The Effectiveness of the Smart Board-Based Small-Group Graduated Guidance Instruction on Digital Gaming and Observational Learning Skills of Children with Autism Spectrum Disorder

Melih CATTIK
Research Institute for the Disabled, Anadolu University, TURKEY
mcattik@anadolu.edu.tr

Serhat ODLUYURT
Research Institute for the Disabled, Anadolu University, TURKEY
syildiri@anadolu.edu.tr

ABSTRACT
The objective of this study was to teach digital gaming skills to children with autism spectrum disorder (ASD) using a SMART board with a graduated guidance teaching method in a small-group instructional format, to determine the participants' levels of learning by observation, and to determine the views of their families on the conducted instruction. For this purpose, a multiple probe design across behaviors was used and replicated across four students who received training at a university practice unit and were diagnosed with ASD. In addition to the effectiveness data collected to determine the effects of the utilized instructional package on the levels of digital gaming and observational learning of the participants with ASD, reliability and social validity data were also collected. The effectiveness data analyzed with graphical analysis. Findings demonstrate that small-group instruction with graduated guidance was effective in teaching digital gaming skills to children with ASD. It was also observed that the children acquired a high level of accuracy at non-directly targeted gaming skills via observational learning.

Keywords: autism spectrum disorder, small-group instructional format, graduated guidance, SMART board, digital gaming, observational learning

INTRODUCTION
Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder considered among the categories of special education. Communication problems have a special significance among those observed in ASD because many of the challenges experienced by individuals with autism arise from the lack of communication with others. Acquiring communication skills plays a crucial role in achieving information, establishing relationships, and choosing and facilitating independent living (Boutot & Myles, 2011). Therefore, it is necessary to use systematic, effective, and scientifically based practices in teaching communication skills to children with autism (National Research Council, 2001; Webber & Scheuermann, 2008; Wong, Odom, Hume, Cox, Fettig, Kucharczyk & Schultz, 2015).

Playing games that start during the early periods in life is a skill with significant contributions to the mental, social, emotional, and language development of individuals (Lifter, Mason, & Barton, 2011). Studies conducted in the field on gaming skills have demonstrated that children with developmental disabilities, including children with ASD, had lower gaming skills based on both quantity and quality when compared to their typically developing peers (Cumine, Dunlop, & Stevenson, 2009; Lifter, Mason & Barton, 2011; Wolfberg & Schuler, 1993). Due to these inadequacies/limitations observed in gaming skills, children with ASD, are often excluded by other people in the social environment, and this negative experience leads to these children feeling lonelier in their social environment (Wolfberg & Schuler, 1993). Children with ASD need systematic instructional practices to achieve both observational learning and gaming skills, while typically developing children learn gaming skills by observing the individuals or events around them (Hobson, Lee, & Hobson, 2009).

The approach that is often recommended in the education of children with ASD is the use of as many visual, auditory, and tactile stimuli as possible. Studies conducted in the field of ASD reveal that using tools that engage more than one sense allow children with ASD to learn more easily and faster (Sehaba, Estraillier, & Lambert, 2005). Digital games that contain multi-sensory stimuli and that can be played on various electronic devices in the virtual environment are those that provide opportunities to play both as an individual and with small-group interaction. Instructing children with ASD through the visual, auditory, and tactile stimuli that digital games offer allows them to acquire targeted gaming skills in less time and in a more permanent manner (Moore & Taylor, 2000).

Bandura argue that many of the behaviors performed by individuals are learned through modeling by observing other people in the same environment (Bandura, 1977). Similar to their typically developing peers, individuals with ASD can acquire a variety of information and skills through learning. A review of the relevant literature revealed that all studies that aimed to teach children with ASD new skills via observational learning were conducted in small-group instructional formats and that these individuals were taught several different skills in academic, social, gaming, communication, and daily living areas (Brown & Whiten, 2000; Colozzi, Ward, & Crotty, 2008; DeQuinzio & Taylor, 2015; Garfinkle & Schwartz, 2002; Griffen, Wolery, & Schuster, 1992; Ingersoll & Schreibman, 2006; Leaf et al., 2012; Ledford, Gast, Lustre, & Ayres, 2008; Ledford, Wolery, & Ahearn, 2015; Mechling & Gast, 2008; Özen, Batu, & Birkan, 2012; Tekin-İftar & Birkan, 2010). According to social learning theory, in order for learning to take place, instruction is required to be conducted in an interactive environment where the child can observe the target behavior. This interactive environment could include two to a few individuals. Such environments are called small-group settings.

Small-group instructional organization is a group setup aimed at instructing the same skills or a combination of different skills to at least two students with the same or different learning and performance characteristics (Brown, Holvoet, Guess, & Mulligan, 1980; Collins, Gast, Ault, & Wolery, 1991; Gürsel, Tekin-İftar, & Bozkurt, 2004). The use of small-group organization is often a strategy to meet the educational needs of children with disabilities (McDonnell, Johnson, Polychronis, Riesen, Kercher, & Jameson, 2006). Studies conducted in the field demonstrated that small-group organization facilitates individuals with disabilities to acquire several skills in academics, communication, social life, and motor development (Aldemir & Gursel, 2014; Browder, Hines, McCarthy, & Fees, 1984; Fickel, Schuster, & Collins, 1998; Camps, Dugan, Leonard, & Daoust, 1994; Orelove, 1982; Schepis, Reid, & Fitzgerald, 1987; Wilson, Cuvo, & Davis, 1986).

Electronic devices used in the instruction of digital gaming could be listed as mobile phones, desktop, laptop and tablet computers, and SMART boards. One of these devices, SMART boards, are electronic devices suitable for use by small groups within the classroom (Campbell &Mechling, 2009). For the purposes of the present study, digital gaming skills were instructed using a SMART board. A SMART board is an interactive technological product by which a user can conduct operations by touching the screen with his fingers or by using electronic pens specially designed for the SMART board (Argott, 2012). Despite the widespread use of SMART boards in general education environments, they have been slowly introduced to special education settings (Coyle, 2013). A review of the related literature demonstrated that individuals with ASD could acquire various skills such as digital game playing, picture-word matching, completing an activity, and reading letters and words using intelligent SMART boards (Argott, 2012; Campbell & Mechling, 2009; Coyle, 2013; Handler, 2011; Mechling, Gast, & Krupa, 2007; Mechling, Gast, & Thompson, 2008).

It is known that the use of technological tools in the instruction of children with ASD has been increasing every day. Although it is also known that children with ASD have a high interest in these tools, it is important to present the tools in the most appropriate way to avoid the possibility of a negative experience. Graduated guidance instruction is an instructional approach in which response prompts, one of the errorless teaching methods, are presented (Duker, Didden, & Sigafoos, 2004; Wolery, Ault, & Doyle, 1992). In graduated guidance instruction, the teacher first provides the controlling prompt and allows the learner to react independently by gradually removing the controlling prompt in the subsequent instruction sessions. A review of related literature showed that children with disabilities have been instructed in both single-step and response chain skills such as daily life, gaming, and chart following using graduated guidance instruction (Bryan & Gast, 2000; Denny et al., 2000; Marchand-Martella & Martella, 2001; MacDuff, Krantz, & McClannahan, 1993; Woods & Poulson, 2006).

A literature review also demonstrated that instructional packages (e.g., SMART board-systematic instruction or small-group organization/systematic instruction) in which two different instructional strategies are used in conjunction are commonly used in instructing gaming skills to children with ASD (Argott, 2012; Campbell, & Mechling, 2009; Coyle, 2013; Garfinkle & Schwartz, 2002; Handler, 2011; Ledford, Gast, Lustre, & Ayres, 2008; Ledford & Wolery, 2015; McDonnell, Johnson, Polychronis, Riesen, Kercher, & Jameson,2006; Mechling, Gast, & Krupa, 2007) while there is a limited number of studies in which more than two instructional strategies were used together. It seems that the use of combined instructional strategies makes it possible to effectively and efficiently acquire multiple skills with complex chaining. Thus, the use of coherent and well-planned instructional strategies packages would increase the effectiveness and productivity of the instruction presented, and, therefore, it would facilitate the job of practitioners.

Children with ASD often receive their education in inclusive settings which are environments that provide opportunities for children to learn several social, academic, language, and communicative skills through observation. Unlike their typically developing peers, for children with ASD to acquire various skills via observational learning, they need support. In the present study, it was considered that the use of technology-based applications and graduated guidance instruction in a small-group instructional format for the acquisition of digital gaming skills by individuals with ASD, would help particularly pre-school children with ASD to acquire digital game skills through observational learning and to transfer the observational learning process to future inclusive settings. To this end, the following research questions were addressed in this study: (a) Is graduated guidance instruction presented with a SMART board within a small-group format effective in teaching digital gaming skills to children with ASD? (b) Does graduated guidance instruction presented with a SMART board within a small-group format have an effect on the learning of digital gaming skills by children with ASD only through observing their peers play, without direct instruction? (c) Is graduated guidance instruction presented with a SMART board within a small-group format effective in the maintenance of acquired digital game playing skills by children with ASD? (d) Does graduated guidance instruction presented with a SMART board within a small-group format have an effect on the generalization of digital gaming skills of children with ASD to different situations? (e) What are the views of the families of the participating children with ASD on the target skills and the instructional process?

METHODS

Participants

The participant groups in this study included the subjects, the researcher, the assistant teacher, the observer. The subjects of the study included four 47-67-month-old boys diagnosed with ASD. Written permission has been taken from the parents of the children before starting study. Demographic information about the participating children is presented in Table 1. The participating children were expected to have certain prerequisite characteristics. The following are the prerequisite criteria that the children with ASD had to meet prior to participating in the study and how the participants were assessed: (a) ASD diagnosis: hospital reports provided by the families of the children and obtained from a general hospital were examined; (b) determination of ASD characteristics as a result of GOBDO-2-TV (Gilliam Autism Rating Scale, Second Edition, Turkish Version (Diken, Ardıç, Diken, & Gilliam, 2012) application; (c) lack of a prior instructional experience on digital gaming and observational learning skills that were planned for instruction in the study (it was determined by asking family and teachers); (d) recognition and fulfillment of directives that include at least two words (presented directives that include at least two words and whether it has been done or not has been examined). Following the determination that the participating children met these prerequisite criteria, the process of planning the small-group instruction was initiated.

Table 1: Characteristics of the subjects

Code Name	Age	GOBDO-2-TV Score	Communication Skills Performance	Educational Status
Can	56 months	88	Use of a few single words and gestures	University unit inclusive preschool
Berk	47 months	102	Use of two-word sentences and gestures	University unit individual training in rehabilitation
Alp	49 months	71	Use of two-word sentences and gestures	University unit inclusive preschool
Efe	67 months	78	Use of two-three-word sentences	University unit inclusive preschool

The application planning process, the planning was conducted so that each of the four participating children should win three digital games determined for each, as well as observing the three games played by their peers in their learning pairs. In other words, within the small groups of four, there were two separate observational learning pairs. Children with similar developmental and behavioral characteristics were selected to form these observational learning pairs. Two participating children (Can and Berk) could not state their desires verbally. In addition, the academic performance levels of these two were similar. The academic performance and ability to verbally express their wishes were also similar for the remaining two participants (Alp and Efe). Another reference used in the determination of observational learning pairs was the similarity of GOBDO-2-TV autistic disability index scores of the participating children. Can and Berk's autism disability index scores (88 and 102) and Alp and Efe's autistic disability index scores (71 and 78) were similar.

The researcher who conducted the study is a graduate of an undergraduate program for teaching individuals with intellectual disabilities. The researcher taught in the university unit the children attended. The study involved a small-group instructional format. Thus, an assistant teacher was included among the research staff. The assistant teacher was a senior student in the undergraduate program for teaching individuals with intellectual disabilities and, at the same time, participated as an intern in the class where the study was conducted.

Settings
The baseline probe, instruction, and maintenance sessions were conducted in a university unit. The class in which the implementation was conducted was 6 x 5 m. In the classroom, there was a cabinet for materials, a wall panel, a SMART board, and chairs for children. Generalization sessions were conducted in a different classroom in the unit.

Materials
The materials used in baseline, instruction, maintenance, and generalization phases were SMART boards, tripods, tablet computers, digital cameras, data entry forms, pens, and the target digital games that were pre-installed on the SMART boards (see Table 2). Digital games targeted for instruction were downloaded for free from the Google PlayStore via the Bluestacks interface program on the SMART board. At the beginning of the study the researcher established skill analysis steps for the predetermined digital gaming skills. The skill analyzes were then presented to three field experts for review and expert opinion. Modifications were made in line with the experts' recommendations and skills analyses were prepared for data recording. In the process of collecting social validity data, a social validity questionnaire that included semi-structured questions developed by the researcher, a voice recorder, and pens were used.

Table 2: Digital games targeted for instruction

Children	Games		
	1st Game	2nd Game	3rd Game
Can	Car Wash	Educational Game Set (Jigsaw)	Animal Maze
Berk	Game Kids Free	Educational Game Set (Picture puzzle)	Educational Game Set (Shadow Jigsaw)
Alp	Supermarket Boy Shopping	Amazing Santa	Early Learning (Color Matching)
Efe	Cleanup Game All Selfie	Animals – Joining the Dots	Early Learning (Figure Matching)

Dependent and independent variables
The study included two dependent variables. The first dependent variable was the learning level of digital gaming skills by the participants with ASD as performed on the SMART board and the other was the level of learning through observation of the gaming skills instruction to the pairs. For this purpose, observational learning pre-test probe sessions and observational learning posttest probe sessions were conducted to observe how well the participants learned the games without receiving instruction for each game. The independent variable was the researcher-presented graduated guidance instruction using the SMART board in a small-group format.

The researcher arranged preparatory sessions before the instructional application began. The purpose of these sessions was to check whether there were any compatibility problems among the children in the small group and whether they experienced problems with the utilized technological devices. Preparatory sessions for the application were terminated after the decision was made that there was no need for any change/adaptation in the process and the application process was initiated.

Research model
In the present study, a multiple probe design across behaviors model was used and replicated across participants to evaluate the effectiveness of SMART board-based graduated guidance instruction on the digital gaming skills of children with ASD. Multiple probe models aim to assess the effectiveness of an instructional or behavior modification program in more than one case. In these models, there is no need to continuously collect baseline data and they are suitable for all behaviors, with or without feedback (Kennedy 2005). In this study,

experimental control was established by the difference between response levels for the instructed and uninstructed games in collective probing sessions and observation of this difference in other games.

Experimental process

The study included baseline, instructional, collective probing, observational learning, maintenance, and generalization sessions. It took four months to complete the study. Instructional sessions were conducted in small-group format and all other sessions were conducted with one-on-one instruction. The researcher determined that children should have 100% correct responses in three consecutive sessions. After the performance criterion was met for all skills, maintenance data were collected. Levels of learning the digital games that had not been directly instructed were determined with observational learning sessions.

Full probe sessions

The full probe sessions were conducted simultaneously and one-on-one with all participants. In these sessions, the single opportunity method, one of the types of skill analysis, was used.

Intermittent probe sessions

Intermittent probe sessions were conducted to demonstrate the performance levels of participants with ASD on the target digital gaming skills. Intermittent probe sessions were conducted individually with the participants following two instructional sessions. Procedures followed in intermittent probe sessions was the same as procedures conducted in full probe sessions.

Instructional sessions

Before the instructional sessions, the researcher prepared the chairs for the participating children by placing them in front of the SMART board and turned the SMART board on. The children's attention was drawn to the instruction (e.g., "Everyone should be seated now. Are you ready to study?"). Children were reinforced by the practitioner when they expressed their readiness with verbal expressions and/or gestures (e.g., "Great, then let's begin!"). The practitioner then offered a special attentional cue to the child and his partner who were the subject of that particular session (e.g., "We are starting to work with Can today. Everyone should watch it carefully, but Berk should watch especially closely!").

The researcher then pointed to the digital game on the SMART board desktop and instructed the focus child to "play" on the SMART board. The basic strategy used in graduated guidance instruction is to fade the controlling prompt. In the present study, the process of fading the prompt was conducted as a physical-sign-verbal prompt hierarchy. When the child provided the accurate response, the process of fading the prompt was immediately initiated and a sign prompt with a lower level control was utilized. In the later stages of the skill, the prompt fading process was initiated based on the child's performance. This process was repeated when the child provided an incorrect response or gave no response. During the instructional sessions, every correct response the subject would independently perform in the skill analysis was reinforced immediately. During instruction, the researcher provided the child with the opportunity to observe his peer while the peer played a digital game on the SMART board. If the researcher noticed the child's attention wandering in a direction different than the peer playing the digital game on the SMART board, the researcher immediately directed his attention to the game on the SMART board, instructing him to "follow his friend. Furthermore, a "group criterion" was established for this study (Collins et al., 1991) since the children participating in the instructional process had the same type of disability, games with similar difficulty levels were targeted for instruction, and an observational learning process was used in the game skills instruction.

Observational learning sessions

The data collection process for winning the pair's target games via observational learning was conducted using an observational learning pre-test posttest process. Pre-test probing sessions were conducted just before the instruction of digital games. Posttest sessions were conducted after all the participants met the performance criteria for their target skills. Observational learning pre-test and posttest sessions were conducted in a manner similar to the collective probe sessions.

Maintenance data collection sessions

Maintenance data collection sessions were conducted to determine levels of retention of digital gaming skills that children learned as a result of the instructional process and the digital gaming skills they acquired by observing and learning through the target behaviors of their peers. Three separate maintenance sessions were conducted in the first, third, and fifth weeks, starting 1 week after the instructional sessions ended. Maintenance sessions were conducted using procedures similar to those used in the probe sessions and assessed two different types of skills: target game-playing skills and game-playing skills acquired through observational learning.

Generalization sessions
The study's generalization sessions involved different individuals, different settings, and different tools and equipment. Generalization pre-test sessions were conducted before the instructional sessions and posttest sessions were held after all instructional sessions were completed. In the generalization across different individuals sessions, the participants played the games with a different practitioner, in the different setting generalization sessions, they played the games on the SMART board in a different classroom, and in the case of generalizing across materials sessions, the participants played digital games on a tablet computer, and all these processes were analyzed. In all generalization sessions, procedures similar to those used in probe sessions were followed.

Reliability
Two types of reliability data were collected in the study. These were (a) inter-observer reliability data and (b) treatment integrity data. Reliability data (i.e., inter-observer reliability and treatment integrity) were collected for at least 30% of all sessions in each phase of the study. The analyses of the obtained inter-observer reliability data were conducted with the inter-observer reliability calculation formula, "Agreement / Agreement + Disagreement X 100" (Gast, Llyod, & Ledford, 2014). Inter-observer reliability was calculated at 100% for all sessions in the study.

Treatment integrity
Analysis of the treatment integrity data obtained in the study was performed using the "observed practitioner behavior / planned practitioner behavior x 100" treatment integrity calculation formula (Gast et al., 2014). The lowest application reliability coefficient obtained was 98.55 (*range*: 83.33% - 100%).

Social validity
The study's social validity data were collected from Can's and Berk's fathers and Alp's and Efe's mothers of the participating children through individual interviews. Interviews lasted an average of 15 minutes for each parent. The "Social Validity Interview Questionnaire" developed by the researchers was used in the process of collecting social validity data, to determine the views of the parents on the functionality of the instruction process and targeted digital game playing and observational learning skills. Interview questions were posed to the parents by the researcher. As the parents answered the questions, the researcher did not provide any guidance. The obtained audio recordings were transcribed, categorized, and analyzed by the researchers.

FINDINGS

Effectiveness and efficiency findings
Findings on the effectiveness of SMART board-based small-group graduated guidance instruction on the digital gaming skills of children with ASD are presented in Figures 1, 2, 3, and 4. Can satisfactorily met the performance criterion for all three target games as a result of a total of 16 instructional sessions. He learned the first target game with a mean 73% (*range*=29% -100%) correct responding in seven sessions, the second game with a mean 88% correct responding (*range*=60% -100%) in five sessions, and the third target game with a mean 90% correct responding (*range*=60% -100%) in four sessions. As a result of a

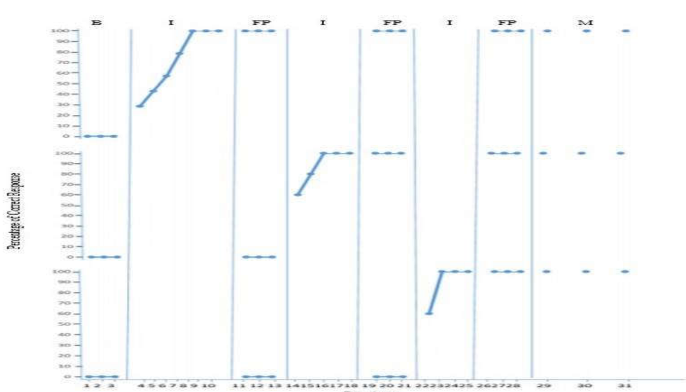

Figure 1: Percentage of correct responses for Can during baseline, post training assessment, full probe and maintenance sessions.

total of 16 intervention sessions conducted with Berk, he satisfactorily met the performancecriterion in all three games. Berk learned the first target game with a mean 55% correct responding (*range*=13% -87%) in seven sessions, the second game with a mean 84% correct responding (*range*=40% -100%) in five sessions, and the third game with a mean 79% correct responding (*range*=33% -100%) in four sessions. As a result of a total of 16 instructional sessions conducted with Alp, he also satisfactorily met the performance criterion in all three games.

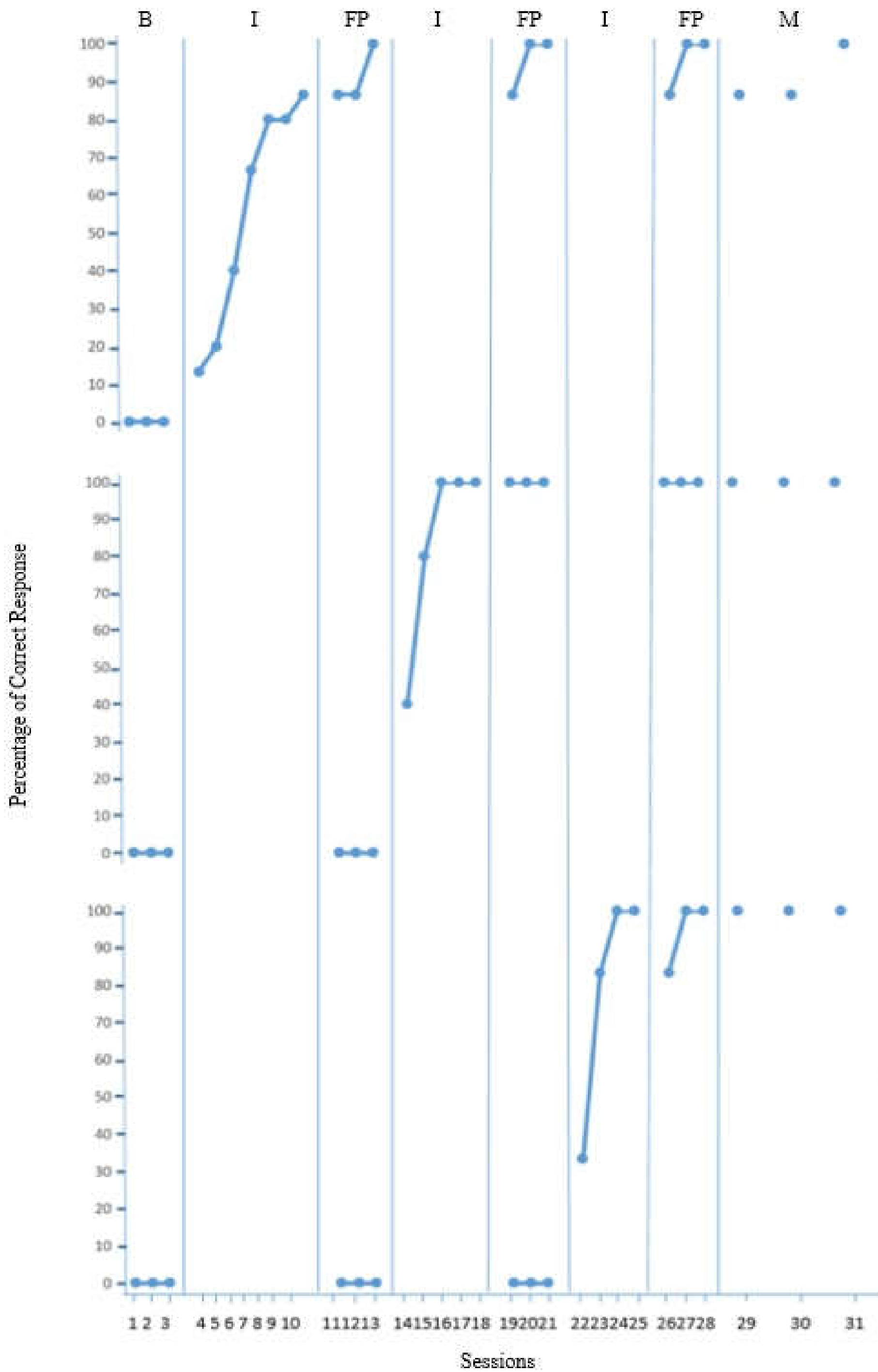

Figure 2: Percentage of correct responses for Berk during baseline, post-training assessment, full probe and maintenance sessions.

Alp learned the first target game with a mean 83% correct responding (*range*=29% - 100%) in seven sessions, the second target game with a mean 95% correct responding (*range*=75% -100%) in five sessions, and the third game with a mean 94% correct responding (*range*=77% -100%) in four sessions.

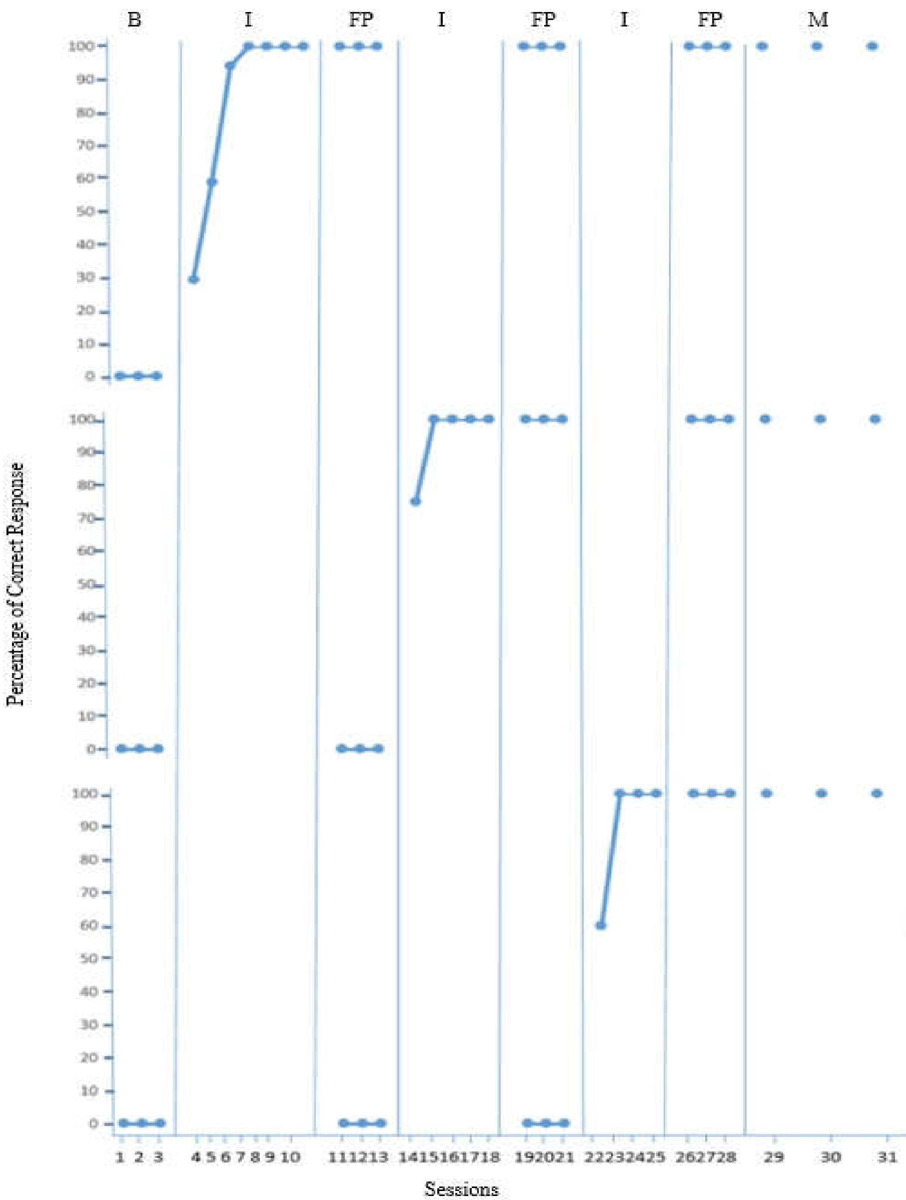

Figure 3: Percentage of correct responses for Alp during baseline, post-training assessment, full probe and maintenance sessions.

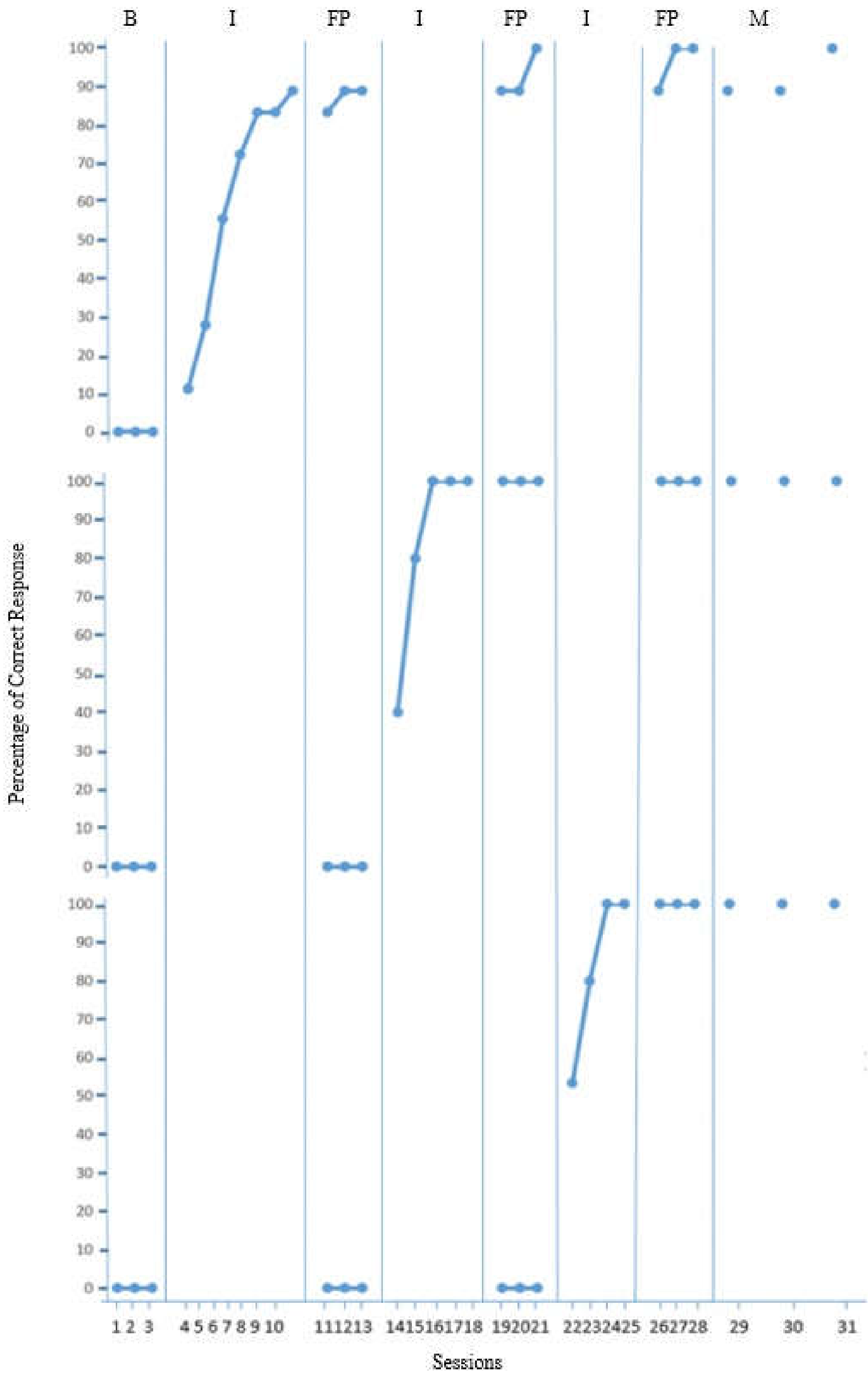

Figure 4: Percentage of correct responses for Efe during baseline, post-training assessment, full probe and maintenance sessions.

Efe satisfactorily met the performance criterion in all three target games as a result of a total of 16 sessions. He learned the first game with a mean 60% correct responding (*range*=11% -89%) in seven sessions, the second target game with a mean 84% correct responding (*range*=40% -100%) in five sessions, and the third target game with a mean 94% correct responding (*range*=77% -100%) in four sessions.

Generalization findings

In the present study, data were collected on the generalization of gaming skills determined for each child with ASD to different individuals, different settings, and different materials. All children with ASD met the generalization criteria in the posttest sessions. Generalization data for different individuals are presented in Figure 5, while generalization data for different settings are shown in Figure 6, and generalization data for different materials are shown in Figure 7.

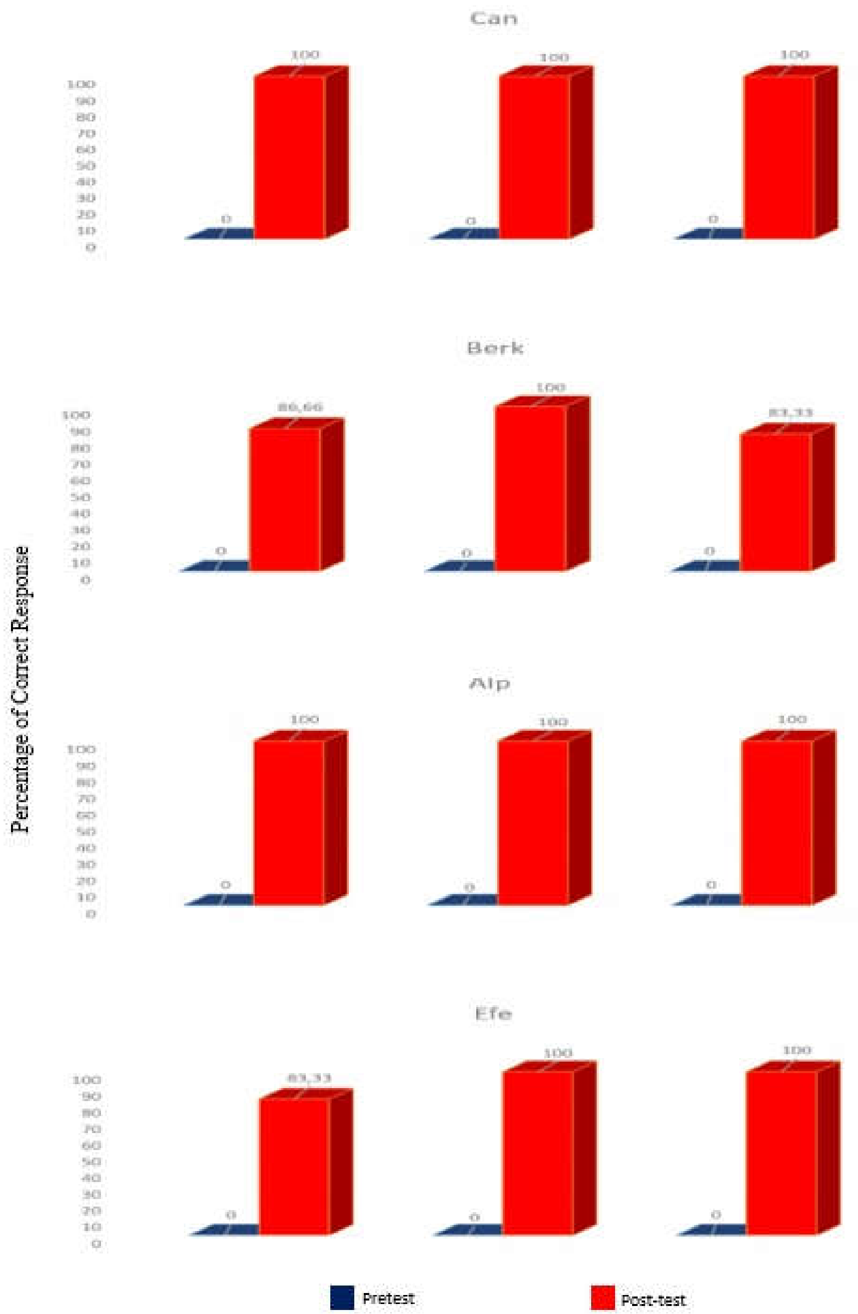

Figure 5: Can, Berk, Alp and Efe's responses to digital gaming skills. Different person generalization pre-test and post-test data.

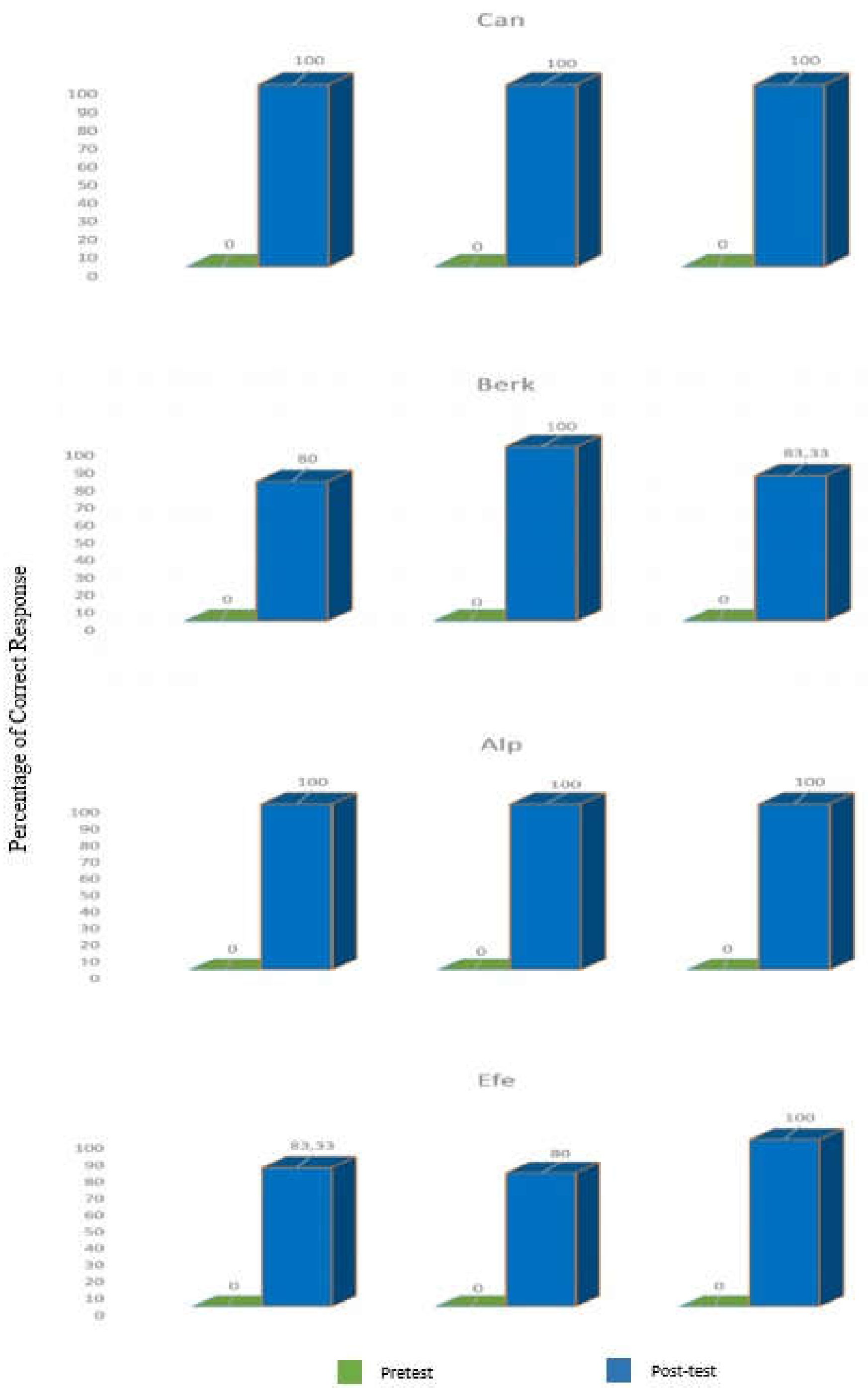

Figure 6: Can, Berk, Alp and Efe's responses to digital gaming skills. Different setting generalization pre-test and post-test data.

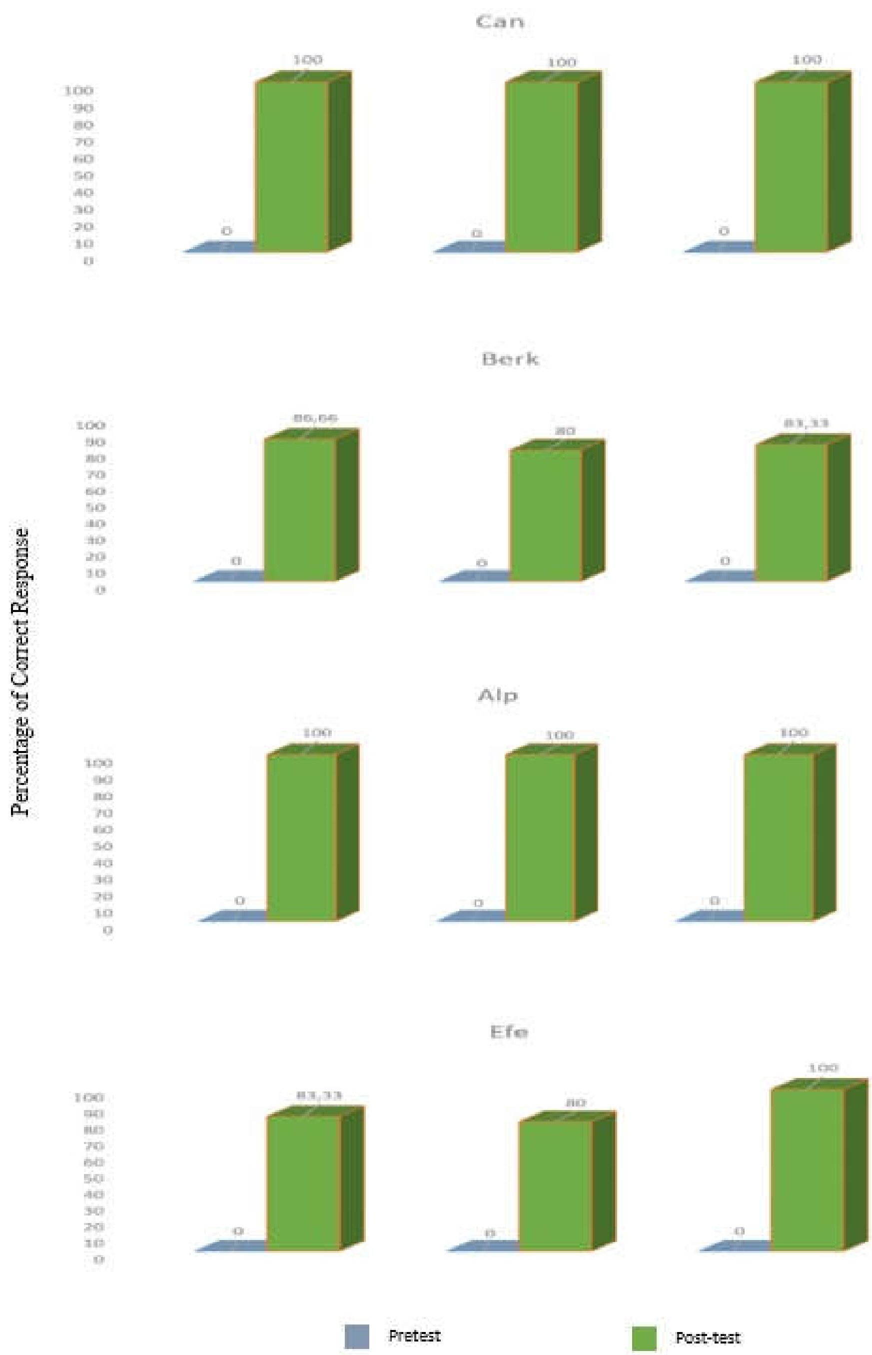

Figure 7: Can, Berk, Alp and Efe's responses to digital gaming skills. Different material generalization pre-test and post-test data.

Observational learning data

The participants' levels of learning their peers' target games via observational learning was measured with pre-test and posttest assessments. Observational learning pre-test and posttest sessions were conducted before each full probe session. Pretest and posttest observational learning data are shown in Figure 8.

Observational learning data for Can on his peer's first target game demonstrate a 0% correct performance level in the pre-test probe session and he won 100% of his peer's games in the observational learning posttest session. Can performed at 0% on his peer's second game in the pre-test probe session and 100% in the posttest session, showing that he learned his peer's game through observational learning. Can's 0% performance on his peer's third game in the pre-test probe session and 100% performance level in the posttest probe session demonstrates that he learned his peer's game through observational learning.

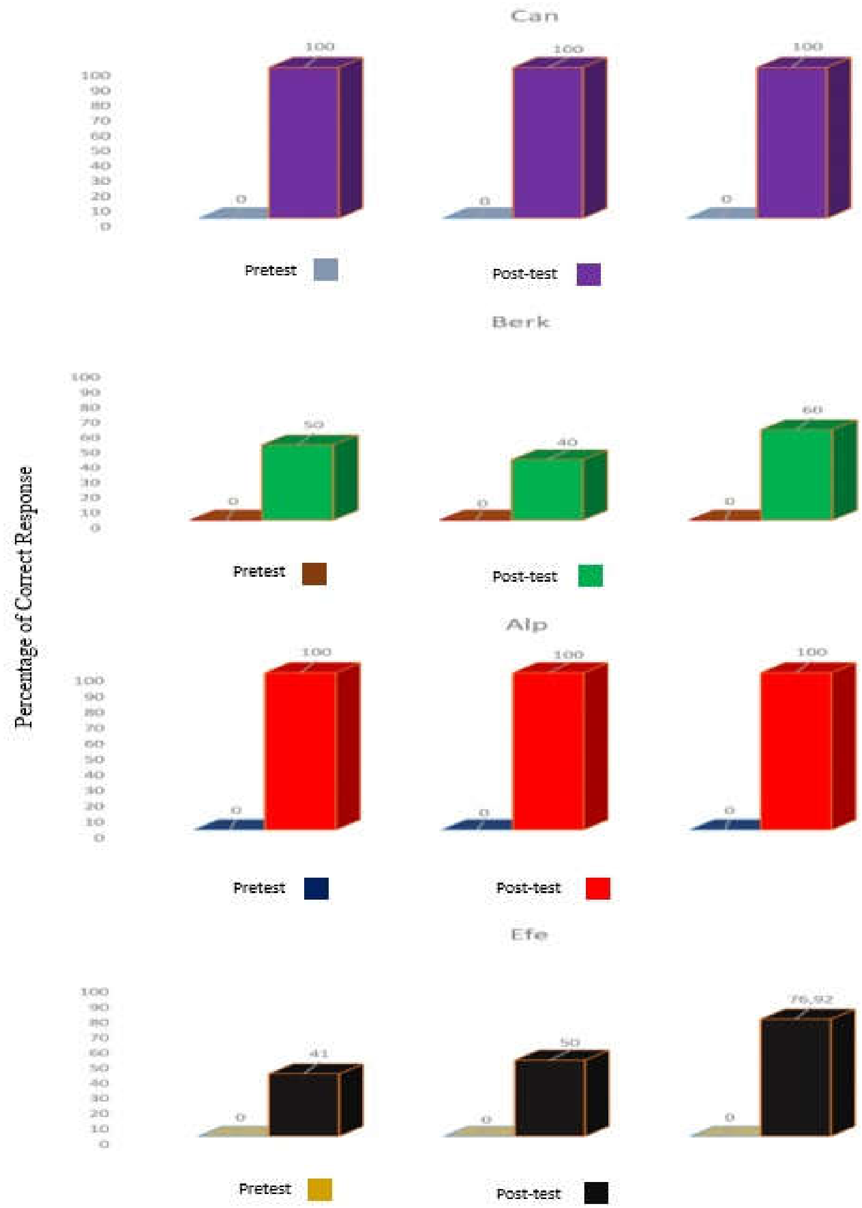

Figure 8: Can, Berk, Alp and Efe's observational learning pre-test and post-test data.

Observational learning data for Berk on his peer's first target game demonstrate that he performed at 0% correct responding in the pre-test probe session and won 50% of his peer's games in the observational learning posttest session. Berk performed at 0% on his peer's second game in the pre-test probe session and at 40% in the posttest session, thus learning his peer's game through observational learning. Berk performed at 0% on his peer's third game in the pre-test probe session and at 60% in the posttest probe session, thus learning his peer's game through observational learning.

Observational learning data for Alp on his peer's first target game demonstrate that he performed at 0% in the pre-test probe session and won 100% of his peer's target games in the observational learning posttest session. Alp performed at 0% on his peer's second game in the pre-test probe session and at 100% in the posttest session, thus learning his peer's target game through observational learning. Alp's performance on his peer's third game was at 0% in the pre-test probe session and 100% in the posttest probe session, indicating that he learned his peer's target game through observational learning.

Observational learning data for Efe on his peer's first target game show that he performed at 0% in the pre-test probe session and won 41% of his peer's games in the observational learning posttest session. Efe performed at 0% on his peer's second game in the pre-test probe session and at 50% in the posttest session, thus learning his peer's game through observational learning. Efe's performance on his peer's third target game was at 0% in the pre-test probe session and at 77% in the posttest probe session, showing that he learned his peer's target game through observational learning.

Social validity findings

Social validity data were collected with face-to-face, semi-structured interviews with the participants' parents on the learning of digital gaming skills by children with ASD. All questions in the social validity interviews were transcribed and the findings demonstrate that the parents' views were generally positive. All parents stated that they were pleased with the intervention (i.e., SMART board-based small-group graduated guidance instruction) for their children's acquisition of digital game-playing skills. Can's father said that: "*I look at these kinds of studies positively. I care about my child plays games with his friends. It was nice to take advantage of this service that the technology brought"*. All parents also stated that they considered their children's acquisition of other nontargeted games (i.e., those instructed to their children's peers) through observational learning important for their children. Alp's mother said in the interview: "*Alp learned from other friends' game through observational learning. So I think that observational learning is an effective method"*. When parents were asked what they thought about the fact that the study was conducted in the children's natural settings, namely, the classes they attended every day, and about how this study was conducted, all parents stated that it was important for their children to play games with their friends and to communicate with them. Berk's father said that: *"It is extremely important for my child to play and communicate with his group mates. I think that it is important for the children to work in their own classroom in terms of common achievements"*. When they were asked whether they thought digital gaming skills would be a positive contribution to the daily lives and other developmental areas for their children, the parents replied that they saw their children with ASD as locked in their own worlds, but they considered the fact that their children observed their peers, desired to achieve the game-playing outcomes they observed, and followed the necessary steps to complete the games as worthy achievements. Finally, when asked for their views on possible failures in the study, the parents replied that they had no concerns about this study.

DISCUSSION

The goal of the present study was to investigate the effects of using a SMART board to deliver small-group graduated guidance instruction to teach children with ASD digital gaming skills and to measure the extent to which these children acquired through observational learning the non-targeted digital games taught to their peers, retention of these skills after the instruction and the display of these skills under different conditions (i.e., different individuals, settings, and materials). Furthermore, the participants' parents' views on their satisfaction with the study results and overall satisfaction with the study process were determined through the conducted social validity interviews.

Study findings demonstrated that all children achieved their targeted digital gaming skills, retained the acquired skills after the instruction was over for 5 weeks, and exhibited these skills under different conditions (i.e., different individuals, settings, and materials). When the level of children's learning of their peers' digital games through observational learning was examined, it was determined that Can and Alp won 100% of the games they learned through observational learning, while Berk won a mean 50%, and Efe won a mean 56%. The results of the social validity interviews conducted at the end of the study demonstrated that the parents of the participants were satisfied with the study's procedures and outcomes. In this section, the prominent aspects of the findings of the study are discussed.

The findings reported in the literature on the effectiveness of SMART board-based small-group graduated guidance instruction demonstrate results similar to those of the present study (Au, Leaf, Leaf, Taubman, McEachin, & Tsiju, 2016; Colozzi, Ward, & Crotty, 2008; Coyle, 2013; Leaf et al., 2012). It was observed that the pre-instructional performances of all participating children on the digital games differed significantly with their post instructional performances. At the end of the instruction, the children reached a level where they could independently demonstrate their target digital gaming skills thus showing that the intervention was an effective application for teaching digital gaming skills to children with ASD who participated in the study (Au et al., 2016; Argott, 2012; Campbell & Mechling, 2009; Coyle, 2013). In addition, when children's performance in acquiring their peers' target digital games was examined, it was observed that two children acquired all steps of their peers' digital games, while the other two performed at a mean 50% accuracy level. The low levels of acquiring digital gaming skills through observational learning for these two children might be due to various factors. The first could be the fact that the children never received instruction on observational learning skills prior to or during the study. In the process, in order to focus their attention on the games of their learning peers, the directive to watch was issued only before the instructional sessions and when it was observed that their focus was not on their peers. Another cause of poor performance may be a significant characteristic of children with ASD: antipathy toward the behavior of others and poor or lacking imitation skills. When GOBDO-2-TV scores of both children with low achievement levels of digital gaming through observational learning were examined, it was determined that they scored three points on each item related to social interaction on the scale, namely Item 32, "does not imitate other people during gaming or learning activities when asked or required" and Item 33: "acts cold, uninterested, shy, and introverted in a group," different from the other two children in the study.

Observational learning is considered as an important skill in educational, economic, and social aspects. Children with autism need intensive, one-on-one training (Smith, 2001). This education is important and useful for children with ASD. However, this intensive and individual training is very costly and not easy to find in general educational settings. Therefore, the creation of observational learning opportunities in systematically organized small-group setting is of great importance for children (Taylor & DeQuinzio, 2012; Townley et al., 2015).

Findings on retention of the skills by the participating children demonstrate that the children could retain digital gaming skills in maintenance sessions conducted after 1, 3, and 5 weeks after the instructional sessions ended. This suggests that SMART board-based small-group graduated guidance instruction was effective in the retention of the acquired digital gaming skills by the participants with ASD after a certain period of time (Au et al., 2016; Argott, 2012; Campbell & Mechling, 2009; Coyle, 2013). The study's generalization findings demonstrate that children could display the acquired digital gaming skills under different conditions (i.e., different individuals, settings, and materials). When the acquisition, retention, and generalization findings obtained in the study were examined, it was observed that SMART board-based small-group graduated guidance instruction was effective on the acquisition, maintenance and generalization of digital gaming skills of children with ASD, similar to the findings in the literature (Colozzi, Ward, & Crotty, 2008; Coyle, 2013; Leaf et al., 2012).

Other points that should be mentioned are the characteristics of the children participating in the study, the setting in which the study was conducted, and the methods utilized for the intervnetion. Although the fact that these children with ASD had inadequate imitation and intra-group interaction skills which would seem to be a limitation in terms of the application of the method utilized in the study, the interest of these individuals for technological devices played an important role in their selection as participants in the study. In fact, it was observed that the children demonstrated higher levels of interest and motivation when they used the SMART board during the instruction compared to their attention and motivation levels during group activities conducted at their desks. Similar cases have been observed in different studies in the literature (Argott, 2012; Coyle, 2013; Handler, 2011). Thus, in the present study, where technological devices were used intensively, the identification of children with ASD as participants played a facilitating role in the implementation of the study. Furthermore, when Alp's and Can's performance data for target skills acquisition are examined, it is interesting to note that data levels and tendencies increased in the second and third games after the initial instructional session and the criteria were met in a short period of time for both games. Findings of several other studies support graduated guidance instruction as an effective teaching strategy. However, it could be argued that the reason behind the situation observed in the present study was the fact that the participating children learned how to use the SMART board and digital gaming faster when compared to the first games. Another reason could be the fact that their familiarity with the SMART board increased over time and both the SMART board and the games functioned as positive reinforcement. Also, the children's learning rate could have been affected by the fact that there were fewer steps in the second and third games than there were in the first game.

The setting in which the study was conducted was the classroom where the researcher was the classroom teacher and the participating students regularly attended. It was observed that there were several advantages of using this setting in the study process. The most important of these was the fact that the over-commitment of the children with ASD to their routines had to be tested. Implementing the research project in a classroom where children are typically educated with familiar friends and teachers may significantly facilitate adaptability to the research protocol. Furthermore, conducting the study at intervals between daily routine activities saved the researcher a considerable amount of time and effort. Another advantage of the setting used in the study process was that the researcher practiced in a familiar classroom during the planning and implementation stages of the intervention. By working in a classroom where the researcher was familiar with the routines, teaching students whom the researcher had known for a semester and whose individual differences the researcher recognized, and conducting the study at intervals determined by the researcher, it was possible to have more control over the study and to conduct the study more effectively.

In the present study, the graduated guidance instructional method was used in a small-group setting. The use of small-group instruction, which is one of the elements of this method, enabled the children to win their peers' digital games via observational learning and to acquire within-group skills (e.g., making lines and raising hands to come to the SMART board) in the process. Another advantage of teaching within a small group was the fact that the sessions were easily planned and implemented since all instructional sessions were conducted with four children. One of the elements of the intervention was the use of the SMART board. The use of SMART board in the implementation process of this study emerged as a positive factor because these children with ASD had more information about technological devices. In the process, it was observed that children paid attention to follow group rules until they came to the SMART board to play, and they paid full attention to the SMART board activities. This demonstrates that the SMART board was an important facilitating factor for the methodology of the present study. In the implementation process, the near-errorless instructional method of graduated guidance instruction was preferred. Graduated guidance instruction is a near-errorless instructional method proved to be effective in the instruction of several response chain skills, such as digital gaming skills (Wolery, Ault, & Doyle, 1992). The use of graduated guidance instruction in this study, by providing support to children in the amount and type they needed, was considered to be effective in creating the steps that could be performed independently and providing positive reinforcement, and it was effective in preventing prompt dependency.

When the study is examined in terms of social validity, the results of the individual social validity interviews conducted with the parents of the study participants were consistent with the findings of similar research (Argott, 2012; Özen, Batu, & Birkan, 2012). Current findings demonstrate that this study which examined the intervention's effectiveness on levels of digital gaming through direct instruction and through observational learning of children with ASD was socially valid. The most positive aspects of the present study according to the children's parents were the children's ability to learn to play their peers' games through observational learning, to wait for their turns in their group, to take turns by raising their hands, and to transfer the digital games they learned to their daily lives. In general, all parents expressed the opinion that they saw no adverse aspect related to the study, while two parents talked about the possibility that the use of digital devices such as SMART boards by children with ASD may lead to obsession, and thus, the children should be allowed to use these devices for a limited amount of time and under supervision.

LIMITATIONS AND FUTURE DIRECTIONS

There are some limitations of the present study that need to be discussed. These are the fact that no generalization data were obtained in the natural setting for the skills instructed to the children. The second limitation is that social validity data were not collected by social comparison. The third limitation was experienced especially in the technological dimension. Due to the differences between the feedback provided for correct and incorrect responses within the digital games used in the study (e.g., in certain games correct actions were applauded) and due to software incompatibilities with the SMART board, problems were experienced during loading and running the applications. Despite the precautions taken to prevent technological problems, the abovementioned facts led to some disruptions in the process.

In the present study, the practitioner was the researcher himself, peers with typical development and preschool teachers, and intern students could be the practitioners. It is very important to create observational learning opportunities for children with ASD (Taylor & DeQuinzo, 2012). Practitioners should organize programs with different application conditions and processes in such a way that enables observational learning. A similar study could be conducted with large groups in addition to student pairs, or small-group arrangements involving two or more students.

In the present study, digital gaming skills were instructed. In future studies, different skills such as social interaction skills, functional academic skills, literacy skills, mathematics (e.g., four operations or problem solving) can be instructed using the SMART board. This study was conducted at the university unit where the participating children regularly attended. In the future, similar studies could be conducted in preschool and primary school inclusive classrooms (in larger groups). Different small-group instructional formats could be set up to provide opportunities for observational learning, and different specific skills could be instructed. Further studies can be planned in which children with ASD would be instructed with opportunities for observational learning.

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