



## Presentation of social stories with tablet computers in social skill instruction for students with autism spectrum disorder<sup>1</sup>

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**Abstract.** Autism Spectrum Disorder (ASD) is an advanced and complex developmental disability. Furthermore, it is described as a disorder that occurs during the early developmental stages, characterized by limited, repetitive behavioral patterns and interests or activities, problems in various forms of social communication and interaction that persist throughout life. The problems that children with ASD experience in social communication and interaction skills also lead to problems in acquisition of social skills. Children with ASD experience mutual social communication difficulties, as well problems in non-verbal social behavior and establishing social relationships. Social stories are written with a perspective of a child in a special format to explain social situations to children with ASD, to instruct social skills and allow them to cope with difficulties in social situations. In the present study, the effectiveness of social story tablet computer software on the acquisition of social skills by children with ASD was analyzed. Two male and 1 female 5-7 years old students who were diagnosed with ASD were included in the study. The social stories developed by the authors before the instruction were adapted to tablet computer environment. The teachers employed in the institution and were the instructors of the students in the study group were informed about the presentation of these stories to the children with ASD and the application. The “sharing” behavior was selected among the social stories that were developed based on the course requirements. In the first two study sessions, the authors provided feedback for the teachers who conducted the study. The study was conducted with a single-subject design with multiple probe model with probe conditions across participants design. The study findings demonstrated that social story tablet computer program was effective on the acquisition of social skills by children with ASD. An increase in the sharing behavior of all three participants was observed. Furthermore, three participating teachers expressed positive views on the social story tablet computer software.

**Keywords:** Autism spectrum disorder, social skills, social story, tablet computer

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### INTRODUCTION

Autism Spectrum Disorder (ASD) is a life-long disorder that is characterized by different forms of social communication and social interaction problems, limited, repetitive behavior patterns and interests or activities and initially observed in early developmental stages (American Psychiatric Association, 2013). Furthermore, delays or untypical functions could be observed in at least one of the language or symbolic play skills used in social communication before the age of three (Heward, 2013).

The main disabilities that individuals with ASD experience include the difficulties in social interaction and communication skills. Thus, these disabilities lead to problems in playing games that require cooperation, establishing friendships, and awareness about other individuals' feelings, thoughts and desires (Kuhaneck, Spitzer & Miller, 2010). Social competence is to have necessary knowledge and skills to have qualified relationships and to challenge the problems of the individual. Also, the behaviors that provide the part of the society and affect the life quality of the individuals are called social skills. The limitations that individuals with ASD exhibit in joint attention, imitation and play skills adversely affect the development of their social skills. Social skills include skills such as making eye contact, following instructions, asking for permission, thanking and greeting skills. The inability of exhibiting these skills translates into an inadequate

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repertoire of the individual to exhibit these skills or inability to exhibit these skills (Gresham, 1986).

In the literature, it was observed that several methods were used in the instruction of social skills to individuals with ASD, including direct instruction method, peer mediated learning, collaborative learning, basic reaction instruction, modeling, shaping, providing clues, incidental teaching, feedback, social reinforcement, behavioral teaching rehearsals, instruction with cognitive process approach, and instruction with video model (Akmanoğlu, 2008; Güven and Diken, 2014). Social stories are also among the evidence-based methods used for the acquisition of social skills by individuals with ASD (Turhan, 2015).

Social stories were first developed by Carol Gray in 1991 to improve social skills of children with ASD (Spencer, Simpson, & Lynch, 2008). In order to explain social situations, to teach social skills and to find solutions for the problems encountered in social situations, stories are developed based on certain rules, including a child's narrative (Reynhout & Carter, 2007). Social stories could be used to reduce problem behavior, as well as to develop new skills and improve the existing skills. It is important to conduct observations about the predetermined target behavior, to identify the performance levels of the individual, and to have information about the frequency and duration of the behavior when developing social stories (Spencer, Simpson and Lynch, 2008).

When authoring social stories, the title should be adequate for the story content and reflect the target behavior (Spencer, Simpson and Lynch, 2008); for instance, "Apologizing is a good behavior." The story could include 5-10 sentences. The sentences could be descriptive (Sometimes I can make mistakes like everyone else), directive sentence (I need to apologize the person whom I made upset), reflective sentence (My teacher will be happy when I apologize), control sentence (I will apologize to my friend when I made him upset), affirmative sentence (Apologizing is a nice behavior), or collaborative sentence (My teacher can help me with my apology). It is one of the reasons that social stories are effective because of supporting them with visuals. Furthermore, recognition of the emotions and thoughts of other individuals, development of an individual's vocabulary, availability of concrete situations, and availability as a reusable material improve the functionality of social stories (Crozier and Tincani, 2005).

Review of educational applications provided for individuals with ASD would reveal that these were designed based on their learning attributes and technology-assisted instruction was among the utilized applications (Knight, McKissick & Saunders, 2013). Changing and developing technology has replaced in the visual support systems since these systems have been used to educate children with ASD (Özdemir, 2018). When the education applications to provide by children with ASD are evaluated, it's seen that studies are designed taking into account student's with ASD learning features. In the literature, technology supported teachings are among these applications (Knight, McKissick and Saunders, 2013). In the literature, studies conducted with technology assistance to instruct social skills to individuals with ASD demonstrated that use of technologies was effective in the instruction of social skills (Ramdoss, Machalicek, Rispoli, Mulloy, Lang, & Reilly, 2012; Turhan, 2015). In the literature, the studies that are supported by technology indicate that using technology is effective to teach social skills to children with ASD (Ramdoss, Machalicek, Rispoli, Mulloy, Lang and Reilly, 2012). Mancid and friends in one of their studies compared book format and computer based social stories to reduce problem behavior. It's seen in the results that computer based social stories were more effective to reduce problem behavior. Another social story study which is supported by technology was performed by Xin and Sutman (2011). It was tried to gain to the participants raising fingers and waiting his turn to speak in the study through computer based social stories. It was seen in the conclusion that computer based social stories were effective to teach target behaviors. However, social interacting with peers (Özdemir, 2008), greetings, initiation the game and verbal response (Litnas, Moore and Anderson, 2008), eye contact, smiling and communication initiation (Scattone, 2008), chatting, going on interaction and participating the game activity (Sansosti and Powell-Smith, 2008), initiating and going on interaction (Thiemann and Golstein, 2001), playing game (Turhan and Vuran, 2015), completing the presented activity (Turhan, 2015) were taught by using technology based social

stories and found effective. Thus, in the present study, social skills were instructed with technological assistance and the following research questions were determined:

1. Is social story tablet computer software effective on the acquisition of social skills by children with ASD?
2. Are the acquired skills permanent 3, 5, and 7 weeks after the application was terminated?

## METHOD

### Participants

Two male and 1 female 5-7 years old students, attending a private special education institution in Bursa province Nilüfer district and diagnosed with ASD, were included in the study. Each participant was expected to have certain prerequisite attributed for acceptance in the study group. These attributes were as follows: a) ASD diagnosis, b) ability to follow instructions, c) recognition of the relationship between the form and the ground, d) ability to concentrate on a provided visual stimulus for at least 2 minutes e) ability to sustain an activity for at least 5 minutes, f) lack of further problems that could affect the application process g) lack of prior training on social stories, the effectiveness of which was tested in the present study. Face-to-face interviews were conducted with the teachers employed in the institution about the above-mentioned prerequisite participant attributes, and the prerequisite attributes were checked with the identified students before the application. Written permission was taken from the families whose children participate to the study. Furthermore, the attendance of the students who were selected was also taken into consideration.

Teachers of the students who were included in the study also participated in the study. One of these teachers was a Classroom Teacher, one was a Psychologist attending master's degree courses, and one was a Preschool Teacher. The psychologist had two years special education experience, the classroom teacher had eight years special education experience, and the preschool teacher had six years special education experience. Participating teachers and students conducted individual education sessions within the institution.

**Table 1** Participant demographics

Students				Teachers		
Name	Gender	Age	Diagnosis	Name	Department	Experience
Yigit	M	6	ASD	Dilek	Psychologist	2 years
Serhat	M	5	ASD	Nuray	Preschool	6 years
Mine	F	6	ASD	Seval	Teacher	8 years
					Classroom Teacher	

After the study participants were determined, the social skills list was presented to the teachers of the participants and the “sharing” behavior, which was found to be common for all three participants, was selected based on the requirements obtained from the teachers. Subsequently, the social story written by the authors on sharing behavior was developed by software engineers for tablet computers.

The study application was conducted by the participant teachers. The teachers of the three participants were employed in the institution where the application was conducted. Three teachers read the social stories during the application phase and completed the controlled event recording form developed by the authors to measure the frequency of sharing behavior. Prior to the application, two-hour long training was provided for the teachers for 3 days by the authors about the research application. Detailed information about teacher training is discussed in the experimental process section.

The study interobserver reliability and treatment integrity data were collected by a field expert. The expert holds a PhD in special education and is a faculty member at a public university.

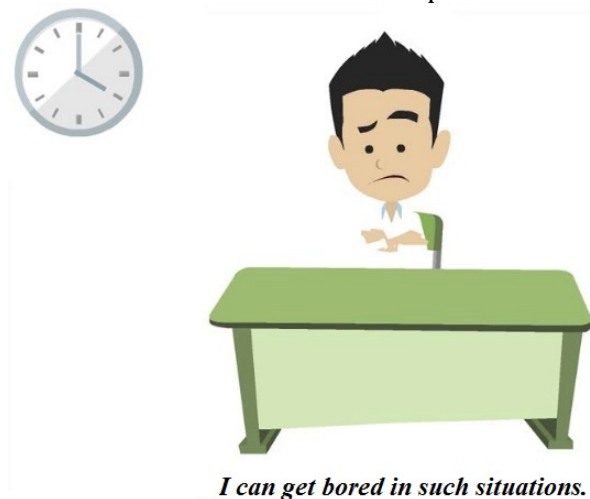
### Setting

The study was conducted at a private rehabilitation center in Nilüfer district, Bursa province in Turkey. During the application process, students' respective classrooms and playrooms were used. Social stories were read to the students by their teachers in their own classrooms, and then instructions were given to move to the playroom and the data were collected in the playroom. In the classrooms where the application was conducted, a desk, activity cabinets, a board and two chairs were available. In playrooms, toys that students could share with their peers were available.

Follow-up sessions were conducted at the settings where the instructions were conducted.

### Materials

The social story written by the authors were adapted to tablet computer by software engineers for use in the study application process. The social story was written based on social story authoring criteria determined by Carol Gray (2002) and visual characters were used for each sentence within the social story software running on the tablet computers. An expert opinion was taken for every social story from an expert whose PhD thesis was about social story. Visual characters were used for every sentence in the social story program. The social story tablet computer software was designed to work on both iOS and Android tablet computers. The story used in the application process included seven sentences; four descriptive, one directive, one reflective and one control sentences. Attention was paid to ensure that the study language was adequate for the language levels of the participants. The visuals developed for each sentence in software included of non-distractive colors and were designed to reflect the simplest meaning of the phrases. The sentences related to the visuals were placed at the bottom of the tablet screen.



**FIGURE-1.** Social story tablet pc program

The user could move from each sentence and each visual related to that sentence to the next sentence and visual by sliding the screen in the social story software developed for individuals with ASD. Since it was planned that the practitioner would tell the story during the implementation, no audio was recorded during the development of the software.



**FIGURE-2.** Moving through the screens in the social story software  
In each session, event data collection form was used to collect the study application data.

### **The Research Method**

The study was conducted with a single-subject design with multiple probe model with probe conditions design across participants. The multiple probe model with probe conditions across participants design is a research model where the effectiveness of an independent variable is analyzed on three participants (Tekin-Iftar, 2012: 224). The model includes two stages: a) the probe phase, b) the application phase repeated with at least three participants (Tekin-Iftar, 2012: 227). Experimental control of this study is established only when there is a change in the data level or tendency of the conditions under which the application is initiated, when there is no change in the data level or tendency of the conditions that were not yet implemented, and the similar occurrences of the effect as the application is sequentially conducted in other cases (Tekin-Iftar, 2012: 217).

### **Dependent and Independent Variables**

Dependent variable is the variable that is changed in a study (Tekin-Iftar, 2012: 25). The dependent variable of the present study was the ability of the target students to share their toys with their peers. The independent variable is a variable implemented to achieve the desired change in the dependent variable. This variable may be an instructional application, intervention or therapy (Tekin-Iftar, 2012: 26). The independent variable was the social story application in the present study.

### **Data Collection and Experimental Processes**

The authors, students, teachers (one classroom teacher, one preschool teacher, one psychologist) and observers participated in the experimental process in the present study. The study was conducted for an average of twenty minutes per day and three days a week for twelve weeks. Experimental process in the study included baseline, instruction and follow up sessions. Before the experimental study process was initiated, pilot instruction session about the experiment process was provided for the teachers of the participants. A pilot session was made for every teacher to see if they were ready for the instruction sessions. The pilot session was conducted in an empty classroom. First of all it was told how to use the social story software program to the teachers, then it was explained how to read the social stories and was modeled. After being modeled, it was wanted teachers to read the social stories and demonstrate the instruction session. Also, controlled event recording forms in the research process were introduced to teachers and explained how they would fill them. Teachers completed the pilot study successfully and they were seen ready for instruction to the students.

The study baseline data were collected with controlled event recording obtained in three different days, once a day for each participant. In order to obtain baseline data, the environment was structured by the authors. Various material (toys, erasers, Lego pieces) were placed in the application environment to determine the participant performances in sharing behavior. A peer of the participant who has sharing behavior and likes playing with his friends was also included

in the environment. Before the study it was told to the peer that they need to play with toys sharing together. At the same time the teacher made the necessary arrangement to play with all toys. After the teacher's "Let's play together" direction in the playroom, the participant's sharing toys behavior was recorded.

Instruction sessions of the study was conducted in the student's own classrooms. In this type of applications, the willingness of the participants to read stories is important (Gray, 2002). Before reading the social story, "I have a story for you. Do you want to listen to it?" was asked to the participants by their teachers and it was observed that each participant was willing to listen to the stories in the instruction sessions. Due to the willingness of the participants, the practitioner organized the environment and sat by the table with the participant. The practitioner placed the tablet computer in front of the participant. The practitioner selected the story on sharing behavior on the screen and then started reading the story. While reading the story, the practitioner made the transitions between the sentences by sliding the screen to the left with the index finger. When switching between the sentences, the participant made sure that the participant was able to review the sentence. The practitioner used an adequate tone and speed when reading the story, and furthermore, adopted adequate emphases at adequate points. After it was observed that the participant listened to the story with attention, the participant was verbally reinforced. After the story was read, the participant was asked two questions on the story. The participant was reinforced verbally after giving the answers of the questions. It was told that "You need to share your toys with your friends while playing." And moved the playroom together. Then one peer of the participant was introduced to the application environment and both were asked to play together as in the baseline sessions. In the meantime, the practitioner presented the participant with the instruction "Let's share your toys with your friend." In this process, the practitioner recorded the participant's behavior and verbally reinforced the participant for accurate reactions. In the period of the study, it was evaluated as an acceptable behavior if the participant gave the toy in hand when his friend wanted; it was evaluated unacceptable behavior if the participant didn't give the toy in hand when his friend wanted.

The follow-up session data were collected on 3, 5, and 7 weeks after the participants' performance met the study criteria. The process adopted in the follow-up sessions was similar to the baseline sessions and the accurate and independent participant reactions were recorded.

### **Interobserver Reliability**

Inter-observer reliability data were collected in at least 30% of all sessions conducted in the study. The "Agreement / Agreement + disagreement X 100" formula was used to analyze the interobserver reliability data (A. House, B. House and Campbell, 1981). It was determined that the interobserver reliability coefficient was 97% in the study.

### **Treatment Fidelity**

Application reliability data were collected in at least 30% of all sessions in the application conducted in the study. A "Treatment Fidelity Form" was prepared to evaluate the practitioner's behaviors in the tablet computer based social story instructions. The behaviors expected from the participants were determined (a) prepare the materials, (b) take the attention, (c) read the social story, (d) ask the questions about the story, (e) wait the participant's answer, (f) reinforce the listening the story behavior, (g) offer the skill instruction, (h) reinforce the target behavior. "Observed practitioner behavior/planned practitioner behavior X 100" formula was used to analyze the application reliability data (A. House, B. House and Campbell, 1981). It was determined that the study reliability coefficient was 100%.

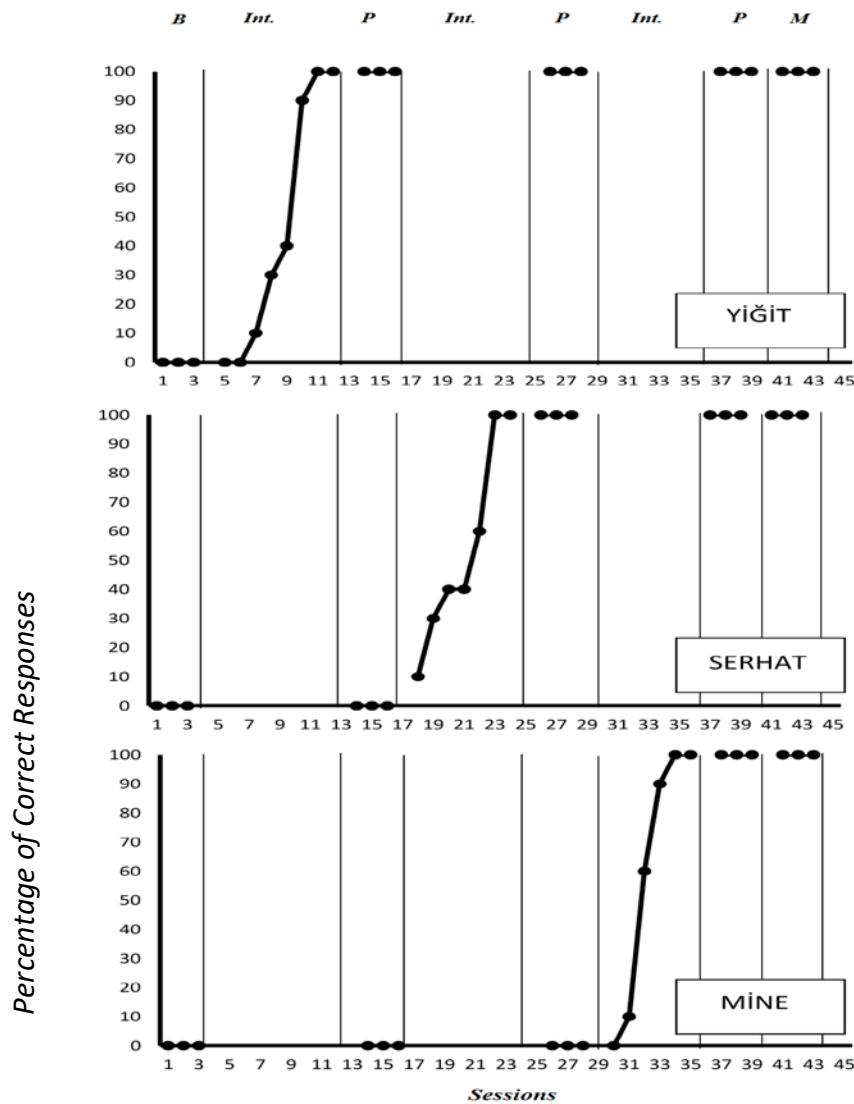
### **Social Validity**

In order to determine the adequacy of the social story tablet computer software and the significance of the study findings for the teachers, social validity data were collected from the participating teachers. The social validity form teacher interview questions developed by the authors was used to collect social validity data. The questions were directed to the teachers were, (a) Do you think that social story is an effective method, b) What do you think about the

intervention of social stories via tablet computers, (c) Do you think maintaining social story intervention for other behaviors and other students? The data collected with the social validity form were analyzed with descriptive analysis. Findings obtained with the social validity data indicated that social story use was effective on the sharing behavior of the participants, it was very easy to use the method by the teachers, and development of social stories for various behavior would be beneficial for students, teachers and even parents, and also the tablet computer software was an effective tool in improving the concentration period of the participants.

## RESULTS

The findings on the acquisition and maintenance of the target behavior by the participants are presented in Graphic 1. During the baseline sessions, Yiğit's performance in target behavior was about 0%. A total of 8 instruction sessions were conducted in order for Yiğit to perform at a level that met the study criteria. After the instruction sessions, Yiğit exhibited 100% success in the probe sessions. In the maintenance probe sessions conducted in the 3rd, 5th and 7th week after the instruction, it was observed that Yiğit continued to perform at 100%.



**GRAPHIC 1.** Graphical analysis on the effectiveness of social story tablet computer software.  
*B: Baseline, Int: Intervention, P: Probe, M: Maintenance*

In the baseline, Serhat's performance in target behavior was about 0%. A total of 7 instruction sessions were conducted in order for Serhat to perform at a level that met the study criteria. After the instruction sessions, Serhat exhibited 100% success in the probe sessions. It was observed that Serhat performed 100% in the maintenance probe sessions conducted in the 3rd, 5th and 7th week after the instruction.

In the baseline, Mine's performance in target behavior was about 0%. A total of 6 instruction sessions were conducted in order for Mine to perform at a level that met the study criteria. After the instruction sessions, Mine exhibited 100% success in the probe sessions. It was observed that Mine performed 100% in the maintenance probe sessions conducted in the 3rd, 5th and 7th week after the instruction.

## **DISCUSSION and CONCLUSION**

In the present study, social stories were presented to students with Autism Spectrum Disorder via tablet computers in social skill instruction. Furthermore, social validity data were collected from the teachers of the participating students. The study findings demonstrated that social story tablet computer software was effective on the acquisition of social skills by the children with ASD. The story developed on sharing behavior was effective on all three children who participated in the study and it was found that there was an increase in the sharing behavior of the children. The social validity data collected from the children's teachers supported the effectiveness of the social story tablet computer software. Furthermore, maintenance probe data collected after the study demonstrated that children maintained the skills they have acquired.

Based on the present study results, the number of sessions that the three participating students required to perform at criterion level was similar to previous studies. This demonstrated that the participating children had similar prerequisite attributes. It was observed that participating children showed great interest in tablet computers during the application. Thus, it could be suggested that their interest in tablet computers had an effect on their acquisition of target skills. Review of the studies in the literature demonstrated that the use of portable devices in the education of children with ASD led to more effective results when compared to other technological devices (Tanji, Takahashi & Noro, 2013). Analysis of the findings of the studies available in the literature revealed that the present study findings were consistent with the findings of other technology-assisted studies conducted with social stories in the literature (Andrews, 2004; Barry and Burlew, 2004; Scattone, 2008; Turhan, 2015; Turhan & Vuran, 2015).

It is considered that the present study is significant due to the development of an original software that could be used in tablet computers that run on both iOS and Android operating systems. It is considered important that the software provides a facility for the practitioners and researchers to conduct applications on tablet computers using social stories. The present study has certain limitations. The fact that tablet computers may not be easily accessible for the educators and parents since their procurement requires financial resources. Another limitation could entail the fact that the frequency and duration of tablet computer use should be well monitored and the interest of children with ASD in technology should not make the practitioners and parents to allow them use these devices for extended periods of time.

Based on the study results, certain recommendations could be presented for further research. In the present study, no voice-over was recorded for social stories in the tablet computer software. The practitioner told the story for the participant during the experimental process. In future studies, voice-overs could be added to the stories in similar software designs. The present study aimed to improve the social skills of the children who participated in the application as a result of the requirement studies conducted in the application environment, thus no generalization data was obtained in the study. It is seen as limitation since generalization data were not collected. Generalization data could also be collected in further studies. Furthermore, social validity data were collected from the teachers who were the practitioners in the present study. The social validity data collected from the teachers were considered significant since these revealed the advantages and disadvantages and supported the study results. Social validity data could also be obtained from the parents or relatives of the participants in further studies. Finally,



further studies could be planned with the social story program that was developed in the present study to include a higher number of participants.

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