J Autism Dev Disord (2016) 46:2845–2858
DOI 10.1007/s10803-016-2824-3

ORIGINAL PAPER

Video Modeling and Observational Learning to Teach Gaming Access to Students with ASD

Amy D. Spriggs[1,2] · David L. Gast[2] · Victoria F. Knight[1,3]

Published online: 6 June 2016

Abstract The purpose of this study was to evaluate both video modeling and observational learning to teach age-appropriate recreation and leisure skills (i.e., accessing video games) to students with autism spectrum disorder. Effects of video modeling were evaluated via a multiple probe design across participants and criteria for mastery were based on these results. Secondary measures were collected on observational learning across participants and behaviors. Participants included 4 children with autism, ages 8–11, who were served in self-contained special education classrooms. Results indicated a functional relation between video modeling and increased independence in gaming; observational learning occurred for at least some steps across students. Results, implications for practitioners, limitations, and ideas for future research are discussed.

Keywords Autism · ASD · Video modeling · Observational learning · Recreation and leisure skills · Video games · Gaming

This research was presented at the ABA-I conference in Seattle, WA, United States.

✉ Amy D. Spriggs
amy.spriggs@uky.edu

1 Present Address: University of Kentucky, 229 Taylor Education Building, Lexington, KY 40506, USA

2 University of Georgia, Aderhold Hall, Athens, GA 30602, USA

3 Present Address: Vanderbilt University, Nashville, TN 37203, USA

Introduction

Rationale for Teaching Gaming as a Recreational Activity to Students with ASD

Recreation and leisure skills are important for all people, but do not often come naturally to children with autism spectrum disorder (ASD). "Recreation is typically defined as an activity that people engage in for the primary reasons of enjoyment and satisfaction… leisure describes a person's perception that he or she is free to choose to participate in meaningful, enjoyable, and satisfying experiences" (Dattilo and Schleien 1994, p. 53). Characteristics of ASD, such as difficulties with social interaction and communication, as well as restricted and repetitive interests often limit childrens' access to recreational activities outside of the home, further limiting development of such skills. As a result, parents have reported that children with ASD have fewer friends and participate in significantly fewer recreational activities than typically developing children (Solish et al. 2010). Participation in recreation and leisure can increase opportunities to develop social relationships and physical well being, as well as decrease inappropriate behaviors for *everyone*. Specifically for children with ASD, such participation can provide a sense of accomplishment, enhance self esteem, and reduce the stress and need for continuous supervision by families and staff (Coyne and Fullerton 2014).

Unfortunately, the current research evaluating recreation skills of individuals with ASD encompasses a narrow range of restricted activities (e.g., bowling, crafts; Dattilo and Schleien 1994) and methods (e.g., systematic instruction). The majority of existent literature targets adults or teens transitioning to post school environments. Although teaching recreation skills are imperative during adolescence due to increases in free time, younger individuals should also have opportunities to benefit from learning these skills. Earlier intervention is important because students with disabilities often require more time to learn and maintain skills. Educators must select recreation activities that are age appropriate and readily available in the students' school, home, and community environments. Skills must also be in students' repertoire or directly taught (Dattilo 1991). In order for students with ASD to engage in recreation and leisure activities and enjoy the potential benefits independently, teachers should provide students with ASD access to a wide range of recreational skills so that students can determine their interests in such activities for themselves.

For example, video games may be a beneficial recreation skill to teach individuals with ASD across ages because they are systematic, formulaic, and provide repetition and familiarity (Sherrow et al. 2015). Recent research suggests video games may have cognitive, motivational, and emotional benefits for all children (Granic et al. 2014; Sherrow et al. 2015). To date, only two studies have evaluated teaching youth with ASD video games as a recreation skill. In the first study, Blum-Dimaya et al. (2010) used an instructional package including graduated time delay, visual activity schedules, and embedded video modeling (VM) to teach students with ASD to play three games on Guitar Hero. The VM played concurrently as students played the game, which differs from the traditional "watch then do" VM. In the second study, traditional VM was used to teach recreation skills (i.e., playing video games on the Wii) to three high school students with moderate intellectual disability and ASD. The VM was effective for teaching all students to play the Wii and students maintained the skills during follow up probes (Sherrow et al. 2015). Updated, rigorous, and relevant research on effective ways to teach recreation skills (including video games) is needed.

Evidence for Using Video Modeling as a Promising Approach for Teaching Gaming Access

VM, an evidence-based practice, may capitalize on the strengths often associated with ASD in the areas of attention, perception, information processing, memory, language, and general intelligence (Quill 1997). VM has been used to teach numerous skills to students with ASD. The visual nature can make video highly motivating and naturally reinforcing for students with ASD. Ayres and Langone (2005) reviewed 15 articles using video interventions, finding positive results for social and functional skills. Authors concluded that one benefit of using VM was the procedurally reliable demonstration of each step that could be viewed with as much repetition as needed to master target skills. Bellini and Akullian (2007) conducted a meta-analysis to analyze current VM literature as it relates to evidence-based practices. In the 23 studies reviewed, the authors concluded that VM are effective for acquisition, maintenance, and generalization of skills. Ayers and Langone point out that while researchers have answered many questions about using VM for instruction, we do not know everything we need to. One specific area not well addressed in the current body of research is using observational learning or VM to teach recreation skills.

Evidence in Favor of Observational Learning as Effective for Teaching Gaming Access

Clearly, VM is an effective and acceptable practice for teaching students with ASD (Stansberry-Brusnahan and Collet-Lingenberg 2010), but it is also a form of observational learning. Observational learning occurs when the behavior of the target student changes to mirror the behavior of others (Dorwick and Jesdale 1991). Observational learning involves a process of observing and doing. In order for students to experience success with observational learning, students must be able to pay attention to, learn, imitate, and retain modeled behaviors (Bandura 1977). It can occur via in vivo modeling from a teacher, watching other students perform a task, or through VM (Darden-Brunson et al. 2008). Literature on in vivo observational learning for students with ASD is minimal; what exists suggests students with ASD might observationally learn from their peers when taught in small group instructional arrangements. Most of the existent studies target discrete tasks (e.g., Delgado and Greer 2009). Visual preferences of many students with ASD would make learning observationally, where the focus can be non-verbal cues, ideal (Quill 1997); however, deficits in imitation skills and challenges interpreting non-verbal language suggests skills acquired from observational learning may be hindered.

Evaluated together, the current literature base on VM, observational learning, and recreation education reveals that while VM has been effective for teaching individuals with ASD, using it to teach recreation tasks and incorporating in vivo observational learning of chained tasks for young students with ASD is lacking. The combination of these reveals an area of instructional promise that needs systematic investigation.

Purpose and Research Questions

The purpose of this study was teaching access to chained recreation skills via VM to elementary students receiving special education services under the ASD eligibility in small group instructional arrangements, facilitating in vivo observational learning opportunities. Researchers selected *access to gaming* for the following reasons (a) the students in the current study had no previous experience with gaming or the range of gaming systems used, (b) access was considered a necessary first step in order for students to engage in video games as a potential recreation activity, and (c) the students in the current study had complex and extensive support needs, which would have made accessing and learning to play all of the video games across gaming systems extremely challenging. This study evaluated the following research questions: Will students receiving special education services under the ASD eligibility learn to complete critical steps to access potential recreation/leisure gaming activities via VM (access being defined as completing the critical steps necessary to begin the game; it did not include accuracy or skill of playing the game)? Will students receiving special education services under the ASD eligibility who are observers of students engaged in chained recreation gaming activities learn to complete critical steps to access those activities?

Method

Participants

Four elementary school age students with a primary special education eligibility of ASD were recruited from special education classrooms in the primary investigator's school where she taught. The order in which students entered intervention (i.e., VM) was randomly assigned prior to the start of the study using an on-line list randomizer. To participate in the study, students met the following inclusion criteria: (a) ability to follow multistep directions; (b) ability to attend to a movie for a minimum of 10 min; (c) ability to attend to a preferred task for up to 15 min (e.g., manipulating materials without requiring redirection); (d) ability to imitate simple gross and fine motor movements demonstrated by the teacher (e.g., jumping, putting items into containers); (e) regular school attendance, with no more than three absences in the previous 9 weeks of school; (f) an educational eligibility of ASD; and (g) parental agreement for participation. Inclusion criteria were assessed via record reviews and screenings (e.g., students had to have mastered a multi-step direction program as evidenced in progress monitoring records or demonstrate the skill in a simple screening). None of the students had previous instruction with VM, observational learning, or in recreation/leisure activities. Three of the four students received free/reduced lunch and the other student was from a high-income family.

Fred

Fred was an 11-year-old Caucasian male in the fifth grade. Fred was considered functionally non-verbal. Although he had some words in his vocabulary, his articulation hindered communicating with strangers. He had a high-tech communication device that he used to answer questions. Fred rarely initiated conversation unless he wanted something not programmed in his communication device. Fred could read simple sentences and could spell highly preferred words (e.g., Barney, computer). He could follow two-step directions given verbally and could imitate almost any motor skill demonstrated. Fred engaged in high rates of aberrant behaviors that included self-injurious behaviors (e.g., hand biting) and aggression toward others (e.g., scratching). The function of his behaviors was often escape and occasionally self-stimulation. He did not take medication during the study.

Fred was evaluated when he was 5-years-old, and the Wechsler Preschool and Primary Scale of Intelligence-Third Edition was attempted but he was "un-testable." He scored a 39.5 on the Childhood Autism Rating Scale (CARS; Schopler et al. 1986), indicating behaviors in the low end of the "Severely Autistic" range. The Gilliam Autism Rating Scale-Second Edition (GARS-2; Gilliam 2006) was administered when Fred was 11. His Autism Index was 126, indicating a "very likely" probability of autism. Fred had a special education eligibility of ASD and Speech and Language Impairment, receiving 180 min of speech therapy weekly. He received services in a self-contained applied behavior analysis (ABA) classroom with reverse inclusion for 15 min daily, and went to lunch and recess with typical peers. Two adults accompanied Fred at all times due to high levels of aggression and self-injury.

Randy

Randy was an 11-year-old Latino male in the fourth grade and communicated using a high-tech communication device. He could answer questions and communicate needs and wants using single words on his device. Randy was learning to identify functional words (e.g., stop, boys, exit). He could follow two-step directions and could imitate many fine and gross motor skills demonstrated. He engaged in escape maintained behaviors (e.g., laughing at inappropriate times, sitting not looking at task materials). He did not take medication during the course of the study.

Randy was formally assessed by a school psychologist when he was 9-years-old. He received a parent rating of 85 and a teacher rating of 89 on the GARS-2, placing him in the "very likely" range of probability for characteristics of ASD. He scored a 33 on the Social Communication Questionnaire, with a score higher than 15 indicating ASD.

Randy had a special education eligibility of ASD and Speech and Language Impairment and received 60 min of speech therapy weekly. He received his education in a self-contained classroom for students with mild and moderate intellectual disability. He went to specials (e.g., computer, music, PE), lunch, and recess with typical peers.

Kevin

Kevin was a 10-year-old Caucasian male in the fourth grade. Kevin communicated verbally, most often requesting wants or protesting. He was beginning to read high frequency sight words and could answer comprehension questions from short stories read to him. He could follow three-step directions, could imitate any motor skill demonstrated, and could draw elaborate scenes from movies or television shows (e.g., Dora the Explorer, Up). Kevin engaged in escape maintained behaviors (e.g., screaming, laying on desk, elopement), eventually leading to attention maintained behaviors. Kevin took Risperdone for aggression and Melatonin for sleeping before and during the study.

Kevin was diagnosed with autism by a school psychologist when he was 5-years-old. Several formal observations and adaptive rating scales were conducted when Kevin was 3 and therefore, the scores were no longer relevant. The GARS-2 was administered when he was 10. Kevin's Autism Index was 117 indicating a "very likely" probability of autism. Kevin had a special education eligibility of ASD and Speech and Language Impairment. He was served via a self-contained ABA classroom and received 60 min of speech therapy each week. His aberrant behaviors interfered with participation in specials, but he did attend recess and lunch with typical peers.

Rachel

Rachel was an 8-year-old Caucasian female in the second grade. Rachel communicated using one word utterances that were often repeated (e.g., "cookie, cookie."). She was learning to put "I want" in front of requests during the study. Most of her communication attempts served to gain something or answer questions. Rachel had just learned to identify letters and was beginning to receptively and expressively recognize high frequency sight words. Rachel preferred to play with her "babies" and often role-played with them (e.g., putting them to sleep). Rachel could follow two-step directions and could imitate many fine and gross motor skills. Rachel engaged in high levels of self-injurious behaviors (e.g., biting herself) and aggression toward others (e.g., pinching, biting). Rachel took Clonidine for seizures and Abilify for anxiety and aggression before and throughout the study.

Rachel had minimal formal testing. She scored −2.33 standard deviations below the mean for her age on the Bayley II given when she was 2. At the age of 8, her Autism Index on the GARS-2 was 122, indicating a "very likely" probability of autism. She had an educational eligibility of ASD and Speech and Language Impairment. She received her education in a self-contained ABA classroom with 90 min of speech therapy each week. She attended lunch and recess with typical peers.

Interventionist and Data Collector

The primary investigator was the classroom teacher. She was in her twelfth year of teaching special education. This study was conducted for her doctoral dissertation. A paraprofessional was trained in data collection using similar, but non-related task analyzed activities until she could collect data on student and teacher behaviors with 100 % reliability. She had been working in the classroom for 2 years and was familiar with the participants.

Settings and Arrangements

All conditions occurred in a self-contained special education classroom in a suburban city in a southern state. All conditions of this study took place in the one-on-one work, small group, or recreation/leisure areas of the classroom. The one-on-one work area consisted of individual cubicles with a table, two chairs and individualized student materials. The small group area included a kidney shaped table, an interactive whiteboard, DVD player, laptop computer, and CD player. The recreation/leisure area included a large television and all gaming equipment. For this study, one student and teacher sat in a cubicle in the one-on-one learning area to view the VM; other students were in the small group area with paraprofessionals, where the VM could not be observed. After the VM was observed by the target student, all students were seated around the target student, in view of the recreation task being performed. Students accessing the video games were situated naturally around the specific activity (e.g., standing in front of the TV and Wii gaming system, sitting at the kidney shaped table playing the Nintendo DS). Students did not have access to the DVDs or the target items outside of instructional times.

Materials and Equipment

Videos were created using a hand held digital video recorder. Task analyses of each task were created by the primary investigator (see Tables 1, 2, 3 and 4 for task analyses and response definitions) and recorded with a third person point of view, showing an adult demonstration of

Table 1 Example: Task analysis and response definition for using the Wii (bowling)

1. Press the square power button on TV to turn on*
2. Press the power button on the Wii
3. Pick up game and insert game disc into Wii*
4. Pick up remote control*
5. Press power button on the remote control
6. Move hand to Wii Sports title and press A*
7. Move hand to start and press A*
8. Put on wrist strap and wait
9. Press A and B together to start game*
10. Move hand to bowling and press A*
11. Move hand to 1 (# of players) and press A*
12. Move hand to character (Mii) and press A*
13. Move hand to yes (continue?) and press A*
14. Move hand to OK and press A*
15. Move hand to OK (play with this Mii?) and press A*
16. Press A (again)*
17. Play game
18. Press power on remote to turn remote and Wii console off
19. Press power button on TV to turn off

Asterisk indicates a critical step for accessing the game

Table 2 Task analysis and response definition for using the Nintendo DS (Backyardigans)

1. Insert game into DS*
2. Open DS*
3. Slide power button*
4. Touch screen with stylus (to start)*
5. Touch game name on screen with stylus*
6. Touch screen with stylus to begin*
7. Touch # 1 (choose profile)*
8. Touch "any game" (chose mode you want to play)*
9. Touch "pirates" (choose the kind of game you want to play)*
10. Touch "pirate flag" (Choose the game you want to play)*
11. Play game
12. Slide power off
13. Close DS
14. Eject game
15. Put game and stylus in game box
16. Hand DS to teacher

Asterisk indicates a critical step for accessing the game

Table 3 Task analysis and response definition for using the Power-Joy Joy Stick (Galaga)

1. Get joy stick out of basket*
2. Plug yellow cord into front of TV*
3. Plug white cord into front of TV*
4. Press square power button on TV to turn on*
5. Slide power button on joy stick to ON*
6. Move arrow (using thumbstick) to #36*
7. Press start*
8. Press start (1 player)*
9. Wait for game to load
10. Play game
11. Move power button to OFF
12. Turn TV off
13. Unplug white cord from TV
14. Unplug yellow cord from TV
15. Put game into basket

Asterisk indicates a critical step for accessing the game

Table 4 Task analysis and response definition for using the V-Flash (Scooby Doo)

1. Press power button on TV to turn on*
2. Push open button on V-Flash*
3. Insert game into V-Flash system*
4. Close machine*
5. Press "on" button to turn V-Flash on*
6. Wait for game to load
7. Pick up controller*
8. Press "enter" when you see game title*
9. Press "enter" (to game zone)*
10. Move joy stick to "x"/no (continue last game?)
11. Press "enter"*
12. Press "enter" (new game)
13. Press "enter" (level one; one player)*
14. Wait for game to load
15. Play game
16. Move joy stick to "x" (play again?)
17. Press "enter"
18. Press "off" on V-Flash
19. Press power button on TV to turn off

Asterisk indicates a critical step for accessing the game

each activity. Activities included Wii Bowling, Nintendo DS Backyardigans, Power-Joy Joy Stick Galaga, and V-Flash Scooby Doo. The teacher narrated each step as it was completed. Task analyses included steps for accessing (e.g., setting up, starting, getting to game/activity, stopping) each activity. All steps included in the task analyses were videoed; not all were critical in accessing the game (e.g., when playing the Wii, the Wii console could be turned on via step 2, *Press the power button on the Wii*, or step 3, *Pick-up game and insert game disk into Wii*). Accuracy of play was not evaluated in this study; playing the game was included as one step in each task analysis, but not as a critical step. Videos were saved onto a classroom laptop, using Flipshare software (downloaded free from the internet) where they could be viewed anywhere in the classroom. All recreation/leisure materials were selected based on classroom availability and/or donations to the classroom to ensure cost-effectiveness and accessibility.

Response Definition and Data Collection

Dependent measures for all conditions were percent critical steps correctly completed independently for each task analysis. Data were collected using a trial-by-trial format where each step in the task analysis was evaluated. Student responses were scored correct if he/she initiated and correctly completed a step in the task analysis within 10 s of the task direction or completion of the previous step. An incorrect response was scored if the student did not initiate and/or complete a step within 10 s or if the student completed a step incorrectly or out of sequence. The only adult assistance provided during any condition of the study was a task direction to "Play the game" or "Watch [student]." These were not recorded as prompts since they were directing student behaviors (e.g., not watching the video) as opposed to incorrect or no responses. Percent correct was calculated by tallying the number critical steps correctly completed within 10 s, divided by the total number of critical steps, multiplied by 100. Critical steps (denoted by asterisks) were those steps necessary to access each activity.

Experimental Design

A multiple probe design across participants was used to evaluate functional relations between VM and skill acquisition (Gast et al. 2014). Multiple probe designs include a series of stacked, time-lagged A–B designs where pre-intervention data are collected intermittently on all behaviors or conditions (tiers) for all students. Intervention is introduced to one behavior or condition (tier 1) at a time, until mastery criteria are reached. In Fig. 1, the multiple probe of the VM is illustrated in the shaded areas of each tier. To demonstrate a functional relation, it is expected that therapeutic changes in level and trend occur only after intervention is applied.

Students not receiving VM were simultaneously assessed for observational learning during each tier (e.g., student 1 learned to access the Wii via VM, students 2, 3, and 4 had the opportunity to observe student 1 play the Wii). Results of observational learning are illustrated in the non-shaded sections of each tier in Fig. 1. These data were reported as secondary measures, not experimental. Although conclusions about the effects of observational learning can be made, the behavior under experimental control in this study was a result of VM intervention. Visual analysis of data (Spriggs et al. 2014) and Tau-*U* (Parker et al. 2011; calculated using singlecase.org) were used to answer the questions regarding accessing recreation activities via VM. Tau-*U* is an effect size measure used with single case research designs that controls for trends in baseline conditions. Values below 0.66 are considered "weak" effects, values between 0.66 and 0.92 indicate "medium" effects, and anything over 0.92 indicates a "large" effect (Parker and Vannest 2009). Each tier that received intervention was evaluated (possible trends in baseline were assessed prior to calculating Tau-*U*), with individual scores weighted Tau-*U* calculated along with 90 % confidence intervals. Visual analysis of data was used to answer questions about observational learning.

Procedures

General Procedures

Individual trials were conducted daily, when all students were present. Daily instruction was used because (a) students with ASD perform better given set routines and schedules, and (b) students can learn skills directly taught every other day, but observational learning is not likely to occur (Venn et al. 1996). Trials lasted no more than 30 min, including watching the VM and engaging with the activity. Natural reinforcement of playing with the video game was used across all conditions; other tangible reinforcement was not used. A specific task direction was provided for each task (e.g., "It's time to play the Wii!" or "It's time to play the DS."). Inappropriate behaviors were managed per individual Behavior Intervention Plans, which included a hierarchy of behavioral strategies, resulting in mandatory completion of all teacher-directed activities. Although rare, Kevin did engage in elopement behaviors during intervention. During 3 trials of accessing the Wii, Kevin had to be redirected to "play the game" after leaving the recreation/leisure area. Other students did not engage in aberrant behaviors while accessing the games.

Probe Condition

Multiple opportunity probes (Cooper et al. 2007) were conducted one-on-one for all tasks with all participants to determine percent steps they could complete independently. Materials for each task were prearranged; a specific task direction was provided (e.g., "It's time to play the Wii!"). Data were collected for each participant for individual steps on each task analysis. When a task analytic

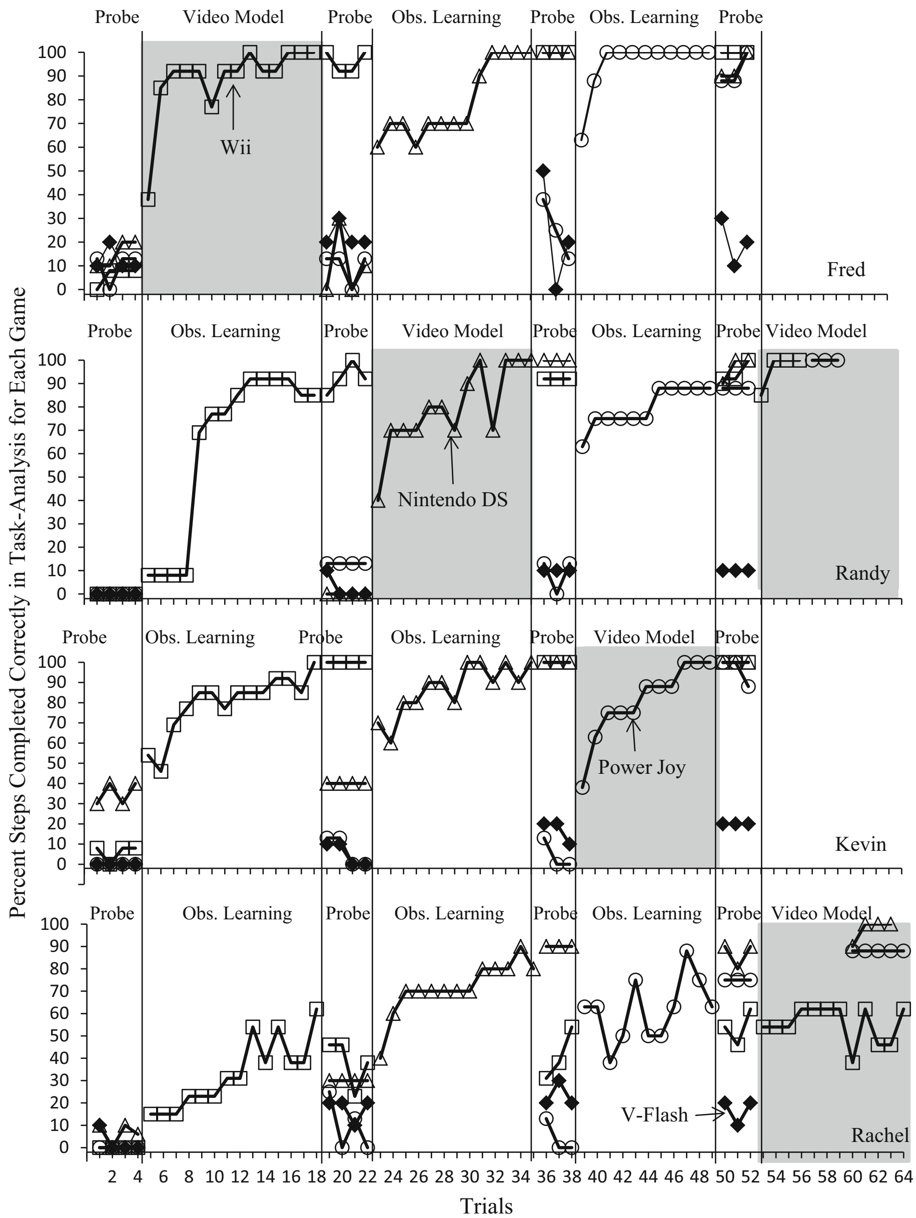

Fig. 1 Percent critical steps completed correctly for each task analysis. *Grey shaded areas* represent trials where video models occurred; observational learning trials occurred without video model instruction. *Open squares* Wii, *open triangles* Nintendo DS, *open circles* Power Joy, *closed diamonds* V-Flash

step was not initiated or completed correctly within 10 s of the task direction or completion of the previous step, the primary investigator completed the step while shielding the student's view. The student had the opportunity to complete each step in the task analysis. VM instruction began for one student after data stabilized for three trials across a minimum of two days across participants.

Video Modeling/Observing Condition

After the last probe trial for all students, VM trials began for one student with one behavior (e.g., Wii) during scheduled recreation/leisure time the following school day. The student was given a specific task direction (e.g., "It's time to play the Wii!"). The student was instructed to sit at a table in the one-on-one learning area, with the teacher, and given the direction "Watch this;" the video was shown. Partitions between the one-on-one learning area and the small group area prevented the other students from watching the video. After the target student viewed the video, all students were brought to the recreation/leisure area to observe the target student. A specific task direction was provided (e.g., "[student 1's name], it's time to play the Wii!"). Post-VM data were collected to assess the target student's immediate ability to complete steps viewed in the VM. If the student failed to correctly complete or initiate a step within 10 s of the task direction or completion of the previous step, the primary investigator completed the step while shielding all students' views (e.g., the learner and the observers). The target student had the opportunity to complete each step in the task analysis. After the target student finished playing, other students were given an opportunity to demonstrate what they observed, following the same guidelines. To assess the observing students accurately, their performance was evaluated one-on-one; all other students were engaged in other activities in the one-on-one learning area where they could not see the activity being performed. Data were collected on each step in the task analysis he/she was able to perform. The order of opportunity to demonstrate accessing the activity for the three observers was randomly counterbalanced with no more than two trials occurring immediately (the 1st demonstration after the peer model) or delayed (the 2nd or 3rd demonstration after the peer model). This allowed all three observers equal difficulty level demonstrations.

Pre-video Model Probe Condition

Following the first VM trial and Post-VM probe, the following procedures were used. Pre-VM probe trials were conducted one-on-one in the morning, not during scheduled recreation/leisure time, across students for the behavior currently being taught (e.g., the Wii). Students not being assessed were engaged in other activities out of sight of the activity. These probes served as "cold" probes to assess student's performance prior to daily instruction. A specific task direction was provided (e.g., "It's time to play the Wii!"); data were collected across students for performance on each step of the task analysis, using the same procedures in the VM/observing condition to complete all steps. All four students participated in Pre-VM probes until mastery criteria, 100 % accuracy on critical steps for three trials for the target student (i.e., the student receiving the VM), were met.

Data were collected during Pre-VM probes and Post-VM probes; mastery criteria were based on Pre-VM performance of the target student (i.e., the student receiving the VM). Three Pre-Video trials of 100 % accuracy on critical steps were required for mastery.

Observational Learning Followed by Video Model Condition

Two students did not reach mastery criteria for one or more game systems that they experienced only via observational learning. Randy did not master the critical steps required to access the Wii and Power Joy, and Rachel did not master the critical steps required to access the Wii, Nintendo DS, and Power Joy. Video modeling on these specific game systems for both students continued after the 4th probe condition (i.e., probe condition following Kevin's mastery of the Power Joy via VM) until mastery criteria were reached or until the end of the school year, whichever came first.

Maintenance

Maintenance probes were collected during probe trials. For example, when tier 3 behaviors reached criterion, tiers 1 and 2 (already mastered) were probed for maintenance.

Reliability

Inter-observer agreement (IOA) and procedural reliability were collected concurrently for 61.8 % of all trials, with a minimum of one collection in each condition for all participants. A paraprofessional trained in data collection procedures took IOA data on student performance and evaluated teacher behaviors using a checklist of expected teacher behaviors. Data were collected in vivo when the primary investigator randomly scheduled reliability checks. Both data collectors were aware that reliability data were being collected, but blind to the data being recorded by each other. Inter-observer agreement was calculated using the point-by-point method where each data point was compared; number of agreements was divided by number of agreements plus number of disagreements and multiplied by 100. Inter-observer agreement data were calculated at 97.1 % agreement. Number of actual teacher behaviors performed was divided by total number teacher behaviors expected and multiplied by 100. Procedural reliability data were calculated at 100 % (i.e., no teacher errors were made).

Social Validity

Social validity measures were collected using multiple formats. At study completion, a Likert scale survey was given to individuals directly involved with students in the study (i.e., parents who did not have the opportunity to observe the intervention and professionals who were in the classroom for at least some of the sessions). Questions were directly related to skills learned and activities engaged in during the course of the study. After students mastered activities, all four were presented; students were instructed to "pick one and play." Results are reported as to which games individual students chose.

Results

Results of individual student performance for each activity are discussed in terms of percent critical steps completed correctly and Tau-*U* effect size for VM. Efficiency data are included and incorporate: trials to criterion for target students and total time to film. Social validity data are discussed in terms of parent and professional opinions and via student preference for activities learned.

Effectiveness of Video Modeling

Analysis of data for all students indicated acquisition of steps necessary to access recreation activities via VM. Tau-U across tiers was 1.00, indicating a strong effect, with a 90 % CI of 0.73 and 1.27. Inter-subject replication for using VM to access recreation skills was obtained; replication for a single activity was not obtained, as students were taught to access different video games and devices. Shaded areas of Fig. 1 depict percent critical steps completed correctly for students receiving VM. Performance on the Wii is denoted by open squares (□), open triangles (Δ) represent performance on the Nintendo DS, performance on the Power Joy is represented with open circles (○), and closed diamonds (◆) denote performance on the V-Flash; all symbols are consistent for the recreation skill being accessed, across students and conditions. Initial probe data were collected for four trials, until data stabilized, across students and activities. Introduction of VM was staggered across participants and activities and was based on target student performance.

Nintendo Wii Video Game

Fred received the VM for the Wii; his percent critical steps completed correctly are depicted in Fig. 1 (open squares). Mean initial probe performance was 2.25 % (ranging from 0 to 8 %), stabilizing at 8 % critical steps completed correctly over three consecutive trials. Upon introduction of VM, Fred's data showed an immediate change in level with an accelerating trend that maintained at or above 92 % for eight consecutive trials. Maintenance trials, where VM were not shown, conducted during trials 19–22, 36–38, and 50–52, show he maintained high levels of accuracy, with a mean of 98.4 % (ranging 92–100 %).

Nintendo DS

Randy received the VM for the Nintendo DS; his percent critical steps completed correctly are depicted in Fig. 1 (open triangles). Mean initial probe data were 0 % for both probe conditions prior to intervention. Upon introduction of VM, Randy's data showed an immediate change in level with an accelerating trend that stabilized at 100 % for three consecutive trials. Maintenance trials, conducted during trials 36–38 and 50–52, show he maintained high levels of accuracy with a mean of 98.3 % (range 90–100 %).

Power-Joy Plug and Play Video Game

Kevin received the VM for the Power-Joy; his percent critical steps completed correctly are depicted in Fig. 1 (open circles). Mean initial probe data were 3.5 % (ranging from 0 to 13 %) for all three probe conditions prior to intervention. Upon introduction of VM, Kevin's data showed an immediate change in level with an accelerating trend that stabilized at 100 % for three consecutive trials. Maintenance trials, conducted during trials 50–52, resulted in high levels with a mean of 96 % (range 88–100 %).

Effectiveness of Observational Learning

All students acquired of at least some steps necessary to access recreation activities via in vivo observation of peers performing the steps. Direct intra-subject and inter-subject replications were obtained. Non-shaded areas of Fig. 1 depict percent critical steps completed correctly for students observing (e.g., for the Wii, students 2, 3, and 4 were observers of student 1). Probe data collected for observational learning mirrored that of VM conditions (e.g., all pre-intervention probe data were collected for three to four trials, until data reached stable or decelerating trends across students and activities). In each tier, students not receiving the VM were included in observational learning opportunities.

Nintendo Wii Video Game

Observational learning of steps to access the Wii were assessed for Randy, Kevin, and Rachel. Results are displayed in non-shaded areas of Fig. 1 (open squares). Students observing the target student demonstrated at least some of the steps performed. Students had immediate increases in level with accelerating trends during intervention. Students maintained similar levels of accuracy in follow-up probes conducted during trials 19–22, 36–38 and 50–52, where they were no longer observing the Wii being played.

Nintendo DS Video Game

Non-shaded areas of Fig. 1 (open triangles) display the results of observational learning performance for Fred, Kevin, and Rachel when accessing the Nintendo DS. Students observing the target student acquired most to all critical steps required to correctly access the Nintendo DS. All students showed an immediate increase in level with accelerating trends during intervention, maintaining high levels of accuracy during follow-up probes.

Power-Joy Plug and Play Video Game

Fred, Randy, and Rachel observed Kevin play the Power-Joy. Results are illustrated in non-shaded areas of Fig. 1 (open circles). Students observing demonstrated learning some to all of the steps necessary to access the Power-Joy. All students had immediate changes in level with variable trend depending on the student.

Effectiveness of Observational Learning Followed by Video Models

Students not mastering activities (i.e., performing 100 % critical steps in a given task analysis) were individually shown VM and performance was evaluated. Shaded areas of Fig. 1 (trials 53–64) illustrate VM performance following prior observational learning opportunities. Randy required VM intervention for two activities; Rachel required VM intervention for all activities. Fred and Kevin mastered all activities, and did not require additional VM instruction.

Randy mastered the Wii after four VM trials (range 85–100 %). Rachel received 11 trials of VM for the Wii following observational learning. Results indicated range performance falling within observational learning alone performance (range 38–62 %) with a mean accuracy of 54.7 %. Rachel mastered accessing the Nintendo DS in four trials (i.e., mean 97.5 %, with three consecutive trials at 100 %). Randy required three trials to demonstrate mastery of the Power-Joy after VM, with a mean and range of 100 % accuracy. Rachel received five trials of the Power-Joy VM with a mean and range performance of 88 %.

Efficiency

Efficiency of intervention was evaluated via trials to criterion and material preparation time. Trials to criterion were evaluated for students receiving VM. Mastery criteria were set at 100 % accuracy of critical steps in each task analysis, over three consecutive trials for the target student (e.g., student receiving VM). Fred mastered the Wii in 14 trials; Randy accessed the Nintendo DS accurately in 13 trials; and Power-Joy trials were mastered by Kevin in 11 trials.

Total task analysis development took 43 min, 48 s; time to video was 44 min, 9 s; time to burn movies to the laptop was less than 3 min.

Social Validity

Social validity was assessed via questionnaires completed by parents and professionals familiar to both students and current study. Questions were scored using a Likert scale format ranging from 1 (strongly disagree) to 5 (strongly agree). Parents agreed that their homes had gaming systems (N = 4; $M = 4$). All parents indicated that prior to participation in the study, their child did not participate in playing the recreation/leisure games at their house ($M = 1.25$) but interest increased at home after involvement in the study ($M = 3.75$). Parents agreed that teaching recreation/leisure skills were important ($M = 4.75$). Parents strongly agreed that VM and observational learning were both important instructional strategies ($M = 5$). Five paraprofessionals who worked in the classroom where the study took place, a Speech and Language Pathologist, an occupational therapist, a Board Certified Behavior Analyst and Randy's teacher (N = 9) all: (a) agreed that teaching recreation/leisure skills to individuals with disabilities is important ($M = 4.7$); (b) strongly agreed that VM and observational learning were important and effective instructional strategies ($M = 5$); (c) disagreed that the study was time consuming ($M = 1.7$); and (d) strongly agreed that the intervention was worth replicating across students and activities ($M = 5$), meaningful to students ($M = 5$), and should be used in the future ($M = 5$). The other participants' classroom teacher did not fill out the social validity questionnaire because she created the questionnaire and served as the primary investigator.

Upon mastery of the activities taught (e.g., Wii, Nintendo DS, and Power-Joy), students were given the choice to "pick one and play." Fred chose the activity learned via VM once (e.g., Wii) and an activity learned observationally twice (e.g., Nintendo DS). Randy chose to play the Wii each time, an activity he mastered after peer observation and VM. Kevin chose the Power-Joy all three times, the game he learned via VM. At study completion, Rachel had mastered one activity, and did not participate in student choice.

Discussion

The purpose of this study was to examine effects of VM on accessing various gaming activities for students receiving special education services under the ASD eligibility and to determine if students could learn those same activities by watching their peers perform the tasks. A functional relation was established between VM and independent access to various gaming devices/video games for three students, and data show observational learning was effective for increasing independently completed steps. Upon study completion, all students were able to independently access one to three age-appropriate video games from various devices and could access all three activities with varying degrees of accuracy. All students learned to perform 100 %

of the critical steps needed to access their video game when receiving VM.

Observationally, all students learned 38–100 % steps necessary to access the activities. This study expands the literature on using observational learning in small group instructional settings for students with ASD, using VM to teach chained tasks, and teaching recreation skills (specifically completing steps to access video games) to students with disabilities.

Observational Learning in Small Groups

Individuals with ASD are often described as having visual preferences, frequently demonstrating strengths processing visual stimuli versus auditory stimuli (Mesibov et al. 1994; Tissot and Evans 2003). Quill (1997) suggested that using visually cued instruction might enhance strengths often associated with ASD in areas of perception, information processing, memory, language, and general intelligence. According to Bandura's Social Learning Theory (1997), most people learn observationally through modeling the actions of others. Visual aspects of observational learning where students are required to watch and then perform via live or symbolic models are ideal for students with ASD (Quill 1997).

Although research evaluating observational learning of chained tasks is limited overall, research including individuals with ASD is even more so (e.g., Tekin-Iftar and Birkan 2010). Collins et al. (1991) list several advantages to small group (as opposed to 1:1) instruction: "(a) teachers can instruct more than one student at a time, (b) less classroom personnel and instructional time… required, (c) students may be prepared to function in less restrictive environments, (d) students may learn to interact appropriately with peers, and (e) students may learn additional information from observing other members of the group" (p. 18). The current study validates many of these advantages to small group observational learning, but future research could evaluate whether students might be better prepared to interact with their peers in inclusive settings as a result of small group interactions.

Video Modeling to Teach Chained Skills and Teaching Recreational Skills

Video models have been effective in teaching students with ASD a variety of chained tasks with most studies focused on chained self-help skills (e.g., Ayres and Langone 2005) or community and/or vocational tasks (e.g., Allen et al. 2010). Only two to date have evaluated VM to teach recreation skills to students with ASD, and results from those studies support similar findings to the current study. For example, Blum-Dimaya et al. (2010) successfully embedded VM to teach three students with ASD to play Guitar Hero, and Sherrow et al. (2015) used VM to teach high school students with moderate intellectual disability and ASD to play the Wii. While the results from using VM were similar to the current study, we also found positive effects for including observational learning, younger students with ASD, and embedded generalization in the form of multiple exemplars of gaming devices and games.

Implications for Practice

The following should be considered when selecting recreational/leisure skills to teach to students: (a) high interest aspects and motivation, (b) appropriate difficulty level and prerequisite skills, (c) methods and programming, and (d) availability. In the current study, the teacher assumed all students would be motivated to access the games in order to play; however, Kevin often screamed, "No" when told, "It's time to play the _____." According to Dattilo and Schleien (1994), the difference between recreation and leisure is the perceived freedom to choose the activities to participate in for fun, with recreation as the activity and leisure as the choice. Teachers should consider allowing student choice of games prior to intervention, as this might increase desire to play and promote the very definition of leisure.

Second, educators should determine prerequisite skills and/or modifications necessary for all students to participate before the intervention begins. In the current study, Rachel was the only participant without computer mouse skills, and had difficulty completing steps for the Wii where excessive hand-eye coordination was required (e.g., moving hand onto correct position to TV and pushing the "A" button). Rachel completed these steps incorrectly or not all, whereas all other students were able to correctly complete these steps. She was able to learn 88–100 % of the critical steps in the other two games, leading researchers to believe that the lack of hand-eye coordination was the most influential pre-requisite skills on her performance for the Wii.

Third, teachers should consider data collection methods, programming VM, pre-determining steps that could be sequentially imperative, and programming for generalization when using VM. In this study, steps that were not sequentially imperative (e.g., it did not matter which cord was plugged in prior to Galaga game selection for the Power-Joy) were scored as incorrect. Similarly, educators may want to program video models for multiple correct responses when needed (e.g., at the point of choosing and playing the game). If typical peers can play the games before teachers create the task analysis, this could show the variety of ways children may access gaming systems. The current study supports the fact that students can be taught to complete the critical steps necessary to access video games in the school setting in response to a specific prompt; however, data suggest the students did not generalize knowledge/skills of accessing one gaming system to another. Teachers should consider programming for generalization across settings, materials, and interaction partners to ameliorate the proximal and context-bound nature of the effects found in the current study (e.g., Yoder et al. 2013).

Limitations

When evaluating results of this study, a few limitations exist. First, only four trials were conducted in the initial probe condition. Although data were stable prior to implementing intervention in tier 1, What Works Clearinghouse suggests a minimum of five trials of stable data in baseline for studies to meet evidence standards (Kratochwill et al. 2010). Authors decided not to require five data points to minimize possible aberrant behaviors due to repeated task demands for skills not already in the participants' repertoire, while establishing a clear level and trend prior to intervention.

Another limitation was probable testing effects; Fred mastered the Power-Joy via observational learning in five trials; Kevin, the student model, required 11 trials. Fred demonstrated accuracy on steps not directly observed via peer observation, and this was likely because after the teacher blocked one of the steps the arrow appeared next to *Press start* on the screen. It is possible Fred learned to complete the step from deducing the information from seeing the arrow placement on the TV.

A third limitation was that while all students performed critical steps necessary to access their targeted recreation activity, data for steps completed correctly during observational learning varied for some students. There are several possible explanations for this. Procedural differences between VM and observational learning opportunities may account for some of the discrepancies. Students receiving VM saw procedurally reliable and narrated demonstrations of accessing the game each time it was viewed; however, when observing peers, they saw non-narrated demonstrations, with and without errors, and missed or out of sequence steps. Such variances could account for the differences in percent critical steps completed correctly for students receiving VM versus students learning observationally. Students not reaching criteria via observational learning were shown VM and performance was assessed. With the exception of Rachel accessing the Wii, students participating in VM increased accuracy.

Fourth, the primary investigator chose participants that met inclusion criteria that attended the school she taught in. All students were eligible for special education services under the ASD label, but none had current cognitive scores or independent confirmation of diagnosis using gold-standard measures (e.g., Autism Diagnostic Observation Schedule).

Finally, the study did not teach the students with ASD how to participate in the video games once they accessed them. Researchers decided that accessing the video games was the first step in determining whether students might want to engage in this recreation activity in the future. In addition, since student choice was not a part of this study, leisure was not directly assessed. This also could have accounted for some of the slight variability seen in the VM sessions. For example, on session 10, Fred selected a game other than bowling in the Wii and in session 32, Randy selected a game other than Backyardigans on the Nintendo DS. Both of these responses were scored incorrect, even though students were technically accessing a game within the gaming system. Had student selection of games within the video games been a part of the intervention, variability may have been decreased.

Future Research Implications

Since most VM studies have not focused on recreation/leisure skills, future studies could consider (a) replicating the current study with additional activities, (b) providing intra-subject replication of VM to strengthen the functional relation between VM and accessing chained recreation activities, (c) including student choice of games to address leisure skills, (d) allowing non-critical sequential errors, which may lead to fewer trials to criterion in the future, and (e) teaching engagement and participation in the games as the next logical steps in this line of research. Future research could evaluate showing the VM to the entire group, still assessing individually. In addition, the inclusion of peers and comparing attending measures could also be useful in future studies.

For example, replicating this study to include typical peers, who already know how to access the activities as in vivo models might provide insight into what or how much students with ASD can learn observationally. Although Ihirg and Wolchik (1984) found no difference in peer versus adult models within VM, having a peer model the skill in vivo, as opposed to observing the peer learning the skill via VM, could increase the procedural reliability of performing the recreation/leisure activity. Together with allowing typical peers the opportunity to facilitate observational learning, social validity could be strengthened if typical students or targeted students selected activities to be taught, as opposed to teacher selection. If peers select games to be played, this would ensure activities are age-appropriate and increase the likelihood typical peers would want to play alongside students with ASD. If target students select games to be played, this would ensure true recreation/leisure activities being learned by each student as per Dattilo and Schleien's (1994) definition. Future research could examine if these opportunities with peers lead to increased interactions between peers and students with ASD during the game.

In addition to the use of peers, future research could also expand the current study to include attending measures. Video-taping students as they receive VM and comparing those to videos of students while they are learning observationally could be useful in determining acquisition differences (e.g., fluency), types of errors, or specific aspects that might be included in one versus the other that seem facilitative or inhibitive.

Conclusions

Results of this study are promising and expand current literature on using VM for recreation skills and for observational learning of chained skills by students receiving special education services under the ASD eligibility. All students were able to learn how to access at least one recreation activity via VM. Using VM as an instructional tool provides multiple benefits and possibilities. Potential portability makes its availability useful across settings, increasing the likelihood of acquisition (e.g., if students are shown the video right before the student is required to perform task) and generalization (e.g., if students can demonstrate the skill in a variety of settings). Usefulness within a classroom setting also makes it ideal. For example, VM can engage multiple children at once, free up the teacher, and provide procedurally reliable demonstrations of the targeted skills.

Although recreation and leisure skills are often taught to adolescents and young adults on the spectrum, children with ASD of all ages can benefit from observational learning both instructionally and socially. When educators are careful to select recreation activities that are age appropriate, meaningful and motivating to the student, and readily available across the students' environments, naturalistic, meaningful social interactions are more likely to occur. VM and observational learning to teach recreation/leisure activities can give students with ASD skills necessary to not only participate with typical peers, but may also foster friendships and acceptance from general education teachers, paraprofessionals, and others.

Acknowledgments This manuscript was prepared from part of a doctoral dissertation completed by Amy D. Spriggs.

Author Contributions AD conceived the study, participated in its design and implementation, analyzed the data, and drafted the manuscript; DG participated in the conceptualization of the study, its design, and confirmed the data analysis; VK participated in revising the final manuscript for critically important intellectual features and confirmed statistical analysis of the data. All authors read and approved the final manuscript.

Compliance with Ethical Standards

Conflict of interest All authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study received IRB approval from the University prior to research being conducted. Parental consent was also obtained. Per IRB approval, participant assent was waived due to cognitive functioning level; parental consent was deemed sufficient.

References

Allen, K. D., Wallace, D. P., Renes, D., Bowen, S. L., & Burke, R. V. (2010). Use of video modeling to teach vocational skills to adolescents and young adults with autism spectrum disorders. *Education and Treatment of Children, 33*, 339–349.

Ayres, K. M., & Langone, J. (2005). Intervention and instruction with video for students with autism: A review of the literature. *Education and Training in Developmental Disabilities, 40*, 183–196.

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bellini, S., & Akullian, J. (2007). A meta-analysis of video modeling and video self-modeling interventions for children and adolescents with autism spectrum disorders. *Exceptional Children, 73*(3), 264–287.

Blum-Dimaya, A., Reeve, S. A., Reeve, K. F., & Hoch, H. (2010). Teaching children with autism to play a video game using activity schedules and game-embedded simultaneous video modeling. *Education and Treatment of Children, 33*, 351–370.

Collins, B. C., Gast, D. L., Ault, M. J., & Wolery, M. (1991). Small group instruction: Guidelines for teachers of students with moderate to severe handicaps. *Education and Training in Mental Retardation, 26*, 18–31.

Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied behavior analysis* (2nd ed.). Upper Saddle River, NJ: Pearson Education.

Coyne, P., & Fullerton, A. (2014). *Supporting individuals with autism spectrum disorder in recreation*. Urbana: Sagamore Publishing LLC.

Darden-Brunson, F., Green, A., & Goldstein, H. (2008). Video-based instruction for children with autism. In J. K. Luiselli, D. C. Russo, W. P. Christian, & S. M. Wilczynski (Eds.), *Effective practices for children with autism* (pp. 241–268). Oxford, NY: Oxford University Press.

Dattilo, J. (1991). Recreation and leisure: A review of the literature and recommendations for future directions. In L. H. Meyer, C. A. Peck, & L. Brown (Eds.), *Critical issues in the lives of people with severe disabilities* (pp. 171–193). Baltimore: Paul H. Brooks Publishing.

Dattilo, J., & Schleien, S. J. (1994). Understanding leisure services for individuals with mental retardation. *Mental Retardation, 32*, 53–59.

Delgado, J. P., & Greer, R. D. (2009). The effects of peer monitoring training on the emergence of the capability to learn from observing instruction received by peers. *The Psychological Record, 59*, 407–434.

Dorwick, P. W., & Jesdale, D. C. (1991). Modeling. In P. W. Dorwick (Ed.), *Practical guide to using video in the behavioral sciences* (pp. 64–76). New York: John Wiley & Sons Inc.

Gast, D. L., Lloyd, B., & Ledford, J. (2014). Multiple baseline and multiple probe designs. In D. L. Gast (Ed.), *Single case research methodology: Applications in special education and behavioral sciences*. Milton Park, Abingdon, Oxon: Francis & Taylor/Routledge.

Gilliam, J. E. (2006). *Gilliam Autism Rating Scale*. Austin, TX: ProEd.

Granic, I., Lobel, A., & Engels, R. (2014). The benefits of playing video games. *American Psychological Association, 69*(1), 66–78. doi:10.1037/a0034857.

Ihirg, K., & Wolchik, S. A. (1984). *Observational learning: Peer versus adult models and autistic children's learning*. Paper presented at the Conference of the Western Psychological Association, Los Angeles, CA (ERIC Document Reproduction Service No. ED 246601).

Kratochwill, T. R., Hitchock, J., Horner, R. H., Levin, J. R., Odom, S. L., Rindskopf, D. M., et al. (2010). Single-case designs technical documentation. Retrieved from What Works Clearinghouse website: http://ies.ed.gov/ncee/wwc/pdf/wwc_scd.pdf

Mesibov, G. B., Schopler, E., & Hearsey, K. (1994). Structured teaching. In E. Schopler & G. B. Mesibov (Eds.), *Behavioral issues in autism* (pp. 195–207). New York, NY: Plenum Press.

Parker, R. I., & Vannest, K. J. (2009). An improved effect size for single case research: Non-overlap of all pairs (NAP). *Behavior Therapy, 40*, 357–367.

Parker, R. I., Vannest, K. J., Davis, J. L., & Sauber, S. B. (2011). Combining nonoverlap and trend for single-case research: Tau-U. *Behavior Therpay, 42*, 284–299.

Quill, K. A. (1997). Instructional considerations for young children with autism: The rationale for visually cued instruction. *Journal of Autism and Developmental Disorders, 27*, 697–714.

Schopler, E., Reichler, R. J., & Renner, B. R. (1986). *The childhood autism rating scale (CARS): For diagnostic screening and classification of autism*. Los Angeles, CA: Western Psychological Services.

Sherrow, L., Spriggs, A., & Knight, V. (2015). Using video models to teach students with autism to play the Wii. *Focus on Autism and Other Developmental Disabilities*. doi:10.1177/1088357615583469.

Solish, A., Perry, A., & Minnes, P. (2010). Participation of children with and without disabilities in social, recreational and leisure activities. *Journal of Applied Research in Intellectual Disabilities, 23*, 226–236. doi:10.1111/j.1468-3148.2009.00525.

Spriggs, A., Lane, J., & Gast, D. L. (2014). Visual representation of data. In D. L. Gast (Ed.), *Single case research methodology: Applications in special education and behavioral sciences*. Milton Park, Abingdon, Oxon: Francis & Taylor/Routledge.

Stansberry-Brusnahan, L. L., & Collet-Lingenberg, L. L. (2010). Evidence-based practices for young children with autism spectrum disorders: Guidelines and recommendation from the nation resource council and national professional development center on autism spectrum disorders. *International Journal of Early Childhood Special Education, 2*, 45–56.

Tekin-Iftar, E., & Birkan, B. (2010). Small group instruction for students with autism: General case training and observational learning. *The Journal of Special Education, 44*, 50–63. doi:10.1177/0022466908325219.

Tissot, C., & Evans, R. (2003). Visual teaching strategies for children with autism. *Early Childhood Development and Care, 173*, 425–433.

Venn, M. L., Wolery, M., & Greco, M. (1996). Effects of every-day and every-other-day instruction. *Focus on Autism and Other Developmental Disabilities, 11*, 15–28.

Yoder, P. J., Bottema-Beutel, K., Woynaroski, T., Chandrasekhar, R., & Sandbank, M. (2013). Social communication intervention effects vary by dependent variable type in preschoolers with autism spectrum disorders. *Evidence-Based Communication Assessment and Intervention, 7*(4), 150–174.