

Effectiveness of Using Tablets with Students with Autism to Improve their Use of Vocabularies

Dr. Saad Athbah

Department of Special Education, Collage of Education, University of Jeddah, Saudi Arabia

Email address: sathbah@uj.edu.sa

Abstract— This study investigates the effectiveness of using tablets with Students with autism to improve their use of vocabularies. In order to achieve the objectives of the study, the experimental design was used by developing an intervention based on using tablets with students with ASD. The sample of the study consisted of three students (7, 9, and 10 years-old), who were chosen purposefully after testing their ability to read by using the Diagnostic and Statistical Manual of Mental Disorders. The single-subject multiple baseline design will be used in this study across participants (AB design). The results of the study showed the effectiveness of using the iPad with students with autism to improve their use of vocabularies, which was evident from the results of the daily running record percentage scores. All the three students showed noticeable improvement in their use of vocabularies (nouns and verbs). The results of this study support the use of technology and portable electronic devices with students with autism. Future research should examine the effectiveness of the use iPads and others tablets by randomly choosing the participants.

Keywords— Autism Spectrum Disorder (ASD), iPads, vocabulary, reading.

I. INTRODUCTION

In the past few years, autism spectrum disorder (ASD) has received increased attention from physicians, researchers, parents, and educational specialists around the world. One reason for this increase is due to the growing number of individuals who have been diagnosed with ASD. For instance, the Center for Disease Control and Prevention (CDC; 2012) has estimated that an average of 1 in 88 children in the United States has an ASD. ASD is considered a complex developmental disorder because children with ASD struggle with many primary common skill deficits and developmental learning difficulties. For example, these complex characteristics include deficits in communication and language skills. Hetzroni and Tannous (2004) have shown that children with ASD have difficulties in the development of language and communication skills. Deficits in joint attention skills are also common in children with ASD. For instance, many children with ASD cannot make eye contact with others even if they want to ask for something they need (Tsao & Odom, 2006). Moreover, children with ASD have difficulties with many adaptive behaviors, such as the safety, dressing, and using toilets.

In addition to the complex characteristics of children with ASD, Tsao and Odom (2006) noted another primary concern about children with ASD is that they have difficulties making and building social relationships with others. These difficulties in social competence are effects of other deficits or difficulties

such language development and joint attention. Bass and Mulick (2007) indicate 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 impact children's communication skills, imagination, and ongoing social interactions.

The academic, social, and others skills difficulties that children with ASD struggle with may be addressed if they receive early intensive interventions (Strain & Danko, 1995). One type of intervention 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 special software can be used on a computer, laptop, tablet, or smartphone. Teachers are more frequently using computers with students with ASD as an instructional tool or method (Bosseler, & Massaro, 2003).

Education for students with autism spectrum disorder (ASD) should include academic learning and also provide students with social, language, adaptive, and communication skills and techniques to reduce distracting behaviors. Students with ASD often are not able to accomplish scheduled tasks independently (even though many of these students have strong cognitive skills) because they have difficulties with memorizing, planning, organizing, and others (Gentry, Wallace, Kvarfordt, & Lynch, 2010).

Students with autism spectrum disorder (ASD) vary in their academic abilities. There are students with ASD who have severe cognitive impairment. They learn academic skills by using many of traditional categories, such as functional academic, self-help skills, language development, and others. On the other hand, there are students with ASD who have high-functioning autism or Asperger Syndrome (HFA/AS) and they need to have modifications in the curriculum and instruction process that meets their specific needs (Zager, 2005).

Students with ASD require intervention programs that meet their needs, address their weaknesses, and emphasize their strengths. In addition, interventions designed for students with ASD have to be designed based on special challenges that students with ASD present (National Research Council, 2001). The National Research Council (2001) recommended that interventions for a child with ASD should start as early as possible, sometimes even prior to a formal diagnosis, even if there is a suspicion of ASD. (Downs & Downs, 2010). The

primary education and treatment for students with ASD should be implemented at school, home, and in community settings (National Research Council, 2001).

According to a study conducted by Yaw et al. (2011), computer-based instruction increased motivation and decreased problem behaviors in children with ASD when compared to personal instruction. In fact, assistive technologies may be a promising method to help improve these children’s communication and social skills (Reichle, 2011). Additionally, since most of the students with ASD are ambulatory, electronic devices that are lightweight and portable are easier for students to use throughout the day, at home, and in school (Sennott, & Bowker, 2009). Examples of such portable and handheld devices include tablets and smartphones. These portable devices utilize many computer software programs, applications, and designs.

Today, technology is being used in almost every place in the world. Computers and portable electronic devices are a simple example of the technology we use almost daily. As researchers, we use computers to analyze our data and type the descriptions of our studies. Students without special needs are enjoying and getting benefit of various technologies such as portable electronic devices. On the other hand, Edyburn (2013) indicated that students with special needs also share or have the same attraction that students without special needs have toward using technology like portable electronic devices. In fact, Goldsmith and LeBlanc (2004) declared that researchers have noticed the significance of having such technological devices in treatments of students with ASD as a result of reports of parents and clinicians.

Even though there is an increasing number of studies that examine the use and effectiveness of using technology with students with ASD, there are many technologies have not been studied yet. Moore, Cheng, McGrath, and Powell (2005) pointed out that “the field remains largely unexplored” (p. 231). Students with ASD have many deficits in social, communication, academic, and behavior skills and technology could help them in improving their skills. According to Ganz, Boles, Goodwyn, and Flores (2013) “the use of technology has emerged over the past few years in the literature demonstrating efficacious interventions for individuals with ASD, particularly via the use of iPads, iPods, and tablet computers” (p. 2). However, Ganz and others (2013) indicated that it is important to study the effectiveness of the use of communication interventions that can be delivered via portable devices that becomes popular in our society. “To date, there have been no studies that have used a tablet computer as a medium for of visual scripts” (Ganz & others, 2013, p. 2). The research question that this study addresses is: Does the use of tablet electronic devices like iPads improve students’ use of vocabularies.

II. METHOD

Participants

This study will include three participants (7, 9, and 10 years-old). These students have been diagnosed with autism and a secondary diagnosis of speech impairment. The Diagnostic and Statistical Manual of Mental Disorders of

these three students showed that they scored low scores for the communications and social sections. According to teachers’ reports, these students are not fluent readers. However, they have had preliminary reading skills. Regarding social-communication skills, these three students had difficulties in initiating and maintaining relationships with others.

Settings

This study will take place in quiet classroom for individual testing at an elementary school. The students will be brought to this classroom at different times to avoid distractions. The classroom has a big U shape table, separate student desk, and a teacher chair. The walls must be clean and bare to avoid distractions.

Materials

The materials for this study will be brought from the special education classroom. Also, three iPads will be provided by the school for the intervention condition. The iCommunicate application is downloaded on these iPads from (www.grembe.com). This app has three different pictures of three nouns and verbs. The nouns are father, mother, and brother. The verbs are push, jump, and pull. Every picture has drawings with labels of nouns and verbs (see Figure 1 as an example).



Fig. 1. An example of photos of the iCommunicate application (Ganz & et. al 2013)

Experimental Design

The single-subject multiple baseline design will be used in this study across participants (AB design). *Phase 1*, Three students will be chosen by the researcher and special education teacher based on their school reports. Each student will be assessed separately by giving different 3 pictures of verbs and nouns over a week period to determine a baseline level of vocabularies’ use. The student will be asked “who is that or what’s happening?” after seeing each picture to describe what the noun or verb he/she see in the picture within 10 seconds period. During the baseline, there will be no prompts or cues will be given. *Phase 2*, Following this, the use of five-week iCommunicate application (independent variable) will be started with the first student. At the end of the baseline period for the first student, the baseline period of the second student will be started. The onset of the intervention, therefore, will be delayed from one participant to the next. This procedure will be repeated with the third student. A running record assessment will be used every day with each student to determine the student’s use of vocabularies (dependent variable) following each lesson. *Probe*: a running record will be used with every student after a month of terminating the intervention for five days long to probe effectiveness of the intervention after its completion.

Intervention

The intervention condition was the same as the baseline with the addition of the following protocol. The iPad will be placed next to the child and turned on. Least-to-most prompting will be used with incorrect answers of the question “who is that or what’s happening?” within 10 seconds. There will be a 10 seconds pause between each prompt. The sequence of prompts will be like following:

- Unprompted response.
- Point prompt.
- Verbal model.
- And direct demand.

The researcher will point to a picture on the iPad if the student do not respond correctly within 10 seconds after being asked “who is that or what’s happening?”. Also, the verbal prompt will be used if the student does not give the correct response within 10 seconds of the point prompt. Finally, the researcher will say the student’s name to get his/her attention and tell the student say the noun or verb if the student does not give the correct response with 10 seconds. Once the student responds correctly to all three nouns and verbs, the intervention will be stopped.

Procedures

The researcher and special education teacher will choose the three students based on their school reports. The researcher will then do the baseline in a quiet classroom in the school every day for one week long. The researcher will then begin the intervention every day for five week long. Finally, the researcher will probe the effectiveness of the intervention in four weeks of completing the intervention. The researcher will use a running record score sheet to determine the use of vocabularies of the students. It is also important to note that

the teacher will be setting on the back of the quiet classroom and doing the running record too for each student.

Response Definitions and Measurement

A correct response of a student means that the student did say and use all of the three nouns (father, mother, and brother) or verbs (push, jump, and pull) independently. For example, when the student says, “my mother” or “I jump”, that considered as a correct response.

Inter-Observe Agreement

The special education teacher will be assigned to complete a separate running record for each student for each session. The method for measuring the Inter-observer agreement will be the total agreement or Frequency-ratio approached ($*S/L \times 100\%$) (Kennedy, 2005).

Inter-Rater Reliability

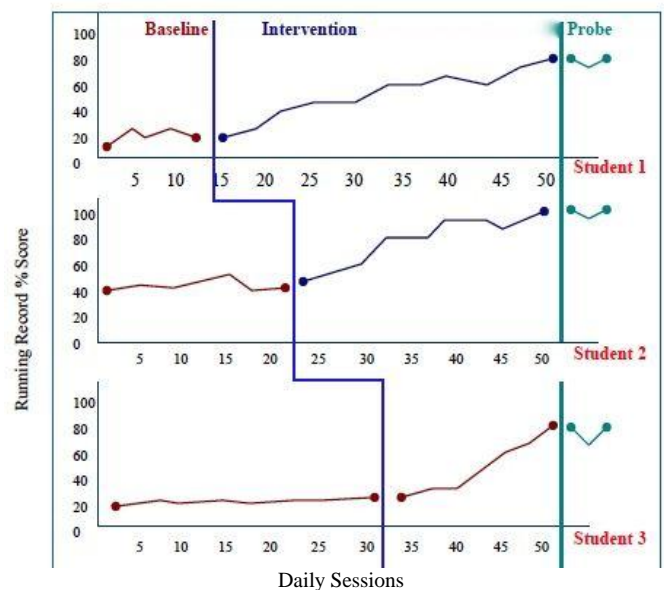
There will be a Treatment Fidelity Checklist used in this study and the special education teacher will have to complete it every third day during intervention, baseline and follow-up in order to check the accuracy of data collected.

Social Validity

A social comparison perspective will be used in this study. Data of students who participated in the intervention will be compared to other who did not participate and need the intervention. That will be done to determine if the skills of participants of the intervention improved in comparison to the same grade-level ability peers.

III. RESULTS

A similar graphic to the following graphic will be used in this study to show the results of this study.



Analysis

The effectiveness of using the iPad with students with autism to improve their use of vocabularies will be evident from the results of the daily running record percentage scores.

The researcher expects that most students will improve their use of vocabularies as a result to the intervention. In addition, data will be analyzed visually and statistically in this study. Visual analysis will include the examination of data for changes in level, trend, and variability to determine the functional relation between the students' use of vocabularies and the intervention (Kennedy, 2005).

When the student demonstrates an increase in level of using vocabularies from the baseline that will be considered as success of the intervention. Moreover, if the student keeps the same success in the probe/follow-up period, that will indicate to the success of the intervention.

Results address the research question. The results of this study will address the research question of whether the use of iPads is effective in helping students with autism in improving their use of vocabularies (nouns and verbs).

IV. DISCUSSION

All the three students showed noticeable improvement in their use of vocabularies (nouns and verbs). They were excited and motivated when they used the iPad during the intervention. The results of this study support the use of technology and portable electronic devices with students with autism. In addition, the study's results are consistent with other reviewed studies. The Mechling (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 3 studies reviewed by Yaw et al. (2011)(Chen and Bernard-Opitz (1993); Heimann, Nelson, Tjus, and Gillberg (1995); and Moore and Calvert (2000) as cited in Yaw et al., 2011), 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 autism. Moreover, results of this study are consistent with Ganz, Boles, Goodwyn, and Flores's study (2013) that indicated that there was increased use of nouns and verbs when using the iCommunicate application with students with autism.

Future research should examine the effectiveness of the use iPads and others tablets by randomly choosing the participants. Moreover, future research should extend settings of studies to outside of schools (e.g. homes and transports) and that will need cooperation of parents. In fact, Kasari and Sigman (1997) indicated that future research should examine parents' perceptions about their children outcomes to improve all interventions. As can be seen from the research, parents' perceptions and opinions toward the effectiveness of a treatment are critical so it is important to study their perceptions about any interventions to be used at home to improve the lives of children and youth with ASD (Green et al., 2005).

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