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ORIGINAL ARTICLE

Video Self-Prompting and Mobile Technology to Increase Daily Living and Vocational Independence for Students with Autism Spectrum Disorders

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Abstract Three male high school students with autism spectrum disorders participated in this study. Vocational and daily living skills were taught using video prompting via an iPhone. Specifically, using a washing machine, making noodles, and using a copy machine were taught. A multiple probe design across behaviors replicated across participants was used to evaluate the effectiveness of the intervention. Results indicate that the three participants increased performance across all behaviors by increasing the percent of steps performed independently. This study introduces a novel approach to using instructional video, in that two of the three students were able to learn how to self-prompt with the iPhone and ultimately teach themselves the target skills. Maintenance probes were also conducted and the iPhone had to be returned to all three participants for two out of three behaviors for a return to criterion levels. In addition to study limitations, implications for practice for video self-prompting are discussed.

Keywords Video prompting · Self-Prompting · Autism · Daily living skills · Vocational skills · Technology

Video modeling has been effective in teaching functional, social, and behavioral skills to individuals with autism spectrum disorders (ASD; Ayres and Langone 2005; Bellini and Akullian 2007). According to Bidwell and Rehfeldt (2004), video instruction is a more efficient means of instruction, in which several learners can benefit at one time. Video instruction may be an effective intervention because it combines observational learning and imitation of observed behaviors (Clark et al. 1992). Video modeling also provides the opportunity for learners to repeatedly watch the model behavior and requires minimal staff training (Bidwell & Rehfeldt).

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Additionally, cost and time are often constraints in education programs regarding community based instruction and naturalistic teaching. Video instruction can provide natural stimuli and opportunities to respond through technology, and can be time and cost efficient. In addition, there are occasions when teaching skills in vivo with a live model might be undesirable because of the necessity of improperly modeling some aspect of the behavior. For example, if a teacher has only one stove at his or her disposal and wants to model turning on the stove and then ask the student to imitate the model, the teacher has to turn on the stove and then turn off the stove in order for the student to have an opportunity to imitate. The undesirable consequence of this is that the student may imitate the entire sequence. That is, he/she would turn on the stove just as the teacher did and then turn it off. Using video technology may obviate this possibility.

Video instruction can include video modeling (VM) and/or video prompting (VP). VM is defined as the viewing of a video of a peer or instructor successfully performing a chained task that participants are required to view at the beginning of each training session (Legrice and Blampied 1994). VP is defined as the viewing of video to watch a model perform steps of a task; however, the student does not watch the entire task, rather he/she watches specific steps as needed (Cihak et al. 2006). Previous research involving video instruction for individuals with ASD has been highly effective (Ayres and Langone 2005; Shukla-Mehta et al. 2010). One possibility for this is that many individuals with ASD have strong visual processing abilities (Quill 1997). In addition, some students with ASD tend to over-select irrelevant features during instruction (Shipley-Benamou et al. 2002), and video instruction can zoom in on the relevant stimuli needed to complete a task (Ayres and Langone 2005). Lastly, children and adolescents with ASD are often highly motivated by television and videos, retelling and echoing phrases heard, therefore learning through video instruction can be reinforcing in itself (Mechling 2005).

Recent trends in research have included the use of portable video instruction to teach daily living and vocational skills to individuals with developmental disabilities, including ASD. Portable devices used to display video models and/or prompts have included portable digital video disc (DVD) players (Mechling et al. 2009a), laptop computers (Bidwell and Rehfeldt 2004; Cannella-Malone et al. 2006; Rehfeldt et al. 2003; Sigafoos et al. 2005, 2007), video iPods (Cihak et al. 2010; Kagohara 2011; Kagohara et al. 2011; Van Laarhoven et al. 2009), handheld personal digital assistant (PDA) devices (Cihak et al. 2007), and portable augmentative and alternative communication (AAC) devices (Mechling et al. 2009b).

Cihak et al. (2007) recognized that handheld devices are not only portable, making them easy to take into the community, but they also blend into the environment. Cihak et al. continue to praise the use of commercially produced handheld devices, as opposed to a device that is custom designed for an individual with a disability. Mass-produced, commercially made devices are not only less expensive; they are frequently used by individuals without disabilities, therefore making them natural and socially acceptable.

As mobile technology saturates society, identifying new ways for individuals with disabilities to use the technology can potentially lead to greater independence. In 1964, when Ogden Lindsley discussed creating a “prosthetic environment” to help eliminate barriers for individuals with disabilities, he touched on the idea of not only improving the environment but also providing specific prosthetic supports and training to these individuals. In the current investigation, we essentially provide a prosthetic device (iPhone) and training to help the participants become more independent. In doing so, we link together many of the elements of self-determined behavior, including; self-instruction, self-efficacy, and independence.

The current study addressed two research questions related to video prompting to teach individuals with ASD. First, will students with ASD learn to use an iPhone as a video self-prompting tool to teach themselves vocational and independent living tasks? Second, will students with ASD learn to independently complete daily living and vocational tasks when using video prompting? The study furthered the evaluation of handheld commercially designed devices as an effective teaching tool for individuals with ASD.

Method

Participants

Three male participants between the ages of 15 and 18 years diagnosed with ASD participated in the study. All participants were served in a self-contained class for individuals with moderate ASD at a public high school in an urban school district. Participant selection criteria included: IEP goals related to daily living, self-help and vocational skills, generalized motor imitation, ability to attend to a short video segment, and adequate vision and hearing as demonstrated by passing the school system's hearing and vision test.

Aaron was an 18 year 6 month old Asian-American male. The following test results were taken from his most recent psychological exam conducted in February 2001. Results of the C*hildhood Autism Rating* Scales (CARS; Schopler et al. 1986) reported a standard score of 41, which placed Aaron in the "severely autistic" range. The *Wechsler Intelligence Scale for Children III* (WISC-III; Wechsler 1991) indicated an IQ of 68, which indicated a mild intellectual disability. The *Psychoeducational Profile- Revised* (PEP-R; Schopler et al. 1990) reported a developmental age of 3 year and 10 months. Aaron had a dual diagnosis of ASD and speech-language impairment (SLI), for which he received speech services. Aaron had high receptive language ability, but rarely initiated communication and often replied with one-word utterances when prompted. He followed directions and tasks when embedded in a written schedule and enjoyed completing tasks once the skill was learned. Aaron had a behavior intervention plan in place for aggressive behaviors (i.e. hitting), but at the time of the study, they were at relatively low levels. Prior to the study, Aaron's familiarity with technology included playing games on the computer and typing with a visual prompt.

Mike was a 15 year 5 month old African-American male. Mike's most current psychological exam was conducted in September 2008. The *Gilliam Autism Rating Scale* (GARS; Gilliam 1995) reported an autism quotient of 72, which placed Mike in the "possibly" range of probability for autism. The *Reynolds Intellectual Assessment Scales* (RIAS; Reynolds and Kamphaus 2003) reported an overall score of less than 40, which placed Mike in the "severely below average" range. The *Adaptive Behavior Assessment System II* (ABAS II; Harrison and Oakland 2003) was also conducted. An overall score of 40 was reported, placing Mike in the very low range of functioning related to adaptive behavior. Mike received speech services for his diagnosis of SLI, along with occupational therapy (OT) to address fine motor deficits. Mike was extremely social and often liked to talk about super heroes and comic books. He also demonstrated relative strengths in receptive communication and could follow 2–3 step directions. Mike had a short attention span and often required prompting to stay on task. Like Aaron, he played games on the computer and could type with visual prompts.

Hugh was a 15 year 5 month old Caucasian male. Hugh's most recent psychological exam was conducted in August 2010. Hugh scored in the "possible" range of probability for autism on the GARS (Gilliam 1995), with a reported score of 91. The *Developmental Profile-III* (DP-3; Alpern 2007) indicated an IQ equivalence of less than 40 and an average developmental age of 3 years 7 months. The ABAS II (Harrison and Oakland 2003) reported an overall score of 43, placing Hugh in the very low range of functioning related to adaptive behavior. Hugh received speech and OT services. Hugh worked well for reinforcement and was able to navigate to destinations independently. He had limited functional communication, but could answer yes/no questions. Like Aaron, Hugh had a behavior intervention plan, but his behaviors were less aggressive and more disruptive in nature (i.e. throwing objects). He had a seizure disorder, which was managed with medications. With technology, Hugh used a touch screen to navigate the computer and play games. He was also learning how to type using visual prompts.

Settings

Sessions took place in the school living center and the teacher workroom. Daily living skills were taught in the high school living center, which was used for cooking and general home living skills. The room was 50 ft × 15 ft. and contained a long table and chairs, a pull-out couch, 2 refrigerators, electric stove, dishwasher, sink, washing machine, and dryer. A microwave and toaster were arranged on the counter to the left of the sink. Cabinets were above and below all counter top space and contained dishes, various appliances, cleaning supplies, and non-perishable food items. Drawers under the countertops contained utensils used for cooking. During probes on laundry, the iPhone was placed on top of the dryer, which was located directly left of the washing machine. During probes on cooking, the iPhone was located to the right of the microwave and to the left of the supplies needed to cook. During both daily living conditions, the data collector stood behind and to the right of the participant. The reliability data collector stood behind and to the left of the participant. All data collectors were able to see the participant perform all steps and had a clear view of the video prompts delivered on the iPhone.

Vocational skills were taught in the teacher workroom, which was used for department planning and making copies. The room measured 40 ft × 15 ft and contained a conference table, two couches, a scanning printer, and an office size copy machine. During probes on copying, the iPhone was placed to the right of the keypad, on top of the cut out for paperclips. The data collector stood behind and to the right of the participant and during reliability sessions, the reliability collector stood behind and to the left of the participant. All participants other than the one engaged in the session were in other classrooms working.

Materials and Equipment

iPhone An iPhone 3 G (running iOS 4.2.1) was used to deliver video prompts for the targeted behaviors. Students were taught to touch the screen using their index finger only. The instructional videos were uploaded on the iPhone, under the iPod application. Prior to a session, the correct video was selected and readied for the participant to press the play button. The iPhone was used with a horizontal screen to space out the back, play/pause, and forward buttons, as well as left the buttons on the screen. In the vertical position, these buttons fade off the screen within a few seconds of not being used.

Videos Video recordings were made using a digital video camera, which were then uploaded onto a computer for editing. Videos were filmed using an adult model and shot from the performer's perspective—point of view video modeling (Cihak and Schrader 2009). At the start of each step, a single word to describe the step was displayed on the screen (e.g., the screen displayed "TURN"). Following this, a video clip of the step to be performed with a built in audio description of the action required was played (e.g., video of a hand turning the dial to the correct place while the audio played "turn the dial to setting for regular"). After the video clip with audio was played, the screen displayed a red octagonal stop sign, with audio that said, "stop." The participants were taught to press the pause button once the stop sign appeared on the screen. After pausing, the participants completed the step that was just shown on the video. Once participants completed the step, they pressed play on the screen to go onto the next step. This pause and play combination was repeated across all steps of all three tasks.

Task Materials Prior to each session, the necessary materials were pre-arranged. The materials used for doing the laundry were a circular basket half-full of clothes and/or towels and a bottle of *All* liquid detergent with a screw on cap. During the copy machine sessions, the participants were given a single page to be copied and a small, yellow slip that read, "To be copied; Quantity: ______". The quantity was filled in by hand with the number 3. For cooking sessions, a package of chicken or beef *Ramen* noodles, a bowl, a fork, scissors, two potholders, and a one-cup measuring cup were displayed on the counter beside the microwave.

Response Definitions and Data Collection

Prior to the beginning of the study each of three tasks (using a washing machine, making noodles, and making copies) were task analyzed into multiple steps (see Table 1). Across all conditions, participants' responses were recorded as correct or incorrect on each step of the task analysis. A correct response was defined as initiating the next step within 5 s and completing the step within 10 s after pausing the video. An incorrect response was defined in four different ways. If the student did not initiate a response within 5 s, it was scored as latency error or no response. If the student initiated a correct response within 5 s but failed to complete the step within 10 s it was considered a duration error. If the student completed a step out of order according to the task analysis, it was considered a sequence error. Lastly, if a student initiated a response within 5 s but failed to complete the step correctly it was

Table 1 Task analysis for target behaviors

Using a washing machine	Making noodles	Using the copy machine
1. Turn dial to setting for regular wash	1. Break up noodles in package	1. Place paper face up on copy tray
2. Pull dial to start running water	2. Use scissors to cut open noodle package	2. Press five
3. Open the door	3. Pour noodles into bowl	3. Press four
4. Take off cap of detergent	4. Take out flavor packet and put on counter	4. Press five
5. Pour detergent into cap	5. Get one cup of water	5. Press enter
6. Pour detergent into washer	6. Pour water into bowl	6. Point to quantity on small paper
7. Put cap back on detergent	7. Open microwave	7. Enter quantity in machine
8. Put detergent on counter	8. Put bowl inside and close microwave	8. Press start
9. Put clothes into the washer	9. Press “stop/clear”	9. Pick up original copy from tray on top
10. Close door	10. Press four	10. Pick up new copies from tray on left
	11. Press one	
	12. Press zero	
	13. Press start	
	14. When microwave beeps, open microwave	
	15. Use both hands to grab potholders and take out bowl	
	16. Use scissors to open flavor packet and pour into bowl	
	17. Get fork and stir noodles	
	18. Throw noodle and flavor packet in trashcan	

considered a topographical error. The number of correct responses was then divided by the total number of steps in the given task analysis to calculate a percentage of correct responses.

The three tasks were selected based on the participants’ identified need for obtaining the skills within their IEP. Transition plans for all three students addressed exploring various vocational options and participating in vocational skill acquisition in the school building. Specifically included in their plans were office work (making copies), laundry services (using a washing machine), and completing routine chore lists at home that included washing clothes. Two participants had transitions goals related to planning and assisting in preparing a meal weekly (i.e. making noodles) and Mike specifically has a transition goal to learn how to use the microwave to make a meal or snack.

Experimental Design and General Procedures

The study used a multiple probe across behaviors design replicated across three participants (Gast 2010) to evaluate the effects of video prompting on skill acquisition (two students used video self-prompting, one student used video-prompting). The tasks were performed individually by all three students while using the iPhone. One daily living or vocational task was completed during each session and 1–2 sessions were conducted each day per student. The order in which the students were taught the skills was counterbalanced across students. Prior to performing the tasks using the iPhone, data were collected on performance for each daily living or vocational task without the use of the iPhone. This baseline condition was followed by the use of the iPhone on the first set of tasks. Criteria for beginning intervention on the next behavior was initially set at 100% across three consecutive sessions. However, criteria were lowered to a minimum of 90% for at least three sessions because of task difficulty and because, one student, Aaron had found a faster way to complete his task while skipping a step. This change in criteria did not impact experimental control because in all cases there were clear changes between baseline responding and responding in intervention before the conditions were changed for subsequent behavior. When criterion was met for a behavior, probe measures were collected across all three tiers. These data functioned as maintenance probes for previously mastered tasks and baseline probes on those that had not yet received intervention. This pattern continued until all three tasks were taught using the iPhone and criterion was met across all behaviors.

History Training

Students were taught to use the iPhone prior to the baseline sessions. Students were presented with a novel task in which they could not predict the next step (simple assembly task). Since the participants had no history with the task, the only option was to refer to the iPhone for prompting. This task consisted of assembling various color magnets to magnetic balls in a specific color order. The researcher modeled the use of the iPhone with the task to the participants. The instructor also narrated what they were doing while performing the task. For example, the iPhone would be preset on a training video, just as it would be during intervention conditions. The researcher would say, “press play,” while pressing the play triangle on the iPhone. After pressing play the teacher would comment, “watch the video,” as the video prompt began to play. At the completion of the clip, the instructor said, “wait for the stop sign,” as the stop sign was displayed on the screen, “and press pause,” and the pause button was pressed on the iPhone, and “do the step” as the instructor performed the previously modeled task. This was repeated for the entire length of the training video followed by the participants practicing use of the iPhone with the skill. Errors made while using the iPhone were interrupted and verbally prompted with the phrases mentioned above.

Training videos were used until the participant was performing the task using the iPhone with no verbal prompts from the instructor. One participant, Hugh, did not have the fine motor coordination to press the play and pause buttons (placed in-between skip backwards and skip forwards buttons) and became easily frustrated with the task. The decision was made for the instructor to control operation of these features on the iPhone during Hugh’s intervention conditions, which would still allow evaluation of video prompting. There would still be six opportunities to demonstrate effects for video self-prompting as well as three for teacher directed video prompting.

Baseline/Probe Conditions

Once Mike and Aaron learned to use the iPhone and the decision was made to use teacher directed prompting with Hugh, each student was evaluated on their ability to perform the steps of each task without any prompts. Each task was evaluated during a minimum of three sessions, or until baseline data stabilized. Multiple opportunity probes were used to allow students the chance to respond for each step of a task analysis (Cooper et al. 2007). If a student failed to initiate a response and/or started to perform the step incorrectly, the researcher interrupted, the participant was turned away from the task, the researcher completed the step, and the student was then given the opportunity to complete the next step in the sequence. Trials began by placing the student in front of the needed materials and given the verbal directive to complete the task (e.g., “Time to do the wash”). The instructor waited 5 s for the student to initiate the first step and 10 s for the student to complete the step. The participant could initiate a correct response within 5 s, initiate an incorrect response within 5 s, or fail to initiate a response at all. Student attention was reinforced with verbal praise on an average of every third step (VR-3). When the noodle preparation was complete, the student could choose to eat the noodles or not.

Maintenance

Maintenance probes were identical to baseline probes in that students were not provided access to the iPhone. When performance deteriorated below criterion level performance for mastered tasks, students were allowed to again use the iPhone as a support to evaluate whether their performance would rebound.

Video Prompting/Self-Prompting

The participants were given the iPhone, already turned on, and set to play the video for the targeted task. This screen was black with a play, forward and rewind buttons at the bottom. The instructor gave a verbal task direction, “Touch play to start doing the wash.” The participant then touched the screen and a single word was displayed describing the step followed by the video with audio description for the first step. At the end of the step, the video displayed a stop sign; this was indication for the participant to press the pause button. After pushing the pause button, the student was expected to imitate the behavior on the video clip. The only exception was that the researcher manipulated the play and pause buttons at the appropriate times for Hugh. No other prompting was provided.

If a student completed an incorrect response, his view of the task was blocked, the instructor completed the step, and then prompted the student to press the play button and advance to the next step. Some responses were not correctable, however the same measures were taken to interrupt the incorrect response; block, and prepare for the next step. For example, during laundry sessions, step four (take off cap of detergent) was completed, and the participant had the opportunity to complete step five. Instead of pouring the detergent into the cap, the student poured the detergent directly into the washing machine. Even though the action could not be undone, the response was marked incorrect, the participant was turned around, and the researcher poured the detergent into the cap and turned the participant back around to complete the next step in the task analysis. Students received descriptive verbal praise (e.g., “Nice job turning the dial”) for correct responses on an average of every third step (VR-3). When the noodle preparation task was complete, the student could also choose to eat the noodles or not.

Reliability

Reliability data were collected simultaneously on dependent and independent variables for an average of 21% of all baseline and intervention sessions for all participants. Inter-observer agreement (IOA) data on the responses during the task were calculated using the point-by-point method by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100 (Ayres and Gast 2010). There was total mean of 99% agreement for correct responses during all conditions, across all participants. Baseline conditions ranged from 92% to 100% (mean 98%) and intervention conditions were all at 100% agreement for all participants. It should be noted that, IOA was not taken for using a washing machine during baseline conditions for Mike. This is because the second observer (a classroom teacher) was unavailable. Discrepancies in IOA were due to marking a response as incorrect versus no response when the participant answered at or around the 5 s latency mark (with percentage of correct responses being the variable graphed, this discrepancy would not have influenced decisions about the effect of the independent variable).

Procedural reliability data were collected by calculating the number of observed researcher behaviors divided by the number of planned researcher behaviors multiplied by 100 (Gast 2010). These data were collected on the same sessions in which IOA data were collected. Procedural reliability data were recorded for the following instructor behaviors: (a) no adult prompts provided during baseline, (b) participant positioned correctly during all sessions, (c) task directive provided, (d) participant given 5 s to initiate a step, (e) participant given 10 s to complete each step, (f) correct movie on iPhone selected prior to start, (g) correct materials available, and (h) if an error was made, the student was turned away, teacher completed step, and student was repositioned. For the purposes of this study, the participant was positioned correctly (behavior “b”) if the participant’s head, shoulders, hips, and feet were in line facing the materials and he was in arms reach to the materials. Mean procedural reliability was 99.6% across all conditions and students (range=91–100%). The only procedural error made during the course of the study included the fork not being available on the counter during a making noodles session.

Results

The percentages of steps performed correctly by each participant across each behavior are represented in Figs. 1, 2, and 3. Each participant was able to perform a few steps of the various behaviors prior to intervention with the iPhone. Overall, baseline remained stable with the exception of Aaron during the second session of making noodles. The session was ended after step 13, due to an escalation of aggressive

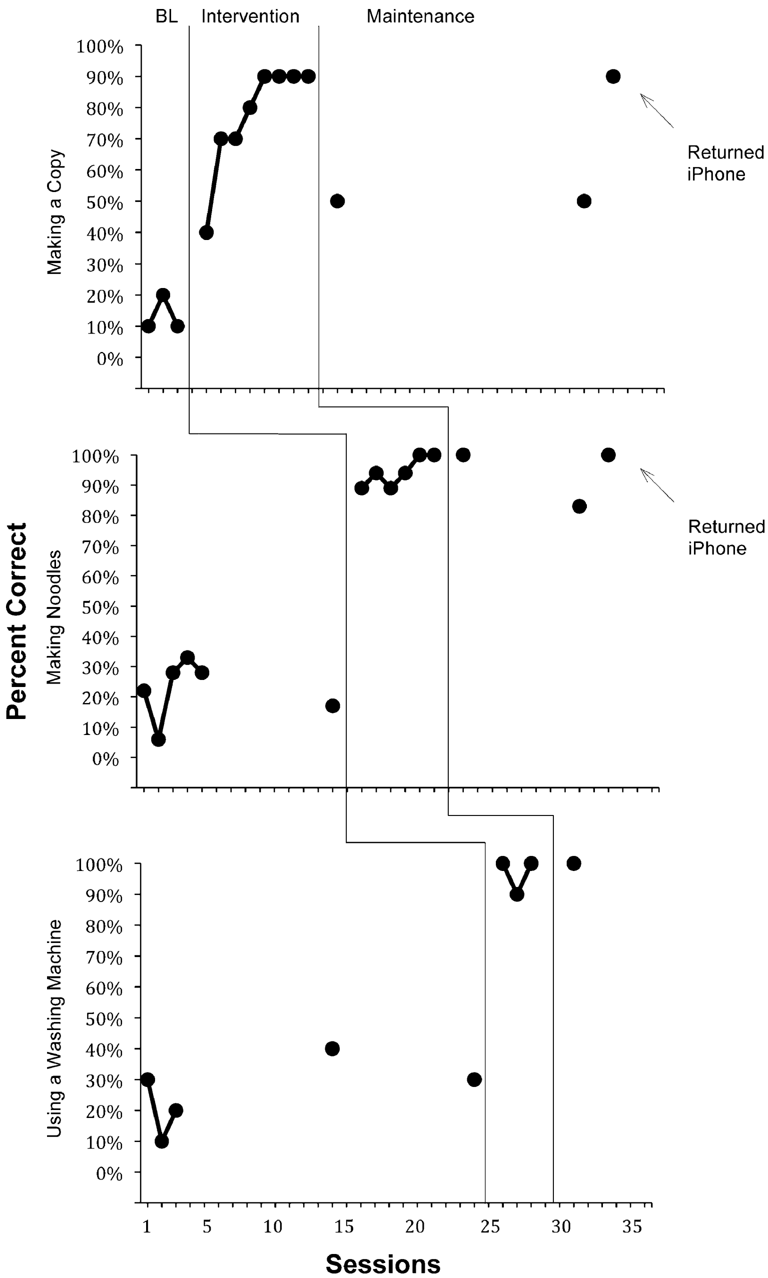

Fig. 1 Graph depicting percent of steps performed correctly by Aaron during baseline, intervention, and maintenance across three behaviors

behavior and elopement from the setting. The percentage reported is the number of correct steps performed before he eloped. Visual examination of the graphs demonstrates immediacy of effect across all behaviors for all participants upon introduction of the video modeling procedure. As shown in each graphic display, there was 100%

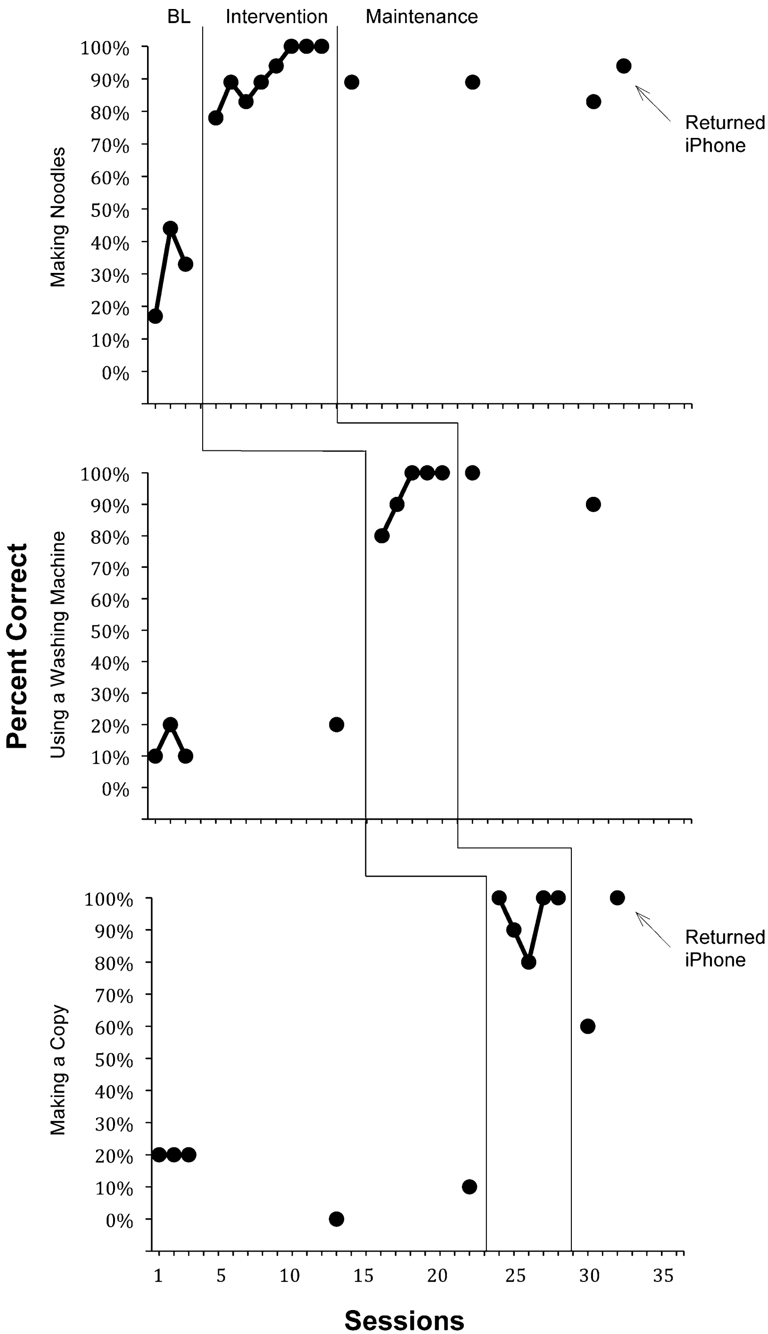

Fig. 2 Graph depicting percent of steps performed correctly by Mike during baseline, intervention, and maintenance across three behaviors

non-overlapping data (PND). These two effects strengthen the argument that video prompting using an iPhone was responsible for the change in behavior seen in teaching daily living and vocational skills to adolescents with ASD. Upon withdrawal

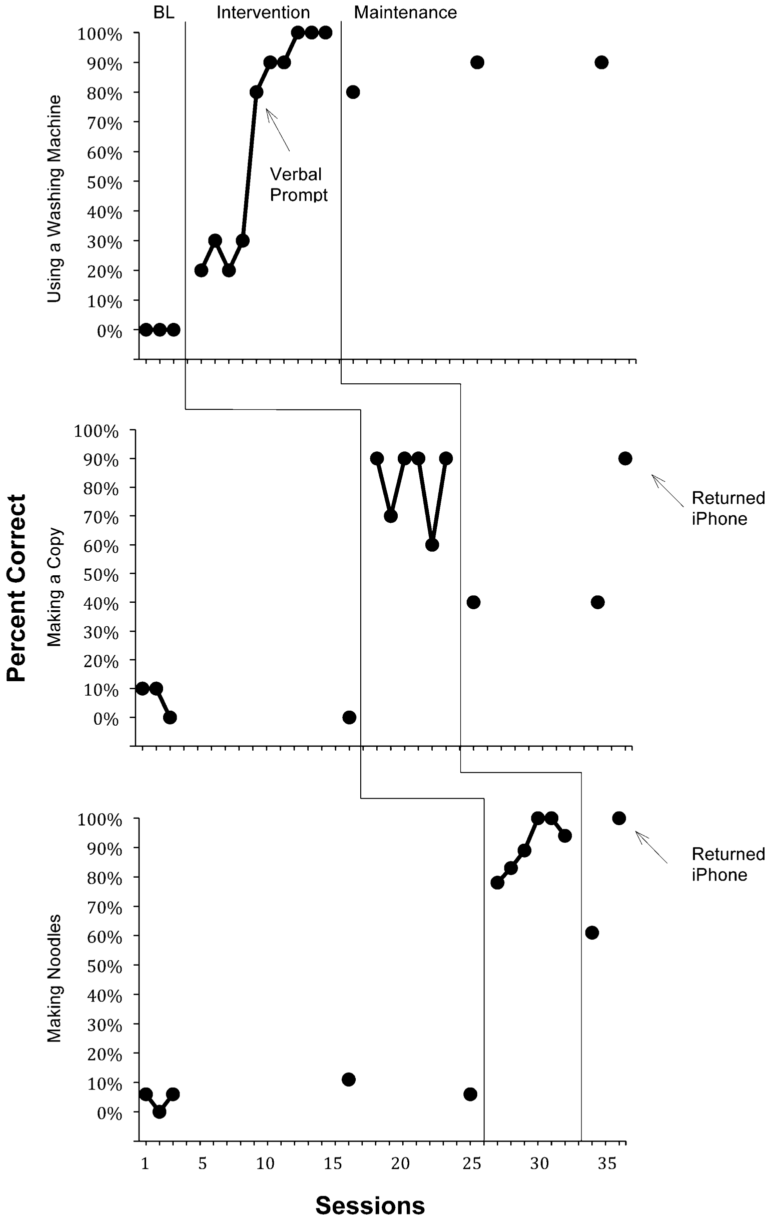

Fig. 3 Graph depicting percent of steps performed correctly by Hugh during baseline, intervention, and maintenance across three behaviors

of the iPhone, all of the participants decreased performance when making a copy and making noodles. Topographical or latency errors were made when the participants were to key a number into the copy machine or microwave. The iPhone was reintroduced at the completion of the study to bring the skills back up to criteria.

Aaron averaged 13% of steps correct during the first baseline condition and immediately increased to 40% correct upon intervention. Correct responding averaged 79% independently correct across intervention sessions (refer to Fig. 1). It took Aaron 7 sessions to reach criteria on his first behavior, making a copy. Aaron's second condition, making noodles took 5 sessions in intervention to reach criteria. Correct responding averaged 23% during baseline sessions and increased to a mean of 96% with the use of the iPhone. It should be noted that Aaron's average baseline during this condition includes the elopement session in which Aaron performed 1 of 13 steps correct before the session was ended. During Aaron's final condition, using a washing machine, correct responding averaged 26% during baseline and increased to an average of 98% during the 3 sessions it took to reach criteria.

Mike demonstrated an immediate and abrupt change between baseline and intervention conditions for all behaviors (refer to Fig. 2). Mike's first condition, making noodles, took the most amount of time, 7 sessions to reach criteria. Baseline data for correct responding averaged 31% during the 3 sessions and increased to a 92% average during the iPhone intervention. Correct responding during the using a washing machine sessions increased from a mean of 15% in baseline to 94% during intervention and took 4 sessions to reach criteria. During making a copy, Mike's final condition, correct responding averaged at 14% during 5 baseline sessions and increased to a mean of 94% in the 5 intervention sessions.

Hugh continually performed 0% of the steps correctly during baseline of his first condition, using a washing machine (refer to Fig. 3). Upon intervention, Hugh was slow to acquire the steps. Researchers hypothesized that Hugh was not accustomed to the video prompting and was relying on teacher confirmation to perform the necessary steps. During the fifth session of the intervention phase, an additional verbal prompt from the instructor was given after the video prompt. Once the instructor pressed the pause button after the first step in the task analysis, the instructor said, "Now you do it. Turn the dial to setting for regular wash." This additional prompt was also given for the fifth step in the using a washing machine task analysis. This was the only session in which verbal prompts from an instructor were provided. When Hugh had use of the iPhone he averaged 66% of steps correctly and took 8 sessions to reach criteria. The second behavior, making a copy, he reached criteria in 4 sessions and increased from an average baseline of 5% to 83% when using the iPhone. The final condition for Hugh, making noodles, took 6 sessions to reach criteria and correct responding rose from a baseline of 6% to 92% using video prompts via the iPhone.

Discussion

Results from this study support use of an iPhone as an effective self-prompting device to teach daily living and vocational skills to adolescents with ASD. Although they are promising, these results cannot yet be generalized across the entire ASD population without more research. Although similar to previous studies evaluating the use of mobile technology for video self-prompting (Van Laarhoven et al. 2009), this study is the first to look at specifically using a mobile phone to self-prompt students through chained tasks. This study also supports the literature on using visual prompting as an effective intervention for the individuals with ASD (Shukla-Mehta et al. 2010). To satisfy the evidence standards of the What Works Clearinghouse (WWC; Kratochwill et al. 2010) the research must establish at least three demonstrations of effect at three points in time. The current study documents six demonstrations of effect (at six points in time) when each individual with ASD controlled the iPhone (three for Aaron and three for Mike) and three demonstrations of effect when the researcher controlled the iPhone for the individual with ASD (Hugh). Since the instructor controlled the device for Hugh, he was not independent when performing the targeted behaviors. The study would meet the WWC design standards with reservations because fewer than five data points were collected during baseline conditions.

Aaron demonstrated a gradual increase of performance in the first intervention condition, which could have been due to his lack of experience using video prompting. He continued to increase performance with further exposure to the iPhone, and demonstrated immediate and abrupt level changes for the subsequent behaviors. During intervention sessions for making a copy, Aaron never completed the step for pointing to the quantity on the small paper. It could be argued that this is not a critical step in the task analysis, as Aaron was able to obtain the same result by looking at the small paper and then keying in the correct quantity in the copy machine (step 7). Changing the copy quantity could have strengthened the study, to see if the participants could generalize and correctly enter different numbers.

This study demonstrated that some skills decreased when the student did not have access to the iPhone. It can be argued that this technology does not need to be faded. Society often relies on directions and manuals to refresh their memory on ways to complete various tasks. Further research is needed to describe effective techniques for self-fading prompt levels and ways to teach students to access certain steps in chained tasks. For example, if the prompts faded to only sound clips, the individuals could work while wearing headphones with the iPhone hidden in a pocket. These skills will benefit individuals with ASD in employment opportunities, so they can efficiently and effectively follow through with various tasks without the assistance of others (Mechling et al. 2009a, 2009b). From a practical standpoint, tools like this could benefit employees who may need to be trained on tasks that are required as part of a job but performed infrequently. Once they learn how to use the self-prompting supports and are taught to mastery on the skill, continued access to the supports would allow them to perform work duties without retraining by other staff.

Although social validity was never formally assessed in the study, the participants demonstrated interest in the iPhone in a number of ways. Mike would boast to other teachers in the school that “the iPhone was his teacher,” and mentioned that he was going to ask for an iPhone for his birthday. Mike’s mother mentioned that he was glad to see Mike using the same technology that his older sisters use and that is makes him feel “cool.” Aaron would stand up immediately when the researcher entered the classroom and look for the iPhone. When asked if he liked to work with the phone or by himself, he replied, “phone.” For Hugh the task of manipulating the iPhone seemed frustrating because of fine motor difficulties, but when he was not required to use the iPhone to self-prompt, no frustration was evident.

Limitations

There were various limitations to the study. The researcher did not collect generalization or maintenance data beyond a limited number of maintenance sessions after the iPhone was withdrawn. Generalization and maintenance are important to assess to make sure the behaviors are durable over time and under a variety of conditions (Cooper et al. 2007). It would be beneficial for these skills to generalize to various environments (e.g. home and work settings) and with an array of materials (e.g., different washing machine, copier, microwave). Specifically with making a copy, the number was always “3”. Future researchers may want to look at programming for generalization for certain parts of the task to mimic what the participant may come into contact with in the natural setting. Overall, replication of the study should include procedures to address maintenance and generalization of skills.

Data were not collected during history training on the participants learning to operate the play and pause buttons on the iPhone. This is a limitation to this study and future researchers may want to explore this experimentally for participants like Hugh. In addition, participants in this study were only required to use the buttons to control the video to self-prompt. Future researchers may want to look at training individuals to operate the device from the beginning, including discriminating the corresponding video for the task being asked to perform. Obtaining these skills will allow individuals needing training on daily living skills to become more independent in accessing video models/prompts on mobile devices.

Future research may wish to test a different interface to use than the one used in this study. An embedded pause button following a video clip would allow the individual to start performing the skill immediately without having to wait to press pause. Also, skip forward and backwards buttons would allow individuals to go back to a step they did not understand the first time, or skip steps already completed without having to watch a corresponding video.

Two other limitations with this specific study should be noted. First, IOA was not collected for Mike during baseline. This was because of unavailability of the second observer, who was unable to leave his classroom. Secondly, criteria for mastery were changed after the study began. Initially it was set at 100% across 3 consecutive sessions and was later changed to 90% independent. While it does not appear that the change affected the experimental design or analysis of a functional relationship between the independent and dependent variables, the change should be noted.

Implications for Practice

The use of an iPhone for video prompting appears to have benefits in the classroom and across community environments. This portable device is readily available and fairly inexpensive compared to technology that is custom designed for an individual with a disability. Additionally, once a student is taught to use video prompts delivered through an iPhone, the procedure can be applied across a wide realm of skills. Practitioners may find that this technology, which is consistent across trials and instructional sessions, may further reduce teacher and paraprofessional errors or inconsistencies when systematically teaching new skills to individuals with disabilities. In addition, using the iPhone to teach or prompt new skills may increase students’ abilities to work independently and decrease the amount of direct staff instructional time. As with any relatively new commercial technology, further research is needed to investigate the applications and benefits of using an iPhone with students with ASD.

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