time my child with ASD spends using portable device applications of an educational or therapeutic nature.

---

**Variables Related to Parents’ of Children with ASD Attitudes**

A multiple regression analysis was conducted in this study to examine to which gender and age, marital status, level of education, occupation, current region of residence, family monthly income, number of children, age and gender of child with ASD, severity of ASD, ability to speak, and type of school predicted parents’ attitudes toward the use of technology and portable devices with their children with ASD. Table 17 presents the results of the multiple regression analysis that reports a significant proportion of total variation in parents’ attitudes toward the use of technology and portable devices with their children with ASD was predicted by parents’ gender and occupation and family monthly income. For every point increase in parents’ gender, a .177 points increase in parents’ positive attitudes toward the use of technology and portable devices with their children with ASD, when controlled for other independent variables including occupation and family monthly income.
In addition, for every point decrease in parents’ occupation, a -0.170 points decrease in parents’ negative attitudes toward the use of technology and portable devices with their children with ASD, when controlled for other independent variables including parents’ gender and family monthly income (Table 17). Also, for every point decrease in family monthly income, a -0.186 points decrease in parents’ positive attitudes toward the use of technology and portable devices with their children with ASD, when controlled for other independent variables parents’ gender and occupation. *p*-values (.036, .034, and .039) in all predictors (less than .05) indicate that all predictors have significant contribution (or are significant predictors) for parents’ attitudes toward the use of technology and portable devices with their children with ASD.

Table 17

Multiple Regression Analysis for all Independent Variables (Demographic Variables)

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Beta</th>
<th>t</th>
<th>p -Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=170</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parents’ Gender</td>
<td>.177</td>
<td>2.111</td>
<td>.036</td>
</tr>
<tr>
<td>Father’s Age</td>
<td>Not-significant</td>
<td>Not-significant</td>
<td>Not-significant</td>
</tr>
<tr>
<td>Mother’s age</td>
<td>Not-significant</td>
<td>Not-significant</td>
<td>Not-significant</td>
</tr>
<tr>
<td>Marital Status</td>
<td>Not-significant</td>
<td>Not-significant</td>
<td>Not-significant</td>
</tr>
<tr>
<td>Category</td>
<td>Value 1</td>
<td>Value 2</td>
<td>Value 3</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Highest Level of Education (Father)</td>
<td>Not-significant</td>
<td>Not-significant</td>
<td>Not-significant</td>
</tr>
<tr>
<td>Highest Level of Education (Mother)</td>
<td>Not-significant</td>
<td>Not-significant</td>
<td>Not-significant</td>
</tr>
<tr>
<td>Occupation</td>
<td>-1.170</td>
<td>-2.139</td>
<td>.034</td>
</tr>
<tr>
<td>Current Region of Residence</td>
<td>Not-significant</td>
<td>Not-significant</td>
<td>Not-significant</td>
</tr>
<tr>
<td>Family Monthly Income</td>
<td>-.186</td>
<td>-2.078</td>
<td>.039</td>
</tr>
<tr>
<td>Number of Children</td>
<td>Not-significant</td>
<td>Not-significant</td>
<td>Not-significant</td>
</tr>
<tr>
<td>Age of Child with ASD</td>
<td>Not-significant</td>
<td>Not-significant</td>
<td>Not-significant</td>
</tr>
<tr>
<td>Gender of Child with ASD</td>
<td>Not-significant</td>
<td>Not-significant</td>
<td>Not-significant</td>
</tr>
</tbody>
</table>
Severity of ASD  Not-significant  Not-significant  Not-significant
Ability to Speak  Not-significant  Not-significant  Not-significant
Type of School  Not-significant  Not-significant  Not-significant

Note. \( p < .05 \) = Statistically Significant.

Table 18 shows a model summary for the multiple regression analysis. In the model summary, \( R = .368 \) indicates that there is a correlation among the entire set of the predictors. The \( r \)-square reports that 14% of the variation in parents’ attitudes toward the use of technology and portable devices with their children with ASD was predicted by parents’ gender and occupation and family monthly income. \( R \) square indicates 14% of the variance in parents’ attitudes toward the use of technology and portable devices with their children with ASD is explained by the set of the predictors (parents’ gender and occupation and family monthly income).

Table 18

Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>( r )</th>
<th>R Square</th>
<th>Standard Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.368</td>
<td>.136</td>
<td>.252</td>
</tr>
</tbody>
</table>
Exploration of Variables of Interest

One-way ANOVA was conducted in this study to examine the relationship between demographic variables and parents’ attitudes toward technology and portable devices, the use of portable devices, and behavior toward technology and the iPad. In addition, the researcher explored variables and differences within groups by using the Post Hoc Tukey HSD Test. The effect size (ES) was calculated for all variables of interest.

Parents’ attitudes toward technology and portable devices. Table 19 presents the results of the ANOVA analysis for parents’ attitudes toward technology and portable devices. Attitudes of parents of children with ASD toward technology and portable devices were not statistically significant $F(15,169) = 1.613, \ p = .076, \ \eta^2 = .135$, large. By using Cohen’s (1988) guidelines for interpreting $\eta^2$ (An ES of .14 is a large effect, .06 is medium effect, and .01 indicates a small effect) (Lomax & Hahs-Vaughn, 2012; Utts & Hechard, 2006), the ES was large suggesting that about 13.5% of the variance of parents’ attitudes toward technology and portable devices was due to differences of attitudes. The Post Hoc Tukey HSD Test indicated that retail/sales, trades, and fulltime parent were more statistically significant occupation of parents of children with ASD than other occupations. Also, family monthly income from 20,000 SR and more than that was more statistically significant.

Table 19

One-way ANOVA for Parents’ Attitudes toward Technology and Portable Devices
Variables of Interest

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>F Ratio</th>
<th>p-Value</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parents’ Attitudes toward Technology and Portable Devices</td>
<td>2.720</td>
<td>.258</td>
<td>1.613</td>
<td>.076</td>
<td>.135</td>
</tr>
</tbody>
</table>

Note. F = significant test. The variability difference is significant at the .05 level.

The use of portable devices. Table 20 presents the results of the ANOVA analysis for parents’ and children’s with ASD use of portable devices. Parents’ and children’s use of portable devices were statistically significant $F (15,169) = 2.402, p = .004, \eta^2 = .189$, large. By using Cohen’s (1988) guidelines for interpreting $\eta^2$, the ES was large suggesting that about 18.9% of the variance of parents’ and children’s with ASD use of portable devices was due to differences by the use of these portable devices. Post Hoc Tukey HSD Test indicated that retail/sales, trades, and fulltime parent were more statistically significant occupation of parents of children with ASD than other occupations. Also, family monthly income from 15.000 SR and more than that was more statistically significant.

Table 20

Parents’ and Children’s Use of Portable Devices
Variables of Interest

|          | Mean | Standard Deviation | F Ratio | p-Value | Effect Size
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>n=170</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Parents’ and Children’s with ASD Use of Portable Devices

| ASD Use of Portable Devices | 1.950 | .286 | 2.402 | .004 | .189 |

Note. F = significant test. The variability difference is significant at the .05 level.

**Parents’ behaviors toward technology and the iPad.** Table 21 presents the results of the ANOVA analysis for parents’ behaviors toward technology and iPad.

Parents’ behaviors toward technology and iPad were statistically significant $F(3,169) = 2.800, p = .042, \eta^2 = .048$, small. By using Cohen’s (1988) guidelines for interpreting $\eta^2$, the ES was small suggesting that about 4% of the variance of parents’ behaviors toward technology and iPad was due to differences by the behaviors. Post Hoc Tukey HSD Test indicated that retail/sales, trades, and fulltime parent were more statistically significant occupation of parents of children with ASD than other occupations. Also, family monthly income from 15.000 SR and more than that was more statistically significant.

Table 21

Parents’ Behaviors toward Technology and the iPad
Variables of Interest

<table>
<thead>
<tr>
<th>Variables of Interest</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>F Ratio</th>
<th>p-Value</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parents’ Behaviors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>toward technology</td>
<td>2.447</td>
<td>.491</td>
<td>2.800</td>
<td>.042</td>
<td>.048</td>
</tr>
</tbody>
</table>

Note. F = significant test. The variability difference is significant at the .05 level.

Parents Interviews

Nineteen parents of children with ASD from Saudi Arabia were interviewed in this study (10 females and 9 males). The researcher used phone and email interviews. Many parents of children with ASD were interested in being interviewed and provided their contact information at the end of their answers to the survey items. It seemed to the researcher that these parents of children with ASD in Saudi Arabia were eager to participate and provide their voices to the researcher. They provided detailed answers to the interview questions (Table 20). The researcher used the thematic analysis and coded common themes and patterns that emerged. In the following paragraphs, the common themes of the parent’s interviews are discussed:

- Parents’ beliefs about ASD
- Parents’ challenges with ASD
• Positive experiences
• Parents’ perspective about current services for children with ASD in Saudi Arabia
• Parents’ perspective about the use of technology and portable devices

See Table 22 for a summary of the guiding questions that were used in the qualitative interviews.

Table 22

---

**Guiding Interview Questions**

---

5- Please tell me about your beliefs about autism.
   
a. Interviewer will ask for clarifications, will provide additional prompts, and will ask the parent to expand on interesting or significant comments.

6- Please tell me about any challenges that you and your family face as you experience life with your child with ASD in lives you’re your child with autism.
   
   - Also, what are some of the positive things that you experience with your child with ASD?

7- What do you think about the current services for children with autism in Saudi Arabia?
   
   - For example, are you satisfied with autism services in the schools? In health settings? In the community?
- If you are not satisfied with the services, please tell me how they could be increased and/or improved?
- What would make your life, your family’s life, and your child with autism’s life better?

8- Overall, what do you think about the use of technology and portable devices with children with autism?

Parents’ beliefs about ASD. More than the half of these parents (52%) of children with ASD from this sample population in Saudi Arabia were knowledgeable about what ASD is and provided an appropriate definition and information of ASD. What was interesting to the researcher was that more than 50% of these parents emphasized that ASD is a disorder not a disease. Also, twenty-one percent of parents believed that children with ASD had talents and as parents of children with ASD, they had to challenge themselves to find their children’s talents and improve them.

Parents’ challenges with ASD. Ten parents (52%) of children with ASD from this sample of the population in Saudi Arabia agreed that the society awareness of ASD was weak and was the biggest challenge they faced when they had a child with ASD. They thought that made their children with ASD more isolated from society. A majority of these parents (84%) reported that another challenge they encountered was the shortage of ASD governmental centers and relying on ASD private centers that did not have specialists in ASD. Parents thought their children with ASD needed more governmental supports and qualified ASD specialists. They had bad experiences with ASD private centers that look for getting more money from the parents instead of providing good services for their children. Twenty-one percent of parents of children with ASD had to
live outside Saudi Arabia to find better services for their children with ASD, 3 in the USA and 1 in France. Other challenges they said they faced were financial and psychological.

**Positive experiences.** Twenty-one percent of these parents of children with ASD indicated that they learned to be more patient as a result of having a child with ASD. Twenty-six of these parents thought that having child with ASD was a test from Allah, God, and they had to accept that and deal with it to get the rewards from Allah later. Also, other parents (21%) reported that they became self-learners about ASD as a result of having a child with ASD. What was more interesting was that about 21% parents of children with ASD did not provide any answer about if they had positive experiences when having a child with ASD.

**Parents’ perspective about current services for children with ASD in Saudi Arabia.** All the parents of children with ASD from this sample of parents in Saudi Arabia said that they were not satisfied at all about current services for children with ASD in Saudi Arabia. They thought the current ASD private centers were less qualified and more expensive. More than a half of parents indicated that there was a need for having more governmental ASD centers. Thirty-six of these Saudi parents of children with ASD indicated that Saudi Arabia needed to have more Saudi ASD specialists. Twenty-six percent of these parents suggested getting benefits from other countries’ experience with services for children with ASD by hiring specialists and experts from outside Saudi Arabia (e.g., the US). They suggested that for current ASD centers that they be supervised by qualified ASD centers in the US. More than the half of parents of children with ASD greed that there was a need for more awareness about ASD and it causes,
which could be provided by society and the media. Twenty-one percent of these parents thought that children with ASD in Saudi Arabia needed to be included in schools with other students.

**Parents’ perspective about the use of technology and portable devices.**

Fourteen parents (73%) of children with ASD thought that using technology and portable devices like iPads with their children with ASD was helpful and beneficial since many of these children had strong visual memories and were seen by their parents to be “smart”. On the other hand, fifteen percent of parents of children with ASD believed that that using these technology and portable devices was a part of the problem because they might isolate these children from the surrounding environment and people and make them addicted to technology. More than 50% of these parents of children with ASD reported that using technology and portable devices like iPads with their children was double-edged sword. They indicated that using these technology and portable devices with their children with ASD could improve their children’s learning process when there are time limits and limited supervision by parents of their children’s use.

**Summary**

This study was conducted to better understand what factors impact parents’ attitudes toward the use of technology and portable devices with children with ASD in Saudi Arabia. Parents were provided with a survey administered online and interviewed about their perspective and attitudes toward ASD, challenges, positive experiences, current services for children with ASD in Saudi Arabia, and the use of technology and portable devices with these children. One hundred and seventy parents completed the
surveys through Qualtrics only survey system. The survey instrument was validated by utilizing a pilot study and also the reliability and validity was examined by expert review for the content validity and Rasch test that indicated a very good reliability (.96).

Demographic information indicated that most respondents were female (62%). Most of parents’ ages were between the ages of 30 and 39 years. Most respondents were married (97%). High School and undergraduate degrees were the most common levels of education for both father and mothers of children with ASD in Saudi Arabia. Fulltime parents and education were the most frequently cited occupations by parents. Most families lived in the central and western regions of Saudi Arabia (72%). About a third of parents had family monthly household incomes ranged from 10,000 to 14,999 SR (Saudi Riyal). Most of the children with ASD were male (79%). The largest age group of children with ASD was 6 to 11 years old (43%). Most of the children with ASD had mild or moderate ASD and more than the half of them were non-verbal. Nearly one quarter of the children with ASD in this study attended government schools and thirty percent were home schooled.

Most parents (85%) reported having used technology (e.g., a computer, portable device, video camera, etc.) with their child with ASD and most commonly used technology among children with ASD was the iPad. Most parents (91%) indicated that their children with ASD had greater access to a portable device at home and only 8% of parents reported that their children with ASD had access to a portable device at school. A majority of parents (79%) reported that school programs had no portable devices or assistive technologies for their children with ASD. Parents who reported that technologies were used in school programs (21%) cited the iPad as the most frequently
used technology. Most reported that their children with ASD used portable devices for games (75%) and watching videos (71%). Thirty-eight percent of parents indicated that their children with ASD used portable devices for learning. Sixty-eight percent of parents reported that using a portable device with their children with ASD had improved their children’s recreation skills; this was the highest number of responses. A quarter of parents reported no improvement in their child’s skills from using portable devices.

Parents were asked to rate their skills in using portable devices and exactly half (50%) of them rated their skills as very good. Nearly one third of parents (28%) reported that their children with ASD had very good skills with portable devices. Thirty-four percent of parents indicated that their children with ASD had no skills in using portable devices.

The results of the multiple regression analysis that report a significant proportion of total variation in parents’ attitudes toward the use of technology and portable devices with their children with ASD was predicted by parents’ gender and occupation and family monthly income. Attitudes of parents of children with ASD toward technology and portable devices were not statistically significant. Parents’ and children’s with ASD use of portable devices were statistically significant. Finally, parents’ behaviors toward technology and iPad were also statistically significant.

Many parents of children with ASD in Saudi Arabia agreed that the society awareness of ASD was the biggest challenge that they face. Parents thought their children with ASD needed more governmental supports and qualified autism specialists. All the parents of children with ASD in Saudi Arabia said that they were not satisfied at all about
current services for children with ASD in Saudi Arabia. Some parents of children with ASD in Saudi Arabia thought that using technology and portable devices like iPads with their children with ASD was helpful and beneficial since many of these children have strong visual memories and smart. Other parents thought the use of technology by these children should be guided by adults and time limits.
CHAPTER FIVE

Discussion

This study was conducted to expand the research knowledge about children and youth with Autism Spectrum Disorder (ASD) and explore parents’ attitudes and perceptions toward using portable electronic devices (e.g., iPads, tablets, and smartphones). Specifically, this study was conducted to examine the attitudes of parents of children with ASD toward the use of technology, specifically portable devices like iPads and to examine the extent to which Saudi Arabian children with ASD use these technologies and portable devices. In order to explore these questions, quantitative survey methods and qualitative interview methods were employed in this study. This study was conducted because the implications of previous investigations have indicated the need for investigating the benefits of technology and portable devices for students with ASD and also because research on the benefits of using portable electronic devices with children with ASD is still in its initial stages (Gentry, Wallace, Kvarfordt, & Lynch, 2010; Sansosti & Powell-Smith, 2008). Thus, the researcher considers this study to be the first step toward investigating the potential effectiveness of using portable electronic devices with children with ASD in Saudi Arabia. In fact, this study is first of its kind in Saudi Arabia to examine parents’ attitudes toward the use of technology and portable devices with children with ASD.

Parents’ Background

Most of the respondents in this student were female parents of children with ASD (62%). That could possibly mean that fathers of children with ASD in Saudi Arabia are
usually busy with their jobs while mothers spend the majority of their time with their children with ASD at home. It was interesting to the researcher that almost all of the parents who participated in this study were married (97%) and most of them fell into the range of 30 to 39 years old. Before conducting the current study, the researcher thought having a child with ASD might cause a divorce with many parents, which from these results does not seem to be happening in this sample of parents. The undergraduate degree was the most common level of education and that is consistent with the findings from a study conducted by Clark, Austin, and Craike (2014). The Clark, et al. study is the only study the researcher found that examined parents’ and professionals’ attitudes toward iPad application use in ASD. Clark, et al. found that higher levels of education of parents of children with ASD resulted in more positive attitudes toward technology use. Most of the parents who participated in the study described in this dissertation were fulltime parents or working in education. Fulltime parents and education were the most frequently cited occupations; other occupations included business/accounting, health care/medical, hospitality, office/administration, retail/sales, trades, and others. In addition, of the participants in the current study, most of the parents’ families lived in the central, Riyadh, the capital city of Saudi Arabia, and western regions of Saudi Arabia (72%). That was interesting because these two major cities in Saudi Arabia are, in fact, the best cities in terms of quality of care for children with ASD as they have more private ASD centers. Nine percent of the families in this study reported living outside of Saudi Arabia. That could be due to the lack of ASD serveries in Saud Arabia. Most of these families’ monthly incomes were slightly above and below the poverty line (9000 Saudi Riyal (SR)) of Saudi Arabia (Al-Damigh, 2014).
Children with ASD

Most of the children with ASD were male (79%) and that is consistent with the ratio of ASD that indicates ASD is a more common disorder in males than females. Most of the children with ASD in this study had mild or moderate ASD, (41% mild and 41% moderate). More than a half of parents indicated that their children with ASD were non-verbal (55%). Perhaps, this was due to limited ASD services and interventions in Saudi Arabia. Most of these children with ASD attended private schools (46%) or were homeschooled (30%). Slightly less than a quarter of them (24%) attended government schools. That was consistent with parents complaints in the interviews regarding issues like the shortage of ASD governmental centers and relying mainly on ASD private centers that parents saw as trying to get money from them as opposed to focusing on providing better ASD services. In addition, the parents’ survey responses reinforce and perhaps explain why all of the parents (19) said in the interviews that they were not satisfied at all with the current services for children with ASD in Saudi Arabia.

Use of Portable Devices

Findings from this study indicate that most parents (85%) reported having used technology (e.g., a computer, portable device, video camera, etc.) with their child with ASD. Moreover, the most commonly used technology among children with ASD was the iPad. That could possibly explain why these parents in the current study have positive attitudes toward the use of technology and portable devices such as iPads with their children with ASD. Most parents (91%) indicated that their children with ASD had greater access to a portable device at home; only 8% of parents reported that their
children with ASD had access to a portable device at school. This study’s results were consistent with and in agreement with Clark, et al. (2014) in that they found that parents reported a high use of technology, especially iPad applications, with their children with ASD. In the current study, parents who reported that technologies were used in school programs (21%) cited the iPad as the most frequently used technology. In general, most parents reported that their children with ASD used portable devices for games (75%), watching videos (71%), and physical activities (67%). Thirty-eight percent of parents indicated that their children with ASD used portable devices for learning. More than half of the parents (52%) reported that their children with ASD had not used any therapeutic or educational applications in the past five days and this could be due to the lack of Arabic educational and therapeutic applications in Saudi Arabia and Middle East countries. Sixty-eight percent of parents reported that using a portable device with their children with ASD had improved their children’s recreation skills; this was the highest number of responses. A quarter of parents reported no improvement in their child’s skills from using portable devices. According to Clark, et al. (2014), parents are considered “as the primary driving force behind iPad use in ASD” (p. 6). Thus, they need to be educated about appropriate use of iPad applications and be cautioned out the need to examine the scientific evidence of these applications. Clark’s statement is supported by the results from this study as well. Half of the parents who participated in the current study reported having very good skills in using portable devices and portable devices applications. Nearly one third of parents (28%) reported that their children with ASD had very good skills in using portable devices and their applications. The current study showed a fairly well-skilled set of parents, so that they can encourage the use of technology with their
children with ASD. However, thirty-four and twenty-four percent, respectively, of parents indicated that their children with ASD had no skills in using portable devices and their applications.

**Parents’ Perspectives on the Use of Portable Devices**

According to parents’ perspectives who participated (50%) in this study, play, visiting friends and relatives, eating out, shopping, and going to amusement parks skills had improved when using portable devices with their children with ASD. Also, fifty-two percent of parents agreed that using portable devices with their children with ASD had improved their children’s family routines skills. On the other hand, other skills such as bath, morning routine, bedtime, mealtime, transportation, and physical did not improve when using portable devices based on parents’ perspectives on a Liker-type scale.

**Parents’ Attitudes Toward Technology and Portable Devices**

Parents of children with ASD in this study asked on a Likert-type scale that included 22 items about their attitudes toward technology and portable devices. Example of these items were as following:

- Technology makes people’s lives better.
- Technology complicates people’s lives.
- Technology makes more work than it saves.
- Although technology is changing all the time, I find I can keep up with it.
- My child with ASD likes using technology (e.g., computers, portable devices, or playing video games).
• Portable device applications complicate people’s lives.
• Portable devise applications really help me with my child with ASD.

Overall, parents held positive attitudes toward almost all of those 22 items. It seemed that parents were enthusiastic and eager to use technology and portable devices applications with their children with ASD. That was consistent with findings from Clark, et al. (2014) study that indicated iPad applications were enthusiastically used by many parents of children with ASD. That indicates that parents of children with ASD usually have positive attitudes toward the use of technology and portable devices such as iPads.

Behaviors Toward the iPad and Technology

Findings from this study indicate that 44% of parents reported that their children with ASD had been using portable devices for more than 2 years. Consistent with the Clark, et al. (2014) study in that they found a similar percent of parents (46%) who said they had begun using iPads with their children with ASD since more than 2 years ago. Thus, that means parents of children with ASD, in Saudi Arabia and Australia, share similar behaviors toward the use of portable devices; even though, they are from different cultures and speak different languages. Also, a small number of percentages of parents in both studies, this study and Clark, et al. (2014) study, reported that their children with ASD had never used any portable device. Nearly half of parents (47.6%) in this study indicated that in the past five days their children with ASD used portable devices all the five days. More than a third of parents (34.1%) estimated that their children with ASD spent less than one hour over the past five days using portable devices.
The majority of parents (72%) reported that they had received a lot, or some, information about portable devices such as iPads. No training was received for portable devices such as iPads as reported by 54% of parents. These results align with the Clark, et al. (2014) study that suggest that there is a need for training parents how to use those portable devices and establishing an evidence-based literature on portable devices.

Forty-percent of parents agreed that they felt comfortable increasing the amount of time their children with ASD spend using portable device applications of an educational or therapeutic nature. These results are consistent with findings from the parent interviews. The interview data indicated that more than 50% of these parents of children with ASD reported that using technology and portable devices like iPads with their children was a double-edged sword. They indicated that using these technology and portable devices with their children with ASD could improve their children’s learning process when there are time limits and limited supervision by parents of their children’s use. Thus, parents thought technology and portable devices like iPads may help in the learning process for these children with ASD when there are some rules and supervision.

**Predictors of Parents’ Attitudes**

A multiple regression analysis was conducted in this study to examine the extent to which gender and age, marital status, level of education, occupation, current region of residence, family monthly income, number of children, age and gender of child with ASD, severity of ASD, ability to speak, and type of school predicted parents’ attitudes toward the use of technology and portable devices with their children with ASD. The results of the multiple regression analysis show a significant proportion of total variation
in parents’ attitudes toward the use of technology and portable devices with their children with ASD was predicted by parents’ gender, occupation, and family monthly income. Again, these results are consistent with Clark, et al. (2014) in which they found a strong positive relationship between attitudes toward iPad application and application use.

**Exploration of Variables of Interest**

ANOVA was conducted in this study to examine the relationship between demographic variables and parents’ attitudes toward technology and portable devices, the use of portable devices, and behavior toward technology and the iPad. In addition, the researcher explored variables and differences within groups by using the Post Hoc Tukey HSD Test. Attitudes of parents of children with ASD toward technology and portable devices were not statistically significant. The effect size (ES) was large suggesting that about 13.5% of the variance of parents’ attitudes toward technology and portable devices was due to differences of attitudes. The Post Hoc Tukey HSD Test indicated that retail/sales, trades, and fulltime parent were more statistically significant occupation of parents of children with ASD than other occupations. Also, family monthly income from 20.000 SR and more than that was more statistically significant.

In addition, parents’ and children’s use of portable devices were statistically significant. The ES was large suggesting that about 18.9% of the variance of parents’ and children’s with ASD use of portable devices was due to differences by the use of these portable devices. Post Hoc Tukey HSD Test indicated that retail/sales, trades, and fulltime parent were more statistically significant occupation of parents of children with ASD than other occupations. Also, family monthly income from 15.000 SR and more than that was more statistically significant.
Also, parents’ behaviors toward technology and iPad were statistically significant. The ES was small suggesting that about 4% of the variance of parents’ behaviors toward technology and iPad was due to differences by the behaviors. Post Hoc Tukey HSD Test indicated that retail/sales, trades, and fulltime parent were more statistically significant occupation of parents of children with ASD than other occupations. Also, family monthly income from 15,000 SR and more than that was more statistically significant.

**Parents Interviews**

Nineteen parents of children with ASD from Saudi Arabia were interviewed in this study (10 females and 9 males). Many parents of children with ASD were interested in being interviewed and eager to participate and provide their voices to the researcher regarding using technology and portable devices with their children with ASD. That is consistent with the enthusiasm of the parents in the Clark, et al. (2014) study about using technology and portable devices with their children with ASD. That could be due to that these parents are eager to make anything that is helpful and beneficial for their children with ASD available. More than the half of parents (52%) in the current study of children with ASD from this sample population in Saudi Arabia was knowledgeable about what ASD is and provided an appropriate definition of and information of ASD. What was interesting to the researcher was that more than 50% of these parents emphasized that ASD is a disorder not a disease. That could explain the eagerness of parents to learn by themselves about anything that may help their children with ASD.

More than half of parents (52%) of children with ASD from this sample of the population in Saudi Arabia agreed that society’s awareness of ASD was weak and was the biggest challenge they faced with their children with ASD. They thought that the
weak understanding by society made their children with ASD more isolated from society. A large majority of these parents (84%) reported that another challenge they encountered was the shortage of ASD governmental centers, which made them rely on ASD private centers that do not have specialists in ASD. Parents thought their children with ASD needed more governmental supports and qualified ASD specialists. These parents talked about bad experiences with ASD private centers that seem to be focused on getting more money from the parents instead of providing good services for children with ASD. All the parents of children with ASD from this sample of parents in Saudi Arabia said that they were not satisfied at all about current services for children with ASD in Saudi Arabia. They thought the current ASD private centers were expensive and not qualified. More than one half of parents indicated that there was a need for having more governmental ASD centers.

Twenty-one percent of these parents of children with ASD indicated that they learned to be more patient as a result of having a child with ASD. Twenty-six of these parents thought that having child with ASD was a test from Allah, God, and they had to accept that and deal with it to get the rewards from Allah later. In Saudi Arabia, disability is often seen as a test from Allah to see a person’s or family’s patience in order to get rewards from Allah later (Alquraini, 2011). Also, other parents (21%) reported that they became self-learners about ASD as a result of having a child with ASD. What was more interesting was that about 21% parents of children with ASD did not provide any answer about if they had positive experiences when having a child with ASD. It seemed to the researcher that the reason for not providing any answer about positive experiences they had could be somewhat related to the fact that all of the interviewed parents in this study
were not satisfied about current services of ASD in Saudi Arabia. Parents felt that they did not have enough governmental support for providing better ASD services.

Fourteen parents (73%) of children with ASD thought that using technology and portable devices like iPads with their children with ASD was helpful and beneficial since many of these children had strong visual memories and were seen by their parents to be “smart”. On the other hand, fifteen percent of parents of children with ASD believed that that using these technology and portable devices was a part of the problem because they might isolate these children from the surrounding environment and people and make them addicted to technology. More than a half of these parents of children with ASD reported that using technology and portable devices like iPads with their children was double-edged sword. They indicated that using these technology and portable devices with their children with ASD could improve their children’s learning process when there are time limits and limited supervision by parents of their children’s use. Thus, using technology and portable devices by children with ASD should be guided by adults such as parents or teachers and not opened.

Limitations of the Study

There are several limitations to this study. First, the sample of parents who did respond was perhaps highly motivated by technology because they responded to a survey about technology. It might be that the parents who were not positive about or motivated by technology avoided taking the survey on the website. The responses to the survey of this study were generally positive about technology but that may have been because only the parents who were positive about technology completed the survey and this might lead
to biased results. Another limitation of the sample results was that the survey was posted in public online websites. Because the survey was posted publicly, there is no way of confirming that those who responded were actually parents of children with ASD.

**Implications**

There are several implications from this study for future research. First of all, a larger more representative sample of parents of children with ASD should be surveyed and interviewed to get a more in-depth picture of their perceptions about the use of technology. This study was unable to address questions that may improve programs for children with ASD, such as what types of training would help parents of children with ASD use technology more effectively, and what the technology tools that are most effective when parents are working with their children with ASD. Second, future research should explore technology and provide parents of children with ASD with a list of available assistive technologies, portable electronic devices, computer programs, and software applications that are effective when used by children with ASD. It was noted in this study that parents of children with ASD desired to have a list of effective technologies and to be guided with regard to what they should use. In addition, Ministry of Education in Saudi Arabia should consider providing ASD governmental centers and supervise current ASD private centers. Finally, future research should include studies on technology and portable electronic devices that are consistently implemented across the home, school, and daily life environments to measure the effectiveness in improving students’ skills in these different settings.
As we have seen in this study, children with ASD have difficulties with communication skills whether these involve verbal or nonverbal skills. Technology such as portable electronic devices is a promising field for helping students with ASD improve their communication skills. Technology can also help parents, teachers, siblings, and others in finding a way that eases the communication with these children with ASD. Finding a way to improve the communication with children with ASD, could also positively affect the social and academic skills of children with ASD. Thus, using interventions that use technology such portable electronic devices with children with ASD should be explored further and investigated in detail in order to help students with ASD have a better life.

**Conclusion**

The results of this study support the use of technology and portable electronic devices with children with ASD. In addition, the study results are consistent with other reviewed studies. Mechling’s (2011) study supported the use of portable electronic devices across different settings such as school, work, and community. Results of the Mechling study also indicated that students were motivated and entertained when using electronic portable devices. The findings of the present study are also consistent with the findings from three studies reviewed by Yaw, Skinner, Parkhurst, Taylor, Booher, and Chambers, (2011) (Chen and Bernard-Opitz, 1993; Heimann, Nelson, Tjus, and Gillberg, 1995; Moore and Calvert, 2000), and studies done by Goldsmith & LeBlanc (2004) and Sansosti & Powell-Smith (2008). These studies reviewed by Yaw as well the other studies mentioned all point out that computers help significantly decrease behavior problems and motivate students with ASD. In this study, many parents confirmed that
their children with ASD liked using technology and portable electronic devices such as computers, video games, and iPads. The survey conducted in this study showed that many parents had used these portable technologies including laptops, iPhones, iPods, iPads, and other brands of smartphones and tablets as rewards to motivate their children with ASD. Similarly, Cihak, Ayres, and Smith (2010) found students with ASD highly enjoyed and were motivated by the use of iPod devices.

This study confirmed that parents feel using portable electronic devices at home, school, or in daily life activities had improved the recreational skills of children with ASD. These findings are consistent with the National Standards Project (2009) review of many studies that have shown that technology-based interventions with children with ASD may “produce favorable outcomes”. The findings from the current study are also consistent with the Bosseler and Massaro (2003) study. Bosseler and Massaro found that the use of computers could improve the language and vocabulary of students with ASD. Furthermore, parents’ opinions in the results of the present study indicated that children with ASD were strong visual learners and had good visual memories, which is consistent with the results of the studies done by Cihak, Ayres, and Smith (2010) and West (2008).

Participating parents in this study mentioned many positive attitudes, opinions, and perceptions toward using technology and portable electronic devices with their children with ASD. It was clear that computers, laptops, iPhones, iPads, iPods, and other smartphones and tablets were favorite devices of their children with ASD. The parents thought and felt that these technologies were their kids’ number one choice and that these devices were fun for their children with ASD. In addition, they thought these technologies could help their children to maintain focus, calm down when stressed, learn
how to cope with losing video games, interact and play with others, and text and communicate with friends and relatives. In short, it seems that these parents believe these technologies have significant benefits.

However, participating parents had a few negative attitudes towards and opinions about their children’s use of technology and portable electronic devices. For instance, even though the parents thought the technologies had great benefits, many of them also felt that these technologies were expensive. The Mechling (2011) study indicated that this issue can be addressed by using “generic devices that are designed for the general population in mass quantities” (p. 495). Generic devices are not customized, such as the oldest generations of the iPod touch. Moreover, the rapid increase of technology will lead to the decrease of prices, allowing these portable electronic devices to become affordable and common (Goldsmith et al., 2004; Mechling, 2007). In addition to some negative attitudes and perspectives toward using technology with their children with ASD, some parents thought their children with ASD would abandon the task that they were using the tablet to work on and would instead play games on these portable electronic devices. This problem could be addressed by deleting all games from the devices or by programming the devices so they would require that the child complete the task before using a different application on the computer. Also, some parents may be concerned that if their children with ASD use this technology, they will be isolated from and interact less with others (Tien, 2008). The present study supports the opposite; the technology helped many of the children/adolescents interact, play, and text with others.

Using portable electronic devices with students with ASD has benefits for students, parents, and teachers. As we have seen in this study, parents felt that portable
electronic devices can help improve the learning, recreation, and entertainment skills of students with ASD.

The electronic devices may also increase the safety of the student with ASD when moving from home to school or daily life settings. For example, a student with ASD could take a picture of his/her current location if lost and send it to the parents for help in locating him/her. Using technology is also critical for parents and teachers. Technology may help parents and teachers find a way to communicate with their students or children with ASD and, as a result, this could reduce the stress of both parents and teachers of children with ASD and of the children themselves.
References


APPENDIX A

RESEARCH STUDY CONSENT FORM
Research Study Consent Form

Study Title: Parents’ Attitudes Toward the Use of Technology and Portable Devices with Children with Autism Spectrum Disorder in Saudi Arabia.

Researchers:

PI: Dr. Darcy Miller

CO PI: Saad Athbah

Sponsor: NA

You are being asked to take part in a research study carried out by Darcy Miller and Saad Athbah. This form explains the research study and your part in it if you decide to join the study. Please read the form carefully, taking as much time as you need. Ask the researchers to explain anything you don’t understand (darcymiller@wsu.edu; sathbah@email.wsu.edu). You can decide not to join the study. If you join the study, you can change your mind later and quit at any time. There will be no penalty or loss of services or benefits if you decide to not take part in the study or quit later. This study has been approved for human subject participation by the Washington State University Institutional Review Board.

What is this study about?

The purpose of this study is to investigate parents’ attitudes toward the use of technology and portable devices with children with Autism Spectrum Disorders (ASD).
The study will also explore parents’ beliefs about ASD and challenges they encounter with their children. The findings will be disseminated in professional educational journals, and also reported to the Saudi Arabian Ministry of Education, to inform them about the possibility for using and applying new technology like iPads and other probable devices in schools. It is expected that the findings will: a) improve educational programs for students with ASD by utilizing new technologies, b) help faculty members in special education departments in Saudi Arabian universities develop appropriate training programs in the use of such technologies for parents of children with ASD, and, c) add to the knowledge in the field of special education.

You are being asked to participate in this study because you can provide a parent’s perspective on the use of technology and portable devices, and what you think are the challenges to using these technologies. The study results could potentially benefit you and your child in getting more access to and training on current technologies and portable devices. In addition, children with ASD will benefit from the study results because the outcomes of the study may lead to applying such technologies in schools in order to have better quality programs for those children with ASD in Saudi Arabia.

Taking part in the study will take about 20 minutes.

**What will I be asked to do if I am in this study?**

If you take part in the study, you will be asked to participate by completing the survey about your attitudes toward the use of technology and portable devices with children with Autism Spectrum Disorders (ASD).
Are there any benefits to me if I am in this study?

There is no direct benefit to you from being in this study, other than the fact that this study will be contributing to the field of special education in Saudi Arabia. The results of this study will be sent to the Special Education Department of the Saudi Arabian Ministry of Education. This study will provide Saudi Arabian officials with significant data regarding the use of technology by students with ASD. It will be a first step toward studying this topic and applying the knowledge to Saudi Arabian students with ASD. This study will focus attention on the use of technology and portable devices to improve the lives of students with ASD in Saudi Arabia.

Are there any risks to me if I am in this study?

The potential risk involved in this study is minimal. Participants might not want to contribute their attitudes and that might may some parents feel uncomfortable. If you are not comfortable at any time during the survey you can quit any time, with no penalties or problems.

Will my information be kept private?

The data from this study will be kept confidential to the extent allowed by federal and state law. No published results will identify you, and your name will not be associated with the findings. Under certain circumstances, information that identifies you may be released for internal and external reviews of this project. All of the participants will be treated in accordance with ethical guidelines of the Washington State University Institutional Review Board. Although there is only a minimal risk identified for participating in this study, a number of considerations will be kept in mind; for example, health and safety issues. There will be adequate action to ensure safety, comfort, and the
freedom to withdraw from the study if desired. All files will be protected using a password protected computer, with only the researchers having access. The data will be kept on the password protected lap top computer kept in a locked office that can only be accessed by the researchers. The results of this study may be published or presented at professional meetings, but the identities of all research participants will remain confidential.

The data for this study will be kept for three years after which time they will be destroyed.

**Are there any costs or payments for being in this study?**

There will be no costs to you for taking part in this study.

You will not receive money or any other form of compensation for taking part in this study.

**Who can I talk to if I have questions?**

If you have questions about this study or the information in this form, please contact the researchers (Dr. Darcy Miller, Phone: (509) 335-5027, darcymiller@wsu.edu or Saad Athbah, (509) 715-9479, sathbah@email.wsu.edu). If you have questions about your rights as a research participant, or would like to report a concern or complaint about this study, please contact the Washington State University Institutional Review Board at (509) 335-3668, or e-mail irb@wsu.edu, or regular mail at: Albrook 205, PO Box 643005, Pullman, WA 99164-3005.

**What are my rights as a research study volunteer?**

Your participation in this research study is completely voluntary. You may choose not to be a part of this study. There will be no penalty to you if you choose not to take
part. You may choose not to answer specific questions or to stop participating at any
time.

**Voluntary Participation:**

Your participation in this research study is completely voluntary. You may choose
not to be a part of this study. There will be no penalty to you if you choose not to take
part. You may choose not to answer specific questions or to stop participating at any
time.

**What does my clicking the link for the survey under this consent form mean?**

Your signature on this form means that:

- You understand the information given to you in this form.
- You have been able to ask the researcher questions and state any concerns.
- The researcher has responded to your questions and concerns.
- You believe you understand the research study and the potential benefits and
  risks that are involved.
APPENDIX B

SURVEY INSTRUMENT
Section 1: Demographic Information

1. Parent’s gender:
   - Male
   - Female

2. Father’s age:
   - < 20 years
   - from 20 to 29
   - from 30 to 39
   - from 40 to 49
   - >50 years

3. Mother’s age:
   - < 20 years
   - from 20 to 29
   - from 30 to 39
   - from 40 to 49
   - >50

4. Marital status:
   - Married
   - Separated
   - Single parent

5. Highest level of education completed by the father:
   - Elementary school
6. Highest level of education completed by the mother:
   - Elementary school
   - Intermediate school
   - High school
   - Collage
   - Undergraduate Degree
   - Graduate Degree

7. Occupation:
   - Business/Accounting
   - Health Care/Medical
   - Hospitality
   - Education/Training
   - Office/Administration
   - Retail/Sales
   - Trades
   - Fulltime parent
   - Others, please specify:

8. Where do you live now:
9. Please indicate your family gross monthly household income:
   o  < 4999 SR
   o  5,000-9,999 SR
   o  10,000-14,999 SR
   o  15,000-19,999 SR
   o  20,000-24,999 SR
   o  25,000-29,999 SR
   o  > 30,000 SR

10. Number of children:
    o  1
    o  2
    o  3
    o  4
    o  5
    o  6
    o  7
    o  8
11. Age of your child with Autism Spectrum Disorder:
   - < 3 years
   - 3 years
   - 4 years
   - 5 years
   - 6 years
   - 7 years
   - 8 years
   - 9 years
   - 10 years
   - 11 years
   - 12 years
   - 13 years
   - 14 years
   - 15 years
   - 16 years
   - 17 years
   - 18 years
   - >18 years

12. Gender of your child with Autism Spectrum Disorder:
13. Please indicate where your child is positioned on the Autism Spectrum Disorder:
   - Male
   - Female
   - Mild Autism
   - Moderate Autism
   - Severe Autism
   - I am not sure

14. Is your child with Autism Spectrum Disorder:
   - Verbal
   - Non-Verbal

15. Please indicate which of the following best applies to your child with Autism Spectrum Disorder:
   - Home schooled
   - Attends a government school
   - Attends a private school

Section 2: Portable Devices Use

In the following sections the terms “portable devices” and “applications” will be used frequently. Portable devices means any electronic device that is portable including such devices as iPads, tablets, smartphones, as well as any other portable electronic device.

The applications term means any application that can be used by those portable devices, such as educational applications, communication applications, game applications, as well as other programs that are located on those portable devices.

16. Have you used any technology (e.g. a computer, portable device, video-taping, or
etc.) with your child with Autism Spectrum Disorder?

   o Yes. If yes, please specify the type of technology used:

   o No

17. Please indicate which of the following applies to your household portable device use (multiple responses permitted):

   o I do not own a portable device
   o I own one portable device
   o There are multiple portable devices in my house
   o My child with Autism Spectrum Disorder shares a portable device with another family member
   o My child with Autism Spectrum Disorder has access to her/his own portable device

18. Please indicate where your child with Autism Spectrum Disorder has access to a portable device (multiple responses permitted):

   o At home
   o At school
   o At an early intervention program
   o During therapy sessions
   o At a relative’s/friend’s house

19. Rate (your) skills in using portable devices:

   o None at all
20. Rate (your) skills in using portable device applications:
   - Beginner
   - Average
   - Very Good
   - Expert

21. Rate the skills of your child with Autism Spectrum Disorder in using a portable device:
   - None at all
   - Beginner
   - Average
   - Very Good
   - Expert

22. Rate the skills of your child with Autism Spectrum Disorder in using portable device applications:
   - None at all
   - Beginner
   - Average
   - Very Good
23. Is there any technology or *portable devices* used in your child's school program?
   - Yes. If yes, please describe all the technology and portable devices that are used:
   - No

24. What does your child with Autism Spectrum Disorder use *portable devices* for (multiple responses permitted):
   - Communication
   - Learning
   - Games
   - Watching videos or YouTube.
   - Surfing the Web
   - Others, please specify

25. Using a *portable device* at home, school, and/or in daily living activities has improved my child’s skills in the following areas (multiple responses permitted):
   - Social
   - Academic
   - Communication
   - Behavioral
   - Adaptive
   - Daily life
   - Recreation
   - None
26. Please respond to the following items using the scale provided:

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

- 26.1. Using a **portable device** with my child with Autism Spectrum Disorder has improved her/his bath skills.
- 26.2. Using a **portable device** with my child with Autism Spectrum Disorder during morning routine (e.g. getting up, getting dressed, brushing teeth, or etc.) has improved these skills.
- 26.3. Using a **portable device** with my child with Autism Spectrum Disorder has improved her/his routine of going to bed/sleep.
- 26.4. Using a **portable device** with my child with Autism Spectrum Disorder has improved her/his mealtime skills.
- 26.5. Using a **portable device** with my child with Autism Spectrum Disorder has improved her/his play skills.
- 26.6. Using a **portable device** with my child with Autism Spectrum Disorder has improved her/his daily transportation skills.
- 26.7. Using a **portable device** with my child with Autism Spectrum Disorder has improved her/his family routines skills (e.g. doing chores, preparing meals, watching TV, etc.).
- 26.8. Using a **portable device** with my child with Autism Spectrum Disorder has improved her/his physical activities skills such as riding a bike, water play/swimming, manipulating toys, or etc.
26.9. Using a portable device with my child with Autism Spectrum Disorder has improved her/his skills when the family go to visit friends or relative, eat out, go shopping, or go to amusement parks.


26.11. My child with Autism Spectrum Disorder needs to be trained first before independently using portable devices.

Section 3: Attitudes Towards Technology and Portable Devices

27. Please respond to the following items using the scale provided:

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

- 27.1. Technology makes people’s lives better.
- 27.2. Technology complicates people’s lives.
- 27.3. I can do more things using technology.
- 27.4. Technology makes more work than it saves.
- 27.5. Technology just makes things more complex.
- 27.6. Although technology is changing all the time I find I can keep up with it.
- 27.7. Technology seems to be getting more complicated.
- 27.8. I find the amount of information about technology available on the Internet is overwhelming.
27.9. I find that changes in technology happen so quickly that I always feel out of my depth.

27.10. My child with Autism Spectrum Disorder likes using technology (e.g. computers, portable devices, or playing video games).

27.11. Portable device applications make people’s lives better.

27.12. Portable device applications complicate people’s lives.

27.13. I can do more things using portable device applications.

27.14. Portable device applications make more work than they save.

27.15. Portable device applications simplify my life.

27.16. Portable device applications just make things more complex.

27.17. Portable device applications seem to be getting more complicated.

27.18. Portable devise applications really help me with my child with Autism Spectrum Disorder

27.19. I find the amount of information about portable device applications available on the Internet is overwhelming.

27.20. I find that changes in portable device applications happen so quickly that I always feel out of my depth.

27.21. I find a great deal of useful information about portable devices on the Internet.

27.22. I feel that I am skilled in using portable devices.

Section 4: Behavior Towards Technology and iPad

28. Please provide the names of the applications you frequently use on your portable devices with your child with Autism Spectrum Disorder.
29. Please indicate how long your child with Autism Spectrum Disorder has been using *portable devices*:

- Has never used a portable device
- Approximately 1-6 months
- Approximately 6-12 months
- Approximately 12-18 months
- Approximately 18-24 months
- Longer than 24 months

30. Provide an indication of how many days your child with Autism Spectrum Disorder has used a *portable device* in the past 5 days:

- Not at all
- One day
- Two days
- Three days
- Four days
- Five days

31. How many days were portable device *applications* of a therapeutic or educational nature used by your child with Autism Spectrum Disorder in the past 5 days:

- Not at all
- One day
- Two days
32. How many days were portable device applications used by your child with Autism Spectrum Disorder for purposes other than education and therapy in the past 5 days (for example, entertainment, play, reward/reinforcement):

- Not at all
- One day
- Two days
- Three days
- Four days
- Five days

33. Over the past 5 days, please estimate how much time your child with Autism Spectrum Disorder spent using a portable device:

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

34. Over the past 5 days, please estimate how much time your child with Autism Spectrum Disorder spent using educational portable device applications:
35. Over the past 5 days, please estimate how much time your child with Autism Spectrum Disorder spent using entertainment portable device applications:

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

36. Please respond to the following statements using the scale provided:

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

36.1. As a parent, I am confident in my ability to select educational and therapeutic portable device applications for my child with Autism Spectrum Disorder.
36.2. As a parent, I am aware of the range of portable device *applications* available for my child with Autism Spectrum Disorder.

36.3. As a parent, I am aware of the *educational* and *therapeutic* advantages of portable device *applications* use in Autism Spectrum Disorder.

36.4. As a parent, I would feel comfortable increasing the amount of time my child with Autism Spectrum Disorder spends using portable device *applications* of an *educational* or *therapeutic* nature.

37. How much information have you received about *portable devices* like iPads?

   o None
   o A little
   o Some
   o A lot

38. How much training have you had about *portable devices* like iPads?

   o None
   o A little
   o Some
   o A lot

39. Check all that apply regarding where you have received *training* about *portable devices* like iPads:

   o Attended workshops
   o Attended conferences, local expos or fairs
   o Library
40. How competent do you feel in being able to use *portable devices* like iPads with your child with Autism Spectrum Disorder?

- Not at all competent
- Competent in some situations but not in others
- Overall, somewhat competent in all areas
- Very competent; I feel like I can use technology to help my child to participate in a variety of activities and routines

41. Please check all the *activities* and *routines* where your child currently uses *portable devices* like iPads:

- During physical or play activities
- For daily caregiving routines such as getting up, going to bed, bath time, or mealtimes
- For socializing and communicating with her/his brothers and sisters, relatives, neighbors, or friends during informal activities
- For learning activities at childcare, school, etc.

42. As a parent of child with Autism Spectrum Disorder, I can afford to provide a *portable device* like an iPad for my child with Autism Spectrum Disorder.

- Yes
- No
43. The *prices* of available *portable devices* like iPads for my child with Autism Spectrum Disorder are:

- Inexpensive
- Fair
- Expensive
- No knowledge/No opinion

**Section 5: Follow Up**

- As a parent of child with Autism Spectrum Disorder, I give the researcher of this study the permission to contact me for a follow-up interview:
  - Yes. If yes, please provide your email or phone number.
  - No