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ORIGINAL PAPER

Using Self-Directed Video Prompting to Teach Students with Intellectual Disabilities

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Abstract This study examined the effects of self-directed video prompting presented via an iPod Touch on teaching four adolescents with moderate-to-severe intellectual and developmental disabilities two daily living tasks. Students were taught to wash a table using instructor-delivered video prompts. After reaching 80 % correct for at least three consecutive sessions, a system of most-to-least prompts was used to teach them to use the iPod Touch and a video prompting app (inPromptu) independently. In the final phase, students used inPromptu on the iPod Touch to teach themselves to vacuum with self-directed video prompts. Results of the study demonstrate that all four students learned to wash a table with instructor-directed video prompts, they all learned to use inPromptu on the iPod Touch independently, two students used inPromptu on the iPod Touch to teach themselves to vacuum, and a third student was learning to vacuum using inPromptu.

Keywords Self-directed video prompting · Moderate-to-severe intellectual and developmental disabilities · Vocational skills · iPod Touch

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Introduction

Many individuals with intellectual and developmental disabilities demonstrate deficits in adaptive skills, such as daily living, vocational, and self-management skills (e.g., Jacobson and Ackerman 1990; Kraijer 2000). Someone who displays deficits in adaptive skills may find it harder to fully interact and participate in their community, create meaningful interpersonal relationships, have limited living arrangement options, and may place elevated levels of stress on family members (Haverman et al. 1997; Sigafoos et al. 2005). In addition, dependence on family members and caregivers may increase the development of learned helplessness, where individuals become passive and do not attempt to take a proactive role in their lives (Thomas 1979). Increasing an individual's adaptive skill level may increase independence and reduce the need for direct care, allowing them to participate more fully in the community (Mechling 2007).

Previous research has demonstrated that video prompting can be effective in teaching individuals with an array of disabilities a variety of skills, such as daily living skills (e.g., Cihak et al. 2006; Van Laarhoven et al. 2011), vocational skills (e.g., Van Laarhoven et al. 2009), and cooking skills (e.g., Ayers et al. 2009; Mechling et al. 2008; Mechling and Stephens 2009).

Although effective, the majority of research on video-based instruction has used the instructor to deliver the antecedent prompts. In order to increase independence, students must be taught to deliver prompts in the absence of an instructor. Self-prompting procedures can use pictures, videos, audio, and self-statements to cue behavior (Mechling 2007). Using these procedures transfers stimulus control from the instructor to the individual, which can increase the student's self-reliance, decrease dependence on caretakers and teachers, and permit teachers to spend less time on classroom management and more time on instructional tasks (McDougall 1998), therefore increasing overall instructional efficiency.

The research on self-operated prompting methods, such as pictures and videos, is promising (Cihak et al. 2010; Mechling et al. 2008; Mechling et al. 2009a, b; Mechling and Stephens 2009). For example, Mechling et al. (2008) demonstrated the effectiveness of self-directed video prompting by teaching three adolescents with moderate intellectual disabilities to cook three different recipes using a portable DVD player. Using a multiple probe across skills design, the students were expected to start and watch the DVD, press "pause" when the video prompted them to complete that portion of the recipe, then return to the video and continue the process. Results indicated that using self-directed video prompting through a portable DVD player increased the level of independence in preparing a simple meal for all three participants across all three recipes. Although the authors reported positive results, the specific procedures for teaching the participants to independently use the DVD player to access the video prompts were not presented.

In order for self-directed video prompting to be the most useful, it should be used with portable devices. Although the research on using such portable devices is promising (Mechling et al. 2008, 2009a, b; Van Laarhoven et al. 2009), further research on these technologies is warranted. The iPod Touch is one device that can be used as a portable, self-operated, prompting device in that the small size allows it

to be easily carried from one environment to another without the need for any additional equipment (e.g., cords, televisions). Given that the iPod Touch has become ubiquitous, individuals with intellectual and developmental disabilities can inconspicuously use the iPod Touch to deliver their prompts without drawing unwanted attention (Mechling 2011). Payne et al. (2012) used video prompting via an iPod Touch to teach cooking skills to two individuals with moderate-to-severe disabilities. Once the students reached mastery with one skill taught with instructor-delivered video prompting, they were taught to use self-directed video prompting on the iPod Touch to teach themselves a new cooking skill. Results of the study indicated that instructor-delivered video prompting was effective in increasing task completion for both participants. Additionally, one participant was able to proceed to instruction on self-directed video prompting, which he subsequently used to teach himself to a second cooking skill with minimal assistance from the experimenter.

Although instructor-delivered video prompting has been demonstrated to be an effective teaching tool, there is limited research available that examines the acquisition of learning to use such devices to self-direct video prompts. Therefore, the purpose of this study was to extend the methodology of Payne et al. (2012) by teaching four adolescents with moderate-to-severe intellectual and developmental disabilities to use self-directed video prompting via an iPod Touch to learn daily living skills.

Method

Participants

Four students with moderate–to-severe intellectual and developmental disabilities participated in this study. All four were students at a fully segregated suburban school for students with moderate-to-profound intellectual, developmental, and physical disabilities. They all participated in a daily living skills curriculum and had the opportunity to practice new skills in the community each week. They were considered good candidates for the study due to deficits in daily living skills as evidenced by informal classroom observations, teacher recommendations, and the inclusion of daily living skills goals on their individual education programs (IEP). Furthermore, they all had the visual capability to see the videos on the small screen of the iPod Touch as well as the motor skills necessary to hold and manipulate the iPod Touch.

Sam was a 16-year-old Caucasian male diagnosed with a non-specific neurological problem consistent with cerebral palsy. He had a moderate-to-severe intellectual disability and communicated using gestures and a few verbal approximations. Sam also engaged in high levels of non-compliance. Matt was a 16-year-old African American male diagnosed with a developmental disability. He had a moderate intellectual disability and communicated using gestures and verbal approximations. Phil was a 15-year-old male with Down syndrome, aphasia, and patent ductus arteriosus. He had a moderate-to-severe intellectual disability and communicated using gestures and a few vocal approximations. Phil also engaged in

high levels of non-compliance. Jenny was a 17-year-old female with attention deficit hyperactivity disorder and a pervasive developmental disability. She had a moderate-to-severe intellectual disability and communicated through simple sentences. Jenny also engaged in high levels of verbal and physical aggression.

Settings

The study took place at the students' school, which was a county-funded school for students with moderate-to-profound intellectual, developmental, and physical disabilities. *Table Washing* sessions were conducted in the school cafeteria, which consisted of eight sets of tables with eight chairs per table. The students were expected to clean one table per session. *Vacuuming* took place in the lobby of the main entrance to the school. The area consisted of an automatic sliding door, a 4 m by 4 m carpeted area with six chairs and two end tables. There was an electrical outlet next to the end table to plug in the vacuum.

Tasks and Materials

Video prompts delivered via an iPod Touch were used to teach the students to wash a table using a spray bottle and rag (*Table Washing*) and to vacuum a carpet (*Vacuuming*). These tasks were selected because they were skills the students had not mastered; the teacher reported that learning these basic cleaning skills could increase their potential for both learning other cleaning tasks and potentially increase their potential for employment, and daily living skills goals were included in each student's IEP. Although they all were able to complete parts of each task, only if the tasks were mastered would the students be able to participate in employment experiences utilizing these tasks in the community.

Task analyses for each task (i.e., *Table Washing* and *Vacuuming*) were developed in collaboration with the students' teaching staff. The materials specific to *Table Washing* included a four-wheeled cart with three shelves, a spray bottle containing diluted cleaning fluid, one washcloth, a roll of paper towels, a cafeteria table, and a garbage can. The materials specific to *Vacuuming* included a Eureka Heavy Duty Commercial vacuum cleaner and approximately 40 pieces of white paper squares cut to 1 cm by 1 cm. Both tasks also required the iPod Touch connected to an auxiliary speaker (iMainGo 2 Handheld Speaker), the inPromptu app (Cannella-Malone and Wheaton 2011), and the video clips for each task (see Fig. 1).

A second-generation iPod Touch was used to present the video clips. The iPod Touch is a portable media player and personal digital assistant, with wireless capabilities developed by Apple, Inc. It has a 9-cm touch screen, external volume controls, built-in speakers, and the ability to be connected to external speakers. inPromptu is an app (available through the Mac App Store) developed for the iPod Touch, iPhone, and iPad for the purpose of video prompting. inPromptu is accessed by touching the application icon on the touch screen, which opens to a list of categories (e.g., cleaning, cooking, and personal hygiene). Selecting a category opens a list of skills (e.g., wash table with spray, vacuum, stack chairs, etc.) where the available video clips are organized. Selecting a specific skill opens a sequence of video clips

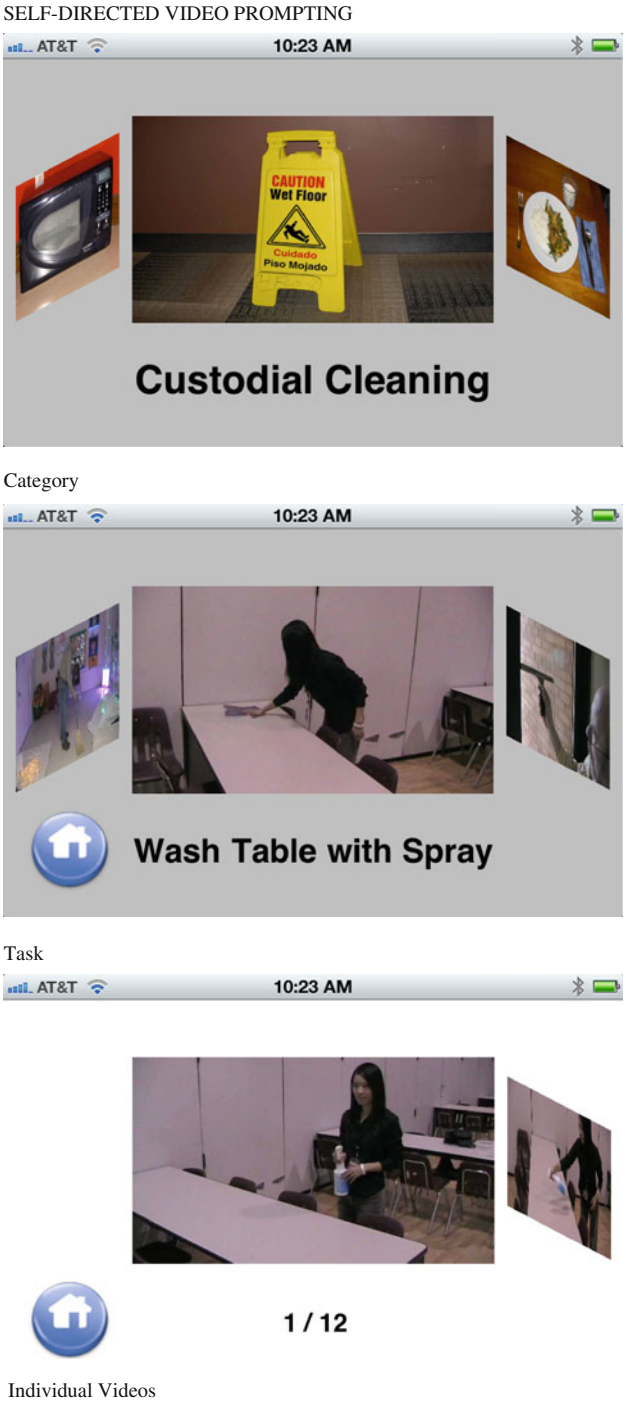

Fig. 1 Screen shots from the inPropmtu app showing the Category, Task, and Video screens

Table 1 Task analyses and step duration in seconds for each task

Table washing	Time (s)	Vacuuming	Time (s)
Take spray bottle to table	8.6	Get vacuum	28
Spray table	9.8	Unwrap and plug in cord	21
Put spray bottle on cart	6.1	Unlock handle	7.1
Take washcloth to table	8.1	Turn on and vacuum	39
Wipe table	17	Lock handle and turn off	6.5
Wipe table edges	17	Unplug and rewrap cord	18
Take washcloth to cart	9.3	Put away vacuum	22
Get paper towels	10		
Take paper towels to table	7.5		
Dry table	21		
Dry table edges	14		
Throw away paper towels	6.3		
Total duration	134.7		141.6

that correspond to the steps needed to complete the skill. Touching the image on the touch screen starts the specific video clip. See Fig. 1 for screen shots from inPromptu.

The video clips for both tasks were developed beforehand using functionally similar materials as those used during training. Each video clip was filmed from the perspective of a spectator in that the student saw another person completing the steps of the task. At the beginning of each clip, a female voice provided an auditory prompt stating what the student was to do in that step. For example, for the first step of *Table Washing*, the student heard, "First, pick the spray bottle up off of the cart and go to the table," and saw the performer in the video pick up the spray bottle and move to the table. For *Table Washing*, the average duration of the video clips was 11.2 s (range 6.1–21 s). For *Vacuuming*, the video clips were an average duration of 20.2 s (range 6.5–39 s). Table 1 provides the task analyses for each task and the duration of each video clip.

Experimental Design

Multiple probe across students designs (Horner and Baer 1978) were used to demonstrate experimental control across all three phases of this study. In the first phase (i.e., video prompting with error correction), baseline, video prompting with error correction, self-directed video prompting, and follow-up conditions were included. In the second phase (i.e., iPod Touch training), two baseline conditions and a most-to-least prompting condition were included. In the final phase (i.e., self-directed video prompting), baseline, self-directed video prompting, and follow-up conditions were included.

Dependent Variables and Data Collection

Correct completion of *Table Washing* and *Vacuuming* was measured in the video prompting with error-correction phase and the self-directed video prompting phase.

Correct task completion was defined as the percentage of steps in each task analysis completed correctly. Using the task analyses presented in Table 1, the researcher recorded whether each step was performed correctly, correctly with the use of video error correction, or incorrectly on a trial-by-trial basis. For a step to be scored as correct during baseline, the student had to complete the step within 30 s of the initial instruction or within 30 s of completing the previous step. During intervention, each step needed to be completed correctly without assistance from the trainer within 30 s of completion of the previous step or 30 s after viewing the video clip. To be scored as correct with video error correction, the student had to complete the step without assistance from the instructor after watching the video clip a second time. This occurred when the first attempt at the step was incorrect. To be scored incorrect, the student had to engage in an incorrect response or not respond twice (i.e., following the first instruction and video error correction). The percentage of correct completion was calculated on a session-by-session basis by dividing the number of steps completed correctly by the total number of steps in the task analysis and multiplying by 100.

Correct use of the iPod Touch was measured in the training and testing of the self-directed video prompting and was defined as the student using the inPromptu app correctly to deliver their own antecedent video prompts. The researcher recorded whether the student correctly completed each of the steps presented in Table 2. Observers also recorded whether the student completed each step independently, or with a physical, partial physical, gestural, or verbal prompt. To be scored as correct, the student had to manipulate the iPod Touch correctly within 5 s of receiving the initial instruction or completing the previous step. If error-correction procedures were needed, observers recorded whether the student selected the correct clip and pressed play independently when told "Not quite right," with a verbal prompt (i.e., "What should you do next?"), or with a physical or gestural prompt. For error-correction procedures to be scored as correct, the student had to start the correct clip within 5 s of being told "Not quite right." The percentage correct of the student's self-directed video prompting was calculated on a session-by-session basis by dividing the number of correct responses by the total number of steps in the iPod Touch use task analysis and multiplying by 100.

Interobserver Agreement and Procedural Integrity

Interobserver agreement (IOA) data were collected by trained observers who were graduate students in special education. During training, observers were provided

Table 2 Task analysis for correct use of the iPod touch

Turn on the iPod touch
Select the inPromptu app
Navigate to and select "Custodial Cleaning"
Navigate to and select *Table Washing* or *Vacuuming* (depending on the phase)
Start the correct video clip

with a data sheet, and the researcher reviewed the definitions of the dependent measures and data collection procedures with them. The first session with a new observer was counted as training, and these data were not included in the final results. As long as IOA in that first session was greater than 80 %, all subsequent sessions were included in the final calculation. IOA was calculated on a trial-by-trial basis by dividing the total number of agreements by agreements plus disagreements then multiplying by 100. A trial was scored as an agreement if both observers scored a step the same. IOA was collected during 55, 42, 65, and 43 % of the *Table Washing* sessions for Sam, Matt, Phil, and Jenny, respectively. IOA was collected during 50, 31, and 50 % of the *Vacuuming* sessions for Phil, Matt, and Jenny, respectively. IOA for *Table Washing* was calculated to be 94 % (range 87–100 %) for Sam, 99 % (range 98–100 %) for Matt, 99 % (range 92–100 %) for Phil, and 98 % (range 92–100 %) for Jenny. IOA for *Vacuuming* was 100 % for Phil and Matt, and 98 % (range 93–100 %) for Jenny.

Procedural integrity data were collected during 48 % of *Table Washing* sessions and 43 % of *Vacuuming* sessions. Procedures were listed in order on a data sheet and the second observer recorded whether the researcher completed the procedures correctly or incorrectly. Procedural integrity was calculated by dividing the total number of steps completed correctly by the total number of steps and multiplying by 100. Mean procedural integrity for *Table Washing* was 99 % (range 99–100 %) and 100 % for *Vacuuming*.

Procedures

Study Overview

Three phases were conducted in this study, video prompting with error correction, independent iPod Touch training, and self-directed video prompting. First, baseline sessions were conducted across the video prompting with error correction, and iPod Touch use phases to document the degree to which each student could wash the table or use the iPod Touch independently. Following baseline, an instructor-delivered video prompting with error correction procedure was used to teach the students to wash a table. After acquisition, baseline data were collected again on iPod Touch use. Next, a system of most-to-least prompts was used to teach the students to use the iPod Touch to self-direct video prompts for *Table Washing*. After acquisition of self-directed video prompting, baseline data for vacuuming were collected. Finally, students used self-directed video prompting to teach themselves to vacuum. Where possible, experimenters collected follow-up data for both *Table Washing* and *Vacuuming*. At the completion of the three phases, social validity data were collected.

Video Prompting with Error Correction (Table Washing)

The purpose of this phase was to teach the students a new skill using instructor-delivered video prompting with error correction on an iPod Touch. We did this for two reasons. First, we wanted to confirm that each student could learn a new skill using video prompting. Second, if problems arose when teaching the students to use

the iPod Touch independently, we would be able to rule out learning via video prompting as the primary cause of the problem. This phase included baseline, intervention, and follow-up conditions.

Baseline During baseline for *Table Washing*, the experimenter brought the students individually to the cafeteria and told each to "Wash the table." The experimenter used a multiple opportunity method of prompting to allow the student the opportunity to respond to all steps of the task. If the student did not initiate a step of the task within 5 s or began to respond incorrectly, the experimenter interrupted the student, blocked his or her view of the task, and completed that step. The student was then presented with the task again and told to "Keep going." This process continued until the entire task was completed. General verbal praise (e.g., "Good working.") was given upon termination of the session regardless of performance.

Intervention Students were brought to the cafeteria individually after lunchtime and provided with instructor-delivered video prompting on how to wash a table. The student was positioned between the cart containing the cleaning materials and the table. The trainer held the iPod Touch in front of the student, said, "Watch this," and played the video clip of the first step. When the clip ended, the trainer said, "Now you do it." The student had 30 s to complete the step. If the student did not initiate the step within 5 s or began to complete the step incorrectly, the trainer said, "Not quite right. Here, watch this again." The trainer then played the video clip a second time. If the student failed to initiate the step within 5 s or began to complete the step incorrectly, the trainer said, "That's not quite right. Watch me." and completed the step with the student watching. No other forms of feedback or prompting were provided.

We found that all four students struggled with step 2 (i.e., spray the table three times) and rarely completed it correctly. The video showed a female model spraying the table with three long sprays across the table. When the students attempted to complete this step, they struggled imitating the model and would either follow the motion, but not engage the spraying mechanism while doing the motion (resulting in insufficient spray on the table), or they would spray cleaner on the table but would not get spray on the entire table. In session 13, the experimenter allowed the students to use more than three sprays if they were able to apply an appropriate amount of spray to the table and did not require them to watch the video a second time. However, this step was not counted as correct unless three sprays were used to cover the table.

For students to move to the next phase of the study (i.e., training on using the iPod Touch), they had to correctly complete 80 % of the task across at least three consecutive sessions. As in baseline, students were provided non-specific praise at the end of each session (e.g., "Thanks for working.").

Training of Self-Directed Video Prompting (Table Washing)

In this phase, we taught the students to use the iPod Touch and navigate inPromptu independently using *Table Washing* from the first phase. We did this to avoid

acquisition problems that might arise if we tried to teach a new daily living skill while teaching them to independently use the technology. This phase consisted of two baseline conditions and iPod Touch training.

Baseline 1 Data for baseline 1 were collected prior to implementing video prompting with error correction (*Table Washing*). During baseline 1, the student was brought to the cafeteria, given the iPod Touch, shown an 8 cm × 13 cm card with a picture of someone washing a table, and directed to "Wash the table." If the student did not turn on the iPod Touch within 5 s or began to complete a step incorrectly, the experimenter interrupted the student and the session was terminated. Non-specific verbal praise was given upon termination of the session regardless of performance.

Baseline 2 Data for baseline 2 were collected after the students met the 80 % correct criterion for *Table Washing*. These data were collected to determine whether the students had learned to use the iPod Touch through observation during the instructor-delivered video prompting with error-correction phase. Baseline 2 sessions were identical to baseline 1 sessions.

iPod Touch Training In this condition, the students were taught to hold, operate, and manipulate the video clips (via inPromptu) on the iPod Touch. The students continued to wash the table as they were taught to use the iPod Touch, and their performance on both *Table Washing* and using the iPod Touch was measured. At the beginning of each session, the students were given the iPod Touch, shown an 8 cm by 13 cm picture of a person washing a table, and instructed to "Wash the table." To teach the students how to use the iPod Touch, the trainer used a system of most-to-least prompts in order to reduce the opportunity for students to engage in incorrect responses. The hierarchy included a full physical prompt, a partial physical prompt, a gestural prompt, and a verbal prompt. In the first two sessions, a full physical prompt was used with a 0-s time delay in order to minimize errors and familiarize the students with the iPod Touch. After the first two sessions, a 2-s time delay was added to provide students the opportunity to complete the iPod Touch steps independently. We chose a 2-s time delay because we observed informally that the students responded immediately when asked to engage in a previously mastered skill. If the student did not complete the iPod Touch step during the 2-s time delay, the experimenter prompted the student through the step. To reduce the prompt level, the student had to perform the step correctly across two consecutive sessions at the current prompt level. If the student responded incorrectly, the experimenter immediately provided the next more intrusive prompt to prompt the student through the step. Prompting decisions were made on a step-by-step basis.

When a video clip ended, the student had 5 s to initiate the step just viewed without any instructions (e.g., "Now you do it."). If the student did not initiate the step or began to complete it incorrectly, the experimenter said, "Not quite right," and provided the student 5 s to restart the video or correct their performance of the *Table Washing* step. If the student did not respond, the experimenter asked, "Now

what should you do?" If there was no response within 5 s, the experimenter prompted the student with the current prompt level for that step. For students to move to the next phase of the study, they had to score 80 % correct or higher in both the iPod Touch Training phase and the *Table Washing* phase across at least three consecutive sessions.

Sam appeared to have a fine motor deficit that resulted in him advancing the video too many steps. Therefore, outside of the experimental setting, the experimenter reminded Sam that the numbers at the bottom of the screen indicated the correct sequence to follow and that if he got confused he should look at the numbers. In session 20 of the iPod Touch training phase, the experimenter suggested that Sam place the iPod Touch on the table or cart, rather than hold it, as he manipulated the device. This made the iPod Touch stable, allowing him better control to press the appropriate buttons.

Self-Directed Video Prompting (Vacuuming)

In this phase, we tested the students' ability to use inPromptu on the iPod Touch independently to teach themselves a new skill. This phase included baseline, self-directed video prompting, and follow-up conditions. Only Phil, Matt, and Jenny met the criteria (i.e., score 80 % correct or higher in both the iPod Touch Training phase and the *Table Washing* phase across at least three consecutive sessions) to participate in this phase.

Baseline These sessions were the same as baseline for *Table Washing*, except that the experimenter instructed the student to "Vacuum" (rather than "Wash the table.").

Self-Directed Video Prompting During this phase, the student was brought to the school lobby—where pieces of white paper were scattered on the floor—positioned near an end table, given an iPod Touch, provided with an 8 cm by 13 cm picture showing a person vacuuming, and instructed to use the iPod Touch video clips to vacuum the entrance area. The student had 5 s to begin the first video clip. If the student made any errors related to using the iPod Touch, a least-to-most prompting hierarchy was used, which consisted of gestural, partial physical, and full physical prompts. A least-to-most prompt hierarchy was used in this phase, because the prompts from the training phase had been faded, and the students' performance suggested that they would require minimal prompting. Although this did increase the opportunity to make errors, it also decreased the intrusiveness of the prompt. For all *Vacuuming* steps, if the student made an error, the same error-correction procedures as described in the video prompting with error-correction phase were used. Students had 5 s to play the next video or begin the next step of the vacuuming task analysis. During this phase, experimenters collected data on independent task completion (i.e., vacuuming) and iPod Touch use. Experimenters provided non-specific verbal praise to students at the completion of each session (e.g., "Thanks for working.").

Follow-Up

During follow-up, procedures were similar to those of the baseline condition, except for error correction and the option of using the iPod Touch. Students were positioned next to the materials and instructed to complete the task (either *Table Washing* or *Vacuuming*). The iPod Touch was in the environment (on the cart for *Table Washing* and on an end table for *Vacuuming*), but the student was not instructed to use it. The student could complete the task with or without using the iPod Touch. If a student completed a step incorrectly, the error-correction procedures from the self-directed video prompting phase were implemented. Experimenters conducted follow-up probes once per week for 3 weeks and collected data on the independent completion of *Table Washing* and *Vacuuming* and on the correct use of the iPod Touch.

Social Validity

The week before the conclusion of the study, three of the participants were asked (a) Did you like watching the video? (b) Were the video prompts helpful? (c) Would you like to learn other tasks using video prompts? and (d) Did you like using the iPod Touch yourself or did you prefer when I showed you the clips? Students responded to the first three questions with "yes," "no," or a head nod or shake. Students responded to the fourth question by either pointing to themselves or the researcher or saying "you," or "me."

Results

Figure 2 presents the percentage of *Table Washing* steps completed correctly for each participant across baseline, video prompting with error correction, self-directed video prompting, and follow-up. Figure 3 presents the accuracy of iPod Touch use (i.e., self-directed video prompting) for each participant across baseline 1, baseline 2, and with both *Table Washing* and *Vacuuming*. Finally, Fig. 4 presents the percentage of steps completed correctly for *Vacuuming* across baseline, self-directed video prompting, and follow-up.

Sam

Data for Sam's *Table Washing* performance are presented in the top tier of Fig. 2. During baseline in the video prompting with error-correction phase, Sam completed 42 % of the *Table Washing* steps correctly across three sessions and consistently completed the same steps correctly. After the video prompts were presented, his performance increased to above 80 % ($M = 85$ %, range 58–100 %). Acquisition of self-directed video prompting began in session 10, and Sam's performance of *Table Washing* was variable ($M = 71$ %; range 58–92 %). Even with this variability, his performance remained higher than baseline levels.

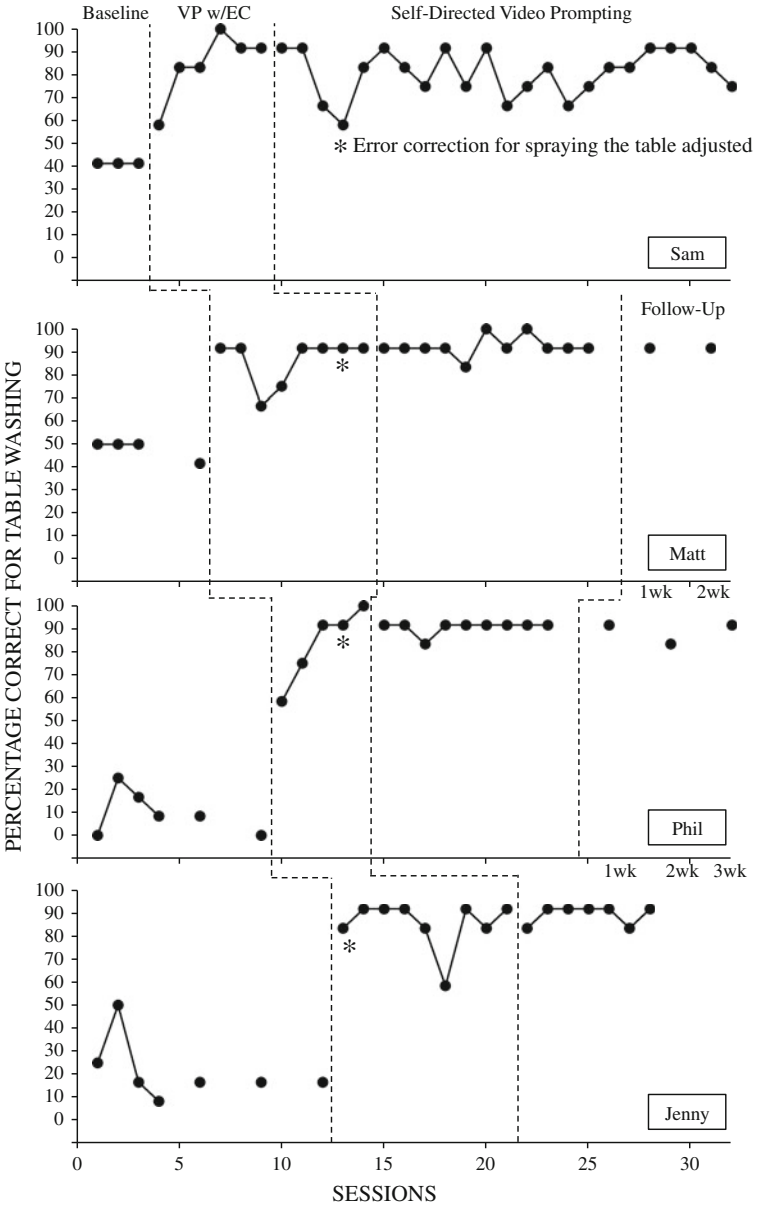

Fig. 2 Percentage correct for table washing across baseline, video prompting with error correction, and video self-prompting for Sam, Matt, Phil, and Jenny. Maintenance data are also presented for Matt and Phil

Data for Sam's correct use of the iPod Touch are presented in the top tier of Fig. 3. Baseline 1 data for Sam's iPod Touch use were collected prior to the start of the video prompting with error-correction intervention, and baseline 2 data were

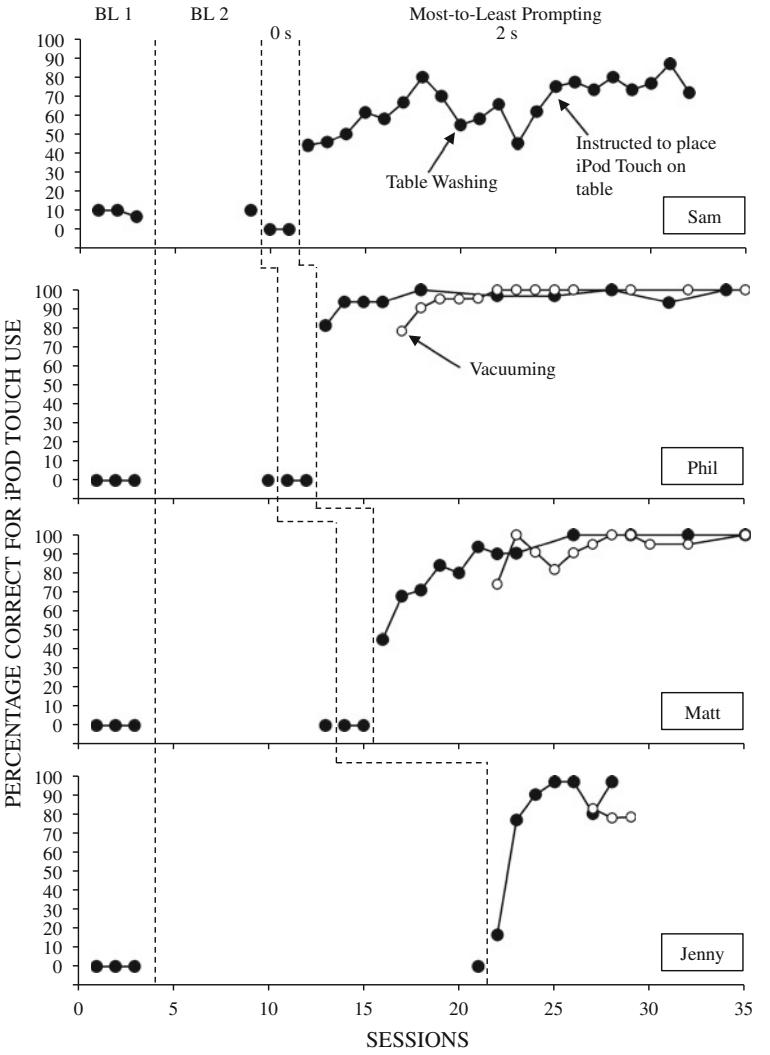

Fig. 3 Percentage correct use of the iPod Touch for Sam, Phil, Jenny, and Matt across baseline 1 (BL 1), baseline 2 (BL 2), and most-to-least prompting (0 and 2 s time delay)

collected after session 9. During baseline 1, Sam initiated an average of 9 % (range 7–10 %) of the iPod Touch use steps correctly. During baseline 2, he initiated 10 % of the steps correctly. When most-to-least prompting was introduced, and following the two sessions with the 0 s time delay, his performance steadily increased, though he demonstrated some variability in his performance. He completed an average of 60 % (range 0–87 %) of steps correctly. Given this variability in performance, Sam never met the criteria to move to the self-directed video prompting for *Vacuuming* phase.

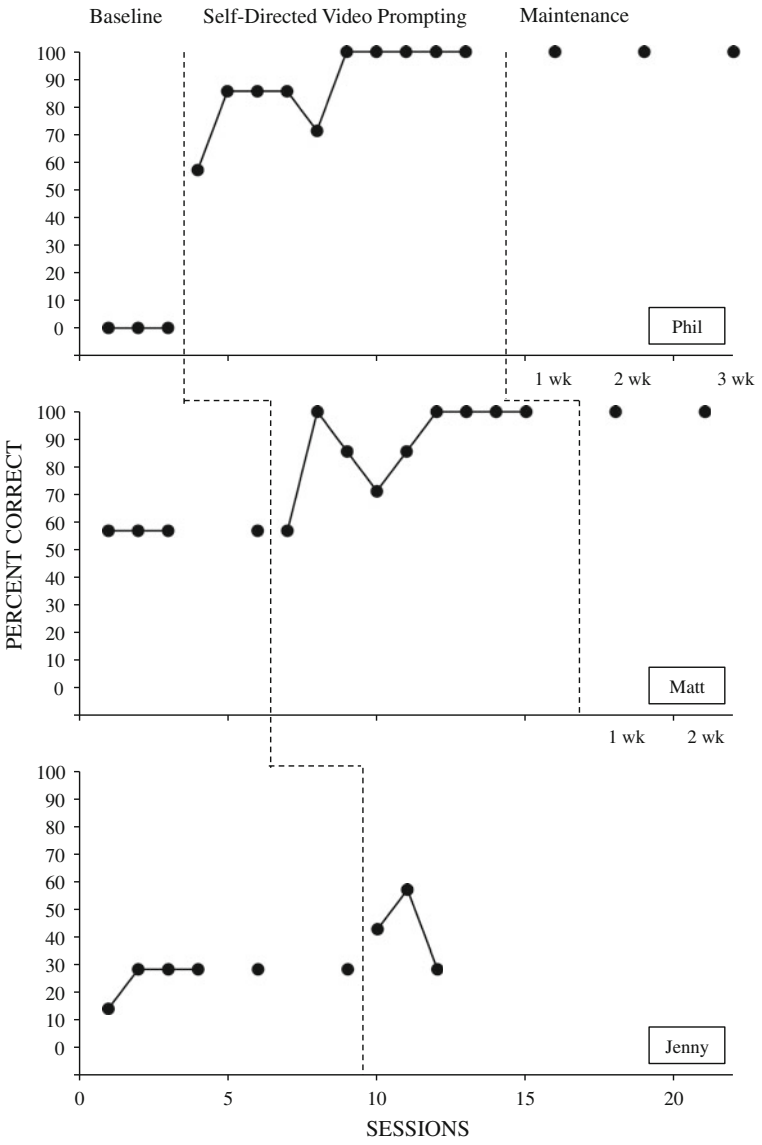

Fig. 4 Percentage correct for vacuuming across baseline and video self-prompting for Phil, Matt, and Jenny. Maintenance data are also presented for Matt and Phil

Matt

Data for Matt's *Table Washing* performance are presented in the second tier of Fig. 2. During baseline in the video prompting with error-correction phase, Matt completed an average of 48 % (range 42–50 %) of the *Table Washing* steps correctly and consistently completed the same steps correctly. After the video

prompts were presented, his performance increased and he completed an average of 86 % (range 66–92 %) of the steps correctly. Acquisition for self-directed video prompting began in session 14, and Matt's performance of *Table Washing* maintained at an average of 92 % correct (range 83–100 %). During follow-up, Matt continued to complete 92 % of the *Table Washing* task correctly.

Data for Matt's correct use of the iPod Touch are presented in the third tier of Fig. 3. Baseline 1 data for Matt's iPod Touch use were collected prior to the start of the video prompting with error-correction intervention, and baseline 2 data were collected after session 13. Matt did not initiate any steps in either baseline 1 or 2. When most-to-least prompting was introduced and following the two sessions with the 0 s time delay, his performance steadily increased, and he completed this phase performing 100 % ($M = 72$ %, range 0–100 %) of the steps correctly. When Matt was expected to use the iPod Touch to self-direct video prompting with *Vacuuming*, he completed an average of 93 % (range 74–100 %) of the steps for using the iPod Touch correctly.

Matt's *Vacuuming* data are presented in the second tier of Fig. 4. During baseline, Matt completed 57 % of the steps correctly across four sessions and consistently completed the same steps each session. When self-directed video prompting was introduced, his performance immediately increased, then showed slight variability, then maintained at 100 % ($M = 86$ %, range 57–100 %). During the 1- and 2-week follow-up checks, Matt maintained his *Vacuuming* performance at 100 %.

Phil

Data for Phil's *Table Washing* performance are presented in the third tier of Fig. 2. During baseline in the video prompting with error-correction phase, Phil completed an average of 9 % (range 0–25 %) of the *Table Washing* steps correctly. After stable responding was observed in baseline, the video prompts were presented, and his performance improved; he completed an average of 83 % (range 58–100 %) of the steps correctly. Acquisition for self-directed video prompting began in session 11 and Phil's performance of *Table Washing* remained stable at an average of 91 % correct (range 83–92 %). During the maintenance phase, Phil completed an average of 89 % (range 83–92 %) of the *Table Washing* task correctly.

Data for Phil's correct use of the iPod Touch are presented in the second tier of Fig. 3. Baseline 1 data for Phil's iPod Touch use were collected prior to the start of the video prompting with error-correction intervention, and baseline 2 data were collected after session 10. Phil did not initiate any steps in either baseline 1 or 2. When most-to-least prompting was introduced and following the two sessions with the 0 s time delay, his performance immediately increased, and he completed this phase performing between 97 and 100 % ($M = 95$ %, range 0–100 %) of the steps correctly. When Phil was expected to use the iPod Touch to self-direct video prompting with *Vacuuming*, he completed an average of 97 % (range 78–100 %) of the steps for using the iPod Touch correctly.

Phil's *Vacuuming* data are presented in the top tier of Fig. 4. During baseline, Phil did not complete any of the vacuuming steps correctly. When self-directed

video prompting was introduced, his performance immediately increased, and he completed this phase performing 100 % ($M = 86$ %, range 57–100 %) of the steps correctly. During the one-, two-, and three-week maintenance checks, Phil maintained his *Vacuuming* performance at 100 %.

Jenny

Data for Jenny's *Table Washing* performance are presented in the bottom tier of Fig. 2. During baseline for *Table Washing*, Jenny's performance was variable during the first four sessions, but levelled off at 16 % correct for the final three sessions ($M = 21$ %, range 8–50 %). During these last three sessions of baseline, she completed the same steps correctly. After stable responding was observed in baseline, video prompting with error correction was presented, and her performance immediately improved; she completed an average of 85 % (range 58–92 %) of the steps correctly. Acquisition for self-directed video prompting began in session 22, and Jenny's performance of *Table Washing* remained stable at an average of 89 % correct (range 83–92 %). Due to time constraints, no follow-up data were collected for Jenny.

Data for Jenny's correct use of the iPod Touch are presented in the bottom tier of Fig. 3. Baseline 1 data for Jenny's iPod Touch use were collected prior to the start of the video prompting with error-correction intervention, and baseline 2 data were collected after session 21. Jenny did not initiate any steps in either baseline 1 or 2. When most-to-least prompting was introduced, Jenny quickly demonstrated that she did not require two sessions with full physical prompts. Halfway through the first session, she began completing the steps correctly without assistance. Her correct responding increased quickly after the first intervention ($M = 79$ %, range 16–97 %). When Jenny was expected to use the iPod Touch to self-direct video prompting with *Vacuuming*, she completed an average of 80 % (range 78–83 %) of the steps for using the iPod Touch correctly.

Jenny's *Vacuuming* data are presented in the bottom tier of Fig. 4. During baseline, Jenny completed an average of 26 % (range 14–29 %) of the *Vacuuming* steps correctly, and she consistently completed the same steps correctly. When self-directed video prompting was introduced, her performance increased only slightly and was highly variable across the three intervention sessions. Jenny completed an average of 43 % (range 29–57 %) of the steps correctly. Unfortunately, we were only able to complete three sessions of the *Vacuuming* task with Jenny, but expect that her performance would have increased given additional time.

Social Validity

Phil, Matt, and Jenny participated in the semi-structured interview. They indicated that they liked watching the videos on the iPod Touch and that they preferred holding (and working) the iPod Touch themselves. They all also indicated that they would like to learn additional skills using the iPod Touch, but none of them indicated what skills they might like to learn.

Discussion

Results of this study replicate previous research teaching students with intellectual and developmental disabilities daily living and vocational skills using video prompts (Ayers et al. 2009; Mechling et al. 2008; Mechling and Stephens 2009; Payne et al. 2012; Van Laarhoven et al. 2009). All four participants learned to wash a table, and two maintained the skill at 2- and 3-week follow-ups using self-directed video prompting. Moreover, all four participants made progress learning to use the inPromptu app independently to provide their own prompts, two participants were able to use inPromptu to teach themselves to vacuum the floor, and one participant was beginning to teach herself to vacuum the floor. The current study also extends the literature by outlining procedures for teaching the students to independently use the iPod Touch to self-direct their video prompts (Cihak et al. 2006; Kagohara 2011; Payne et al. 2012; Van Laarhoven et al. 2009).

Although the findings of this research are positive, there are a number of limitations that should be considered. First, the definition of step 2 of the *Table Washing* task (i.e., spray the table three times) likely prevented our participants from completing the skill with 100 % accuracy. Given that we used a topographical definition (i.e., the response was considered correct only if it matched the model in the video), which the students struggled to imitate, only four sessions across the four students resulted in 100 % correct responding. Future research should consider when functional definitions would be more appropriate than topographical ones.

Second, the time constraints of the school year did not allow enough time for Jenny to acquire *Vacuuming* or to demonstrate maintenance of *Table Washing*. Given the trends in her data, we expect that had we had more time, she would have learned to vacuum. In addition to the school year ending, one thing we noted with Jenny was that she appeared to respond to the verbal cues more than the visual cues in the video clips. After the voice on the video completed the instruction, she began the skill rather than watching the videos. When Jenny began to teach herself to vacuum, she struggled with the steps that required her to unwrap (step 2) and rewrap (step 6) the cord, because she did not watch the model. Given that the school year ended, we were not able to address this issue.

A third potential limitation is our use of the single opportunity method during baseline for the teaching of the iPod Touch. Using this method, baseline sessions were terminated as soon as the student completed a step incorrectly or stopped responding for 5 s. Although this method may underestimate performance, it was used because even though the students might have been able to complete subsequent steps, the steps required for using the iPod Touch independently had to be completed in a specific order. Therefore, failing to complete one step would mean that the entire skill from that point forward could not be completed.

A fourth limitation is that we did not have a true measure of maintenance because we included error-correction procedures during the follow-up sessions. Although we wanted to determine whether the students would maintain their performance without assistance from a trainer, we determined that it was more important for them to not practice errors. Therefore, we conducted follow-up sessions in which the error-correction procedures were kept in place. Given more time, we could have faded out

the error-correction procedures and collected data on the students' maintenance of table washing, vacuuming, and iPod Touch use. Future research should explore how well students with moderate-to-severe intellectual and developmental disabilities maintain the skills on their own.

Finally, the experimenter provided the students with the materials necessary to complete the task and made sure the iPod Touch was functioning properly prior to each session. In a natural setting, such as a community work environment, it is unlikely someone would be there to make sure everything was working properly prior to the task. The student would likely be expected to maintain their own device as well as set up their own work area. Future research should examine the independent maintenance of the prompting device as well as its effects on setting up the work area (i.e., finding materials needed). Additional video prompts could be used to teach the student these skills.

One finding that we did not expect was the deterioration of Sam's performance when self-directed video prompting was introduced. When video prompting with error correction was introduced with *Table Washing*, he demonstrated immediate gains in the skills. Additionally, he demonstrated more moderate, though still clear, gains in acquiring use of the iPod Touch. One reason for the variability may be a deficit in his fine motor skills. Sam struggled with pressing the correct button and selected the incorrect step on many occasions. He also pressed the buttons until he was at the end of the steps and required physical prompts to navigate back to the appropriate step. Self-directed video prompting is a strategy that requires the individual to maintain the correct sequence of tasks to ensure a high level of correct responding (Cooper et al. 2007). For Sam, advancing past the correct step may have provided him with prompts that were extraneous, leading to higher than expected levels of incorrect responding. After we suggested that Sam place the iPod Touch on the table or cart, he demonstrated an increase in correct responding for both the use of the iPod Touch as well as completion of *Table Washing*. In future research, it would be worth exploring effective placement of any technology so that students would have the best opportunity to manipulate the device correctly.

A second unexpected finding was that Jenny engaged in self-fading of the visual prompts before skill mastery. For example, during vacuuming, she began to unwrap the power cord before she finished watching the video, possibly impacting her level of responding for the step. Previous research has demonstrated the benefits of allowing participants to self-fade aspects of antecedent prompts, but these demonstrations programmed individual choices into the self-fading procedure along with error-correction procedures (Mechling et al. 2009a, b; Mechling et al. 2010). For example, Mechling et al. 2009a, b allowed participants to self-fade the mode of prompt delivery by choosing specific prompts (e.g., picture alone, picture + auditory). If the participant attempted the step incorrectly, an error-correction procedure was implemented where they were prompted through the task using the next most intensive prompt. For example, if they selected a picture prompt initially and incorrectly initiated the task, the instructor required them to use a prompt that included the picture and auditory prompt. Their results indicated that participants adjusted to less intrusive prompts (e.g., pictures) as they became more proficient in completing the task. In the current investigation, an error-correction

procedure was in place, but it was similar to the initial prompt (e.g., "Watch the video."). Future research may be necessary to determine what types of procedures are the most effective in preventing self-fading of prompts before skill mastery.

One implication of these data is that if students can use self-directed video prompting to teach themselves new skills, then the need for an instructor to be present might be reduced. By having the students teach themselves, the teacher could spend more time with students who need more intensive instruction. Moreover, being able to work more independently might provide opportunities for students to work more unobtrusively in community settings, potentially increasing the overall quality of life.

In summary, students in this study were taught one skill using teacher-directed video prompting, how to use the iPod Touch to independently deliver their own prompts and to self-direct their video prompts to teach themselves a different skill. The data indicate that video prompting was an effective teaching tool for our participants, the iPod Touch was an effective video prompting device, and that students with severe intellectual and developmental disabilities can be taught to deliver their own prompts to learn new skills.

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