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A COMPARISON OF INDIVIDUALIZED AND NON-SPECIFIC VIDEO-PROMPTS IN TEACHING DAILY LIVING SKILLS TO STUDENTS WITH AUTISM SPECTRUM DISORDERS

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ABSTRACT

Three elementary students with autism spectrum disorders (ASD) participated in this study, which examined generalization effects of video self-prompting to teach daily living skills. Video self-prompting involves students controlling video-prompts, which show shortened video clips of someone performing steps of a target skill. The student then performs individual steps of the skill before proceeding to the next video clip. An adapted alternating treatments design was used to compare individualized and non-specific video-prompts in teaching six daily living skills. The individualized video-prompts were tailored to each student in terms of the model used, materials, and setting, while the non-specific set of video-prompts used an unknown adult as the model, different materials, and a novel setting. The video-prompts and daily living skills were counterbalanced within and across participants. Improvements were noted for both the individualized and the non-specific video-prompts for all three students and all six skills. All three students required a slightly higher number of sessions to meet 100% correct using the non-specific video-prompts than the individualized video-prompts. One student was able to maintain the target skills two and four weeks post-intervention without the use of video-prompts. Limitations of the study, suggestions for future research, and implications for educators are discussed.

Keywords: video self-prompting, generalization, video prompting, video-based instruction, individualization, autism spectrum disorders, daily living skills

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Chapter 1

Introduction

As prevalence rates for autism spectrum disorders (ASD) continue to increase (Center for Disease Control, 2014), the need for teachers and researchers to develop and identify best practices for teaching students with ASD is of utmost importance. Video modeling is commonly seen in today's classrooms and has been identified as an established, evidence-based intervention to teach personal responsibility skills to individuals with ASD by the National Autism Center (Wilczynski et al., 2009). Video-prompting is a form of video modeling wherein a video of someone performing a target skill is shown to the student. Unlike video modeling, that shows the performer completing the entire task (Cannella-Malone et al., 2011), video-prompting breaks the task into discrete steps on the video. Participants watch clips on the video depicting the task sequence that is typically less than 30 seconds in length, and are asked to perform a step before the next step is viewed (Cannella-Malone et al., 2006).

Video-prompting is a promising instructional technique for individuals with ASD, particularly due to their deficits in short-term working memory (Poirier, Martin, Gaigg & Bowler, 2011; Williams, Goldstein, Carpenter, & Minshew, 2005). These deficits become more apparent as tasks become more complex (Minshew & Goldstein, 2001). When information is presented to students in small segments, it can be processed more effectively and efficiently (Minshew & Williams, 2008). Video-prompting allows students to gradually attain the steps required to perform the desired skill while demonstrating proficiency.

Video-prompting can provide benefits for the both the instructor and the student. For the instructor, video-based instruction allows more consistent and precise teaching methods to occur (Ayres & Langone, 2005). As classroom sizes continue to expand, the ability to provide direct instruction by video is not only effective but also efficient in terms of instructional time required. Teachers can use video-prompting with classroom-related educational personnel to ensure that students with ASD are receiving a consistent model. For the student, video-prompting provides shortened segments that allow the students to focus on each discrete step, rather than trying to remember an entire skill at one time. Students also benefit by the presentation of the skill via technology. In a study conducted by Charlop-Christy, Le, and Freeman (2000), students had quicker skill acquisition when instruction was presented via video instruction than in vivo (live) instruction. The authors stated that possible explanations for these results included the possibility that video instruction compensates for children's stimulus over-selectivity, is motivating to students, and is more stimulating than in-vivo instruction. Another benefit of video-based instruction is portability. With advancements in technology, instruction is possible in students' homes, workplaces, and the community.

Many of the studies on video-prompting techniques have targeted daily living skills, as acquisition of these skills is a primary concern for parents and families of individuals with ASD (Heiman, 2002). Daily living skills include, among others, self-care skills (e.g., dressing), hygiene (e.g., brushing teeth), household chores (e.g., mopping), cooking (e.g., simple meals), and community living skills (e.g., grocery shopping). Video-prompting has been shown to be effective in teaching a wide array of daily living skills such as washing dishes (Sigafoos et al., 2007), doing laundry

(Cannella-Malone et al., 2006), folding clothes (Van Laarhoven, Kraus, Karpman, Nizzi & Valentino, 2010), and cooking (Mechling, Gast, & Seid, 2009; Van Laarhoven & Van Laarhoven-Myers, 2006). Video-prompting also has been shown to be effective for a wide age range (9-41 years old) of students with mild and moderate disabilities (Domire & Wolfe, 2014).

A recent review of the literature identified 12 studies that examined video prompting and daily living skills (Domire & Wolfe, 2014). Findings of the review showed that, although video-prompting is a promising intervention for teaching daily living skills to students with ASD, there are components of the intervention that still require more research. Some areas for needed research include: level of individualization, video self-prompting with error correction procedures, maintenance of target skills, and social validity.

Level of Individualization

Tailoring the level of individualization of video-prompts, involves using similar stimulus components in the video as the natural environment for the student. These components include the setting where the target skill is performed, the materials used, and the model or participant. Incorporating these components into the video could improve student performance of the target skill. Bandura (1977) postulates the model of the video is an important factor in imitation, stating that the most effective models are similar to the students in terms of gender, age, and ability-level. Thus, according to Bandura's theory, students will be more likely to attend to a video where the model was similar to themselves or if the student themselves modeled the behavior.

In addition to using a similar model, using similar materials and settings in video-prompts could have an effect on student performance. Individualizing these components in the video-prompts is a way of programming common stimuli. Stokes and Baer (1977) identified programming common stimuli as one of nine techniques for programming generalization. This technique could be essential for students with ASD, who have difficulty generalizing newly learned skills to settings, materials, and contexts that differ from training (Maurice, Green, & Luce, 1996). Traditionally, video-prompting relies on a "train and hope" technique; students are delivered instruction via videos that use different settings and materials and students are expected to transfer this knowledge to a different context.

Limited research exists on the effects of the level of individualization of video-prompts on student outcomes. The case for individualization with this intervention is of significant importance, due to the efficiency of creating video-prompts. Creating individualized videos that program common stimuli could be time-consuming, and teachers have voiced concern about the time required to make video-prompts (Mechling, Ayres, Foster, & Bryant, 2013). This could affect the usability of the intervention. Individualization also brings up concerns regarding commercial video-prompts that are available as applications or computer software. If video-prompts must be individualized for each student, these commercial video-prompts may not be as effective. Research is needed to compare the effects of individualized video-prompts to traditional or non-specific video-prompts.

Mechling and colleagues (2013) addressed this need to compare individualized and non-specific videos by comparing the effects of commercially available and custom-

made video prompts. Four high school males with autism participated in the study related to cooking skills. Results showed that although gains were made with both commercial and custom-made video-prompts, larger gains were noted with the custom-made (individualized) videos. Mechling and colleagues (2014) also conducted a study evaluating generalized performance across materials using video technology. It should be noted that the intervention in this study differed from traditional video-prompting studies in that more than one step of the target skill was shown during each video clip. Results indicated that overall the four high school age males with ASD required more sessions to reach criteria and committed more errors when using the generalized materials. The results also indicated, however, that three of the four students were able to reach 100% accuracy when using materials that differed from those in the video model.

Video Self-Prompting with Error Correction Procedures

Allowing students to control video-prompts (referred to as video self-prompting), allows students to gain independence and reduce the need for external prompting from others. The majority of the studies centered on teaching daily living skills have focused on video-prompts controlled by a researcher or teacher, rather than the student controlling the prompts independently (Domire & Wolfe, 2014). Specifically, three studies (Bereznak, Ayres, Mechling & Alexander, 2012; Mechling et al., 2009; Payne, Cannella-Malone, Tullis, & Sabielny, 2012) have looked at video self-prompting. Bereznak and colleagues (2012) found that three students with ASD between the ages of 15 and 18 performed an increased number of steps independently using video-prompting. Results showed that 2 of the 3 participants were able to self-prompt. Mechling and colleagues (2009) also found that students between the ages of 16 and 17 were able to self-prompt to

complete cooking tasks. Payne, Cannella-Malone, Tullis, and Sabielny (2012) taught one 18 year-old student to video self-prompt.

Questions remain over real time error correction procedures for video self-prompting and video-prompting. Providing error correction ensures that the student learns to perform the skill correctly and does not practice the error itself. Two studies that formally compared error correction procedures (Cannella-Malone et al., 2011; Goodson et al., 2007) noted that error correction improved skill acquisition. Participants in the study conducted by Cannella-Malone and colleagues (2011) were interrupted when performing an error and prompted to watch the video again. If the student performed an error again, the instructor would model the step. Video-prompting combined with error correction resulted in greater gains for the students than video prompting alone. Goodson and colleagues (2007) found that three of the four participants were unable to learn the target skill with video prompting alone. When error correction procedures were introduced for these participants, they were able to perform the skill.

Maintenance

The literature on video-prompting offers mixed results on the maintenance of target skills after video-prompts are removed. Some studies have shown participants were able to retain the skills demonstrated in the video for up to ten weeks after the prompts were removed (Van Laarhoven et al., 2010; Van Laarhoven and Van Laarhoven-Myers, 2010). Other researchers have noted difficulty maintaining target skills during maintenance sessions (Bereznak et al., 2012; Sigafoos et al., 2007). The conflicting results of these studies raise questions about whether different components of video-prompts affect maintenance of target skills.

Social Validity

Social validity has been identified as a quality performance indicator for research studies using single-case design (Horner, Carr, Halle, & McGee, 2005). Domire and Wolfe (2014) found that social validity was consistently overlooked in the video-prompting literature. Only three studies formally looked at social validity measures (Mechling et al., 2009; Rayner, 2011; Van Laarhoven et al., 2010). The students in one study were asked which intervention they preferred, and parents and teachers were asked if they believed the procedure had a positive effect. Students, teachers, and parents all responded favorably (Van Laarhoven et al., 2010). In the Rayner (2011) study, however, teachers had varying responses in terms of the validity of the intervention.

Research Questions

This study aimed to examine areas of limited research in existing video-prompting literature including level of individualization, video self-prompting with error correction procedures, maintenance, and social validity. To address level of individualization, the study compared non-specific video-prompts to individualized video prompts. Video self-prompting with error correction procedures was used to broaden the research in these areas. Maintenance data were collected to determine if students could maintain target skills and if the level of individualization of the video-prompts affected performance. Finally, social validity was formally addressed to offer insight into teachers' perceptions of the intervention. The following questions guided the study:

1) What are the effects of individualized video-prompts and non-specific video-prompts on student performance when teaching daily living skills to elementary-age students with ASD?

2) What are the effects of video self-prompting with live error correction procedures on daily living skill acquisition?

3) What are the effects of the interventions on the maintenance of the target skill?

4) Do teachers view individualized and non-specific video-prompts as a socially valid and feasible intervention for their classrooms?

Chapter 2

Methodology

Participants

This study focused on elementary-age students, a population previously underrepresented in the video-prompting literature (Domire & Wolfe, 2014). Three students with ASD participated in the study. An elementary classroom teacher who taught students with ASD in a suburban district nominated students that a) were unable to perform the target skill, b) had normal vision, c) had the motor skills required to navigate the video prompts using the touch screen of the iPad, d) would benefit from learning the target skill and improved independence, and e) hadn't formally been taught the target skill. Letters describing the research study and permission slips were sent home to the parents identified by the classroom teacher (see Appendix B for informed consent).

Chris. Chris was an 11-year-old African-American male. Chris's test results reported a score of 35 on the Childhood-Autism Rating Scale (Schopler, Reichler, & Renner, 1988), placing him in the "mildly to moderately autistic range." Results of the Woodcock-Johnson Third Edition Normative Update Tests of Achievement (Woodcock, Johnson, Mather, McGrew, & Werder, 1991) placed Chris in the "very low" category for letter-word identification, passage comprehension, and applied problems. Chris received a scaled sore of 44 on the Adaptive Behavior Assessment System (Harrison & Oakland, 2003), placing him in the "delayed range." Chris received speech and language therapy. The classroom teacher reported that Chris's strengths included gross and fine motor skills, desire to participate, and complete activities independently.

Areas for growth included increasing vocabulary and making requests, basic addition and subtraction skills, peer interaction, and word decoding. Chris's preferred reinforcers were edibles, gross motor activities, and drawing.

Nolan. Nolan was a 12-year-old Caucasian male. Results on the Kaufman Survey of Early Academic and Language Skills (Kaufman, 1993) indicated that Nolan's vocabulary and early academic and language skills composite was in the lower extreme range. Nolan also scored in the below extreme range for expressive language skills, and in the lower extreme range for receptive language skills. Nolan received speech and language therapy and occupational therapy services. The classroom teacher noted that Nolan's strengths included rote memory, peer interaction, and imitation skills. Areas for growth reported included improving expressive language skills, word decoding, verbal requesting, and independent daily living skills. Reinforcers that were commonly used with Nolan in the classroom were edibles, gross motor activities, and sensory activities.

Zack. Zack was a 10-year-old Caucasian male. Zack received a standard score of 94 on the Gilliam Autism Rating Scale (Gilliam, 1995). This score shows "average behavior characteristics associated with ASD." Zack's score of 94 on the Adaptive Behavior Assessment (Harrison & Oakland, 2003) placed Zack in the "extremely low range." Zack received speech and language therapy, as well as occupational therapy services. The classroom teacher reported that Zack's strengths included memorization skills, sight word recognition, and appropriate behaviors. Areas for growth included verbal requesting, expressive language, word decoding, and independent living skills. Reinforcers commonly used with Zack were edibles, computer time, and time on a bike.

Setting

Baseline, intervention, and maintenance sessions were conducted in the students' classroom in a suburban school. The classroom consisted of several different stations around the room, with 6 student desks in rows in the middle of the classroom. The classroom had a refrigerator and microwave in the back, left corner, and two computers along the front, left side of the room. Sessions were conducted at a table in the back, left corner of the classroom. Sessions were conducted with each participant individually (i.e., one at a time). The participant sat across from the researcher during the sessions. A shelf that was placed behind the table was used to store materials for two of the target skills.

Materials and Video-Prompts

An assessment was conducted prior to selection of the intervention skills. After the assessment, in which no instruction for completion of the task was given, six daily living skills were targeted for the intervention: folding a shirt, wiping the table, hanging a shirt, sweeping the floor, getting a drink of water, and setting the table. These skills were selected after the assessment showed that the participants were not able to complete the activities. They were also chosen because the topography, or form of the behaviors, were comparable; they all primarily involve basic arm and hand movements, grasping, and releasing. The skills that were assessed but not included in the intervention were: folding a towel, getting a snack, and making lemonade. The target skill of folding a towel was removed because the steps too closely resembled those of folding a shirt, thus increasing the risk of carryover effects. The target skills of getting a snack and making lemonade were not included in the intervention because two of the students could perform these

skills independently. A task analysis revealed a similar level of difficulty and number of steps required to complete the six tasks chosen for the intervention. Each skill required a total of five steps. The steps for each skill are detailed in Figure 1. Materials needed to complete these skills were: a t-shirt, plastic bin, plate, cup, fork, knife, button-down shirt, hanger, broom, paper, dustpan, paper towels, cleaning spray, large bottle of water, and paper cup. Students used an Apple iPad to view the video-prompts using the Keynote application. Each video-prompt was presented on a single slide. An Apple iPhone and iMovie was used to create and edit both sets (individualized and non-specific) of video-prompts. Both sets of video-prompts were filmed using a spectator-based point of view. This point of view is filmed so that the viewer watches someone else performing the skill with their entire body as a model, rather than a performer-based point of view that uses hands and arms as the model being shown. Audio voiceover was used to state the directions for each step, and these steps were displayed in text along the bottom of each video. At the end of each clip, an icon representing "turn" was displayed, with the voiceover prompt of "your turn." The two sets of video-prompts differed in terms of the model, "turn" icon, materials used, and setting.

Individualized Video-Prompts. The individualized video-prompts were customized for each student. Peers were used as models in the videos, so that each student watched a model that was similar in terms of age and race. When the "turn" slide appeared on the individualized video-prompts, a picture of the student was shown on the slide with the student's name included in the audio prompt (e.g. Nolan's turn). The materials used in the individualized video-prompts were the same as the intervention

setting. The setting for the individualized video-prompts also was the same setting where the students were asked to perform the target skill.

Fold t-shirt:
1) Take shirt out of bin
2) Lay shirt flat on table
3) Fold the left side of the shirt to the right side (match sleeves)
4) Fold the bottom of the shirt to the top of the shirt
5) Move the shirt to the side

Sweep the floor:
1) Get the broom and dustpan
2) Sweep paper into pile (5 pieces)
3) Sweep paper into dustpan
4) Dump paper into trash
5) Put broom and dustpan away (where you found it)

Set the table:
1) Get plate, fork, knife, and cup off shelf
2) Place the plate in front of the chair
3) Place the fork on the left side of the plate
4) Place the knife on the right side of the plate
5) Place the cup on the top, right side of plate

Wipe the table:
1) Take 1 paper towel from roll
2) Spray table 3 times
3) Wipe the whole table
4) Throw away the paper towel in trash
5) Put spray and paper towels on shelf

Hang up shirt:
1) Take shirt out of bin
2) Place shirt on table
3) Place hanger in neck of shirt
4) Button the top three buttons
5) Hang up shirt in closet

Get a drink of water:
1) Unscrew cap
2) Pour water into cup
3) Put cap back on water
4) Drink water
5) Throw away cup

Figure 1: Task Analyses for Target Skills

Non-Specific Video-Prompts. The non-specific video-prompts used an unknown adult as the model. The model differed from the students in terms of age, sex, and appearance. At the end of each clip, the "turn" slide displayed a line drawing representation of the concept "turn," with an audio prompt of "your turn." The materials used for the non-specific video-prompts differed from the materials used in the intervention wherever possible (e.g. dishes used were different in terms of size and color,

different brands of items were used, different clothes). The setting used for this set of video-prompts was a home environment unknown to the students.

Research Design

An adapted alternating treatments design (AATD) was used to compare the effects of the individualized video-prompts and the non-specific video-prompts. In this design, after the baseline phase is complete, the interventions are administered, and the effects on behavior are observed (Barlow & Hayes, 1979). The two interventions (individualized and non-specific) were counterbalanced across tasks and participants in order to minimize the risk of sequencing effects. The AATD is a comparison design that looks at the efficiency of interventions. Wolery, Gast, and Hammond (2009) define efficiency as having two dimensions: 1) the strategy reliably produces learning and 2) the strategy is superior to another strategy on an important dimension. Wolery et al. (2009) identify important dimensions to be: the rapidity of learning, the extent of maintenance and generalization, breadth of learning, acquiring untrained relations, and influencing future learning. This study examined the first dimension of efficiency for both interventions (production of learning) as well as the comparison of the two interventions on the rapidity of learning, and the extent of maintenance and generalization.

Procedures

When selecting participants, the classroom teacher was asked to nominate students that were familiar with the touch screen interface of the iPad. Prior to the baseline session, students were introduced to the iPad and Keynote application. Participants were not asked to locate this application on the iPad; Keynote was already open to the video-prompts during this session and all phases of the study. Students were

shown how to move through the slides by sliding the screen and play the movie by pressing the arrow in the center. Participants were assessed on this skill by the researcher asking, “Show me the next slide” and “Play the movie.” During this session, the researcher also instructed the participant to perform each step after watching the video. Target skills were counterbalanced within and across participants for all phases of the study. Sessions were recorded using a laptop computer.

Baseline. No video-prompts were used during the baseline sessions. Participants were provided with the necessary materials to complete the task (e.g., plate, cup, knife, fork) and verbally prompted to complete the task (e.g., “Can you fold the shirt?”). If the student did not initiate the step within 10 seconds, the researcher provided the verbal prompt to complete the task again. If the student completed some of the steps but not all, the researcher asked, “Are you finished?” If the student responded “yes,” the session was ended. Data were collected on how many steps the students could complete independently, without any external prompting. Baseline data were collected for a minimum of five consecutive sessions or until the data was stable. Stability was defined as variability of less than 50% from the mean of the baseline (Alberto & Troutman, 1982). Students showed slightly higher than 50% variability with 2 of the 18 tasks across participants (i.e., Nolan’s task of wiping table, Zack’s task of getting a drink of water). Despite this higher variability, effects were still consistent across participants and across tasks.

Comparison: During the comparison phase, students were given the same verbal prompt as in the baseline phase. Each participant student was then presented with the iPad open to the video-prompts for that particular skill. The student clicked on the arrow

in the center of each slide, watched the video, completed the step, and progressed to the next slide to watch the video of the next step. If the student played and watched the video, but did not initiate any of the steps after 10 seconds, the researcher modeled the step. If the student played and watched the video, and began to perform the step incorrectly, the researcher interrupted the error and modeled the step. If the student played the video but didn't look at the screen, the researcher prompted the student to watch the video again. If the student began to perform the step but didn't complete the step within 30 seconds, the researcher modeled the step. Data were collected daily for ten sessions and the number of sessions to reach 100% correct was compared across interventions (see Appendix C for data collection sheet).

Maintenance. Maintenance sessions were conducted two and four weeks after the intervention phases in the students' classroom. The procedures for the maintenance sessions were the same as in baseline, with no video-prompts being available to the student. If the student did not meet the criteria of 100% accuracy on a target skill, they were reintroduced to the video-prompt set for that target skill.

Dependent Variables and Data Analysis

The main dependent variable in the study was the percentage of steps performed by the participant that were independently correct. Data were collected and analyzed across all conditions for this variable. Upon completion of all phases, the data were visually analyzed to compare changes of level and trend between the two sets of video-prompts. The average number of sessions to meet 100% correct also was calculated and compared across students and interventions. Finally, Nonoverlap of All Pairs (NAP) was calculated. NAP measures the nonoverlap or "dominance" between phases (Parker &

Vannest, 2009). Another way to define NAP is "the percentage of data which improve across phases" (Parker, Vannest, & Davis, 2011, p. 312). NAP is calculated by comparing each baseline data point to each intervention data point. Each comparison is scored based on the level of overlap between the data points. No growth or negative change is scored +1, a tie between data points is scored +0.5, and a positive growth or no overlap is scored 0. The sum of these scores subtracted from the total number of pairs (number of data points in baseline multiplied by the number of data points in intervention) and then divided by the total number of pairs (Parker & Vannest, 2009). Strengths of NAP include its "precision, power of the approach, and direct manner in which it is interpreted" (Vannest & Davis, 2013, p. 104).

Inter-observer Agreement and Procedural Integrity

Inter-observer Agreement. Inter-observer agreement (IOA) was calculated for the percentage of steps completed independently. IOA was calculated by dividing the number of agreements by the number of agreements and disagreements and multiplying by 100 (Caro, Roper, Young, & Dank, 1979). A trained graduate student observed and scored 30% of randomly selected videos of across all phases. After completing the scoring, the researcher and graduate student compared scores to determine if and where any discrepancies existed. The average IOA across all participants was 97% (range: 90%-100%). There were slight variations in IOA between participants. Chris's average IOA was 98% (range: 93%-100%), Nolan's was 97% (range: 93%-100%), and Zack's was 96% (range: 90%-100%).

Procedural Integrity. The same graduate student also scored 30% of the videos for procedural integrity. A checklist was developed to ensure that the researcher followed

all of the administration procedures across the baseline, intervention, and maintenance phases (see Appendix D for procedural integrity checklist). Procedural integrity was calculated by dividing the number of procedural steps completed correctly by the total number of procedural steps and multiplying by 100 (Billingsley, White, & Munson, 1980). The average procedural integrity across all participants was 96% (range: 88%-100%). Chris's average procedural integrity was 100%, Nolan's was 94% (range: 88%-100%), and Zack's was also 94% (range: 89%-100%). Variation between participants can be attributed to the increased number of opportunities to correct errors for Nolan and Zack.

Social Validity

Following the intervention, the classroom teacher was asked to complete a survey asking about her opinions and attitudes on the acceptability of the intervention, the outcomes, and the goals of the intervention. These three components have been identified as a necessary framework for assessing social validity (Wolf, 1978). The survey consisted of the following questions:

1) Would you use video self-prompting in your classroom? Why or why not?

2) Do you feel that your students benefited from their exposure to video-prompts? Why or why not?

3) Do you feel the goals (sweeping the floor, wiping the table, etc.) are social significant?

4) Do you feel the video-prompting intervention is accepted by society/families/peers as being an appropriate method for teaching?

5) Would you choose to use individualized or commercial/non-specific video-prompts in your classroom? Why?

Chapter 3

Results

Results of the current study showed that students showed improvement in the percentage of steps performed correctly across all 6 target skills using both individualized and non-specific video-prompts. Differences were noted amongst participants in terms of the degree of the percentage of increase in performance, and the maintenance of the target skills. All students required a fewer number of sessions to meet 100% correct using individualized video-prompts. Table 1 shows the students' average performance across all phases and number of sessions to reach 100% correct for individualized and non-specific video-prompts. Table 2 shows the students' average Nonoverlap of All Pairs for individualized and non-specific video-prompts between baseline and intervention phases.

Table 1: Students' Average Performance and Number of Sessions to Reach Criterion Across Baseline, Intervention, and Maintenance Phases

Individualized Video-Prompts				
Student	Baseline (%)	Intervention (%)	Maintenance (%)	Sessions (#)
Chris	42.7	94.7	97.7	1.3
Nolan	4.0	70.7	56.7	5.3
Zack	30.7	74.7	61.7	4.7
Average	**25.8**	**80.0**	**72.0**	**3.8**

Non-Specific Video-Prompts				
Student	Baseline (%)	Intervention (%)	Maintenance (%)	Sessions (#)
Chris	17.3	90	93.3	3
Nolan	26.7	68.7	65	7.3
Zack	0	62	62.3	7
Average	**14.7**	**73.6**	**73.5**	**5.7**

Table 2: Students' Average Percentage of Nonoverlap of All Pairs

	Individualized Video-Prompts	Non-Specific Video-Prompts
Chris	100	100
Nolan	100	93
Zack	96	96
Average	**99**	**96**

Chris

Individualized Video-Prompts. Chris's results can be seen in Figure 2. The target skills that Chris viewed using individualized video prompts were folding a shirt, hanging a shirt, and getting a drink of water. Chris's performance increased from an average of 20% correct at baseline to the 100% criterion after three instructional sessions for the folding a shirt task. Chris maintained this level of performance throughout the remaining intervention sessions. For the hanging a shirt task, Chris started with an average of 40% correct at baseline and met the 100% criterion on the first instructional session. Chris's performance on this task had some variability, dropping to 80% for sessions 7, 8, 12, and 14. Chris's average score for the getting a water task was 68% at baseline and increased to 100% during the first instructional session. Chris performed this task at 100% for the remaining sessions of the intervention phase. Using individualized video-prompts, the average number of sessions for Chris to reach 100% correct for the three target skills was 1.33 sessions. Chris's average NAP from baseline to intervention phase for all three target skills using individualized video-prompts was 100%.

Chris

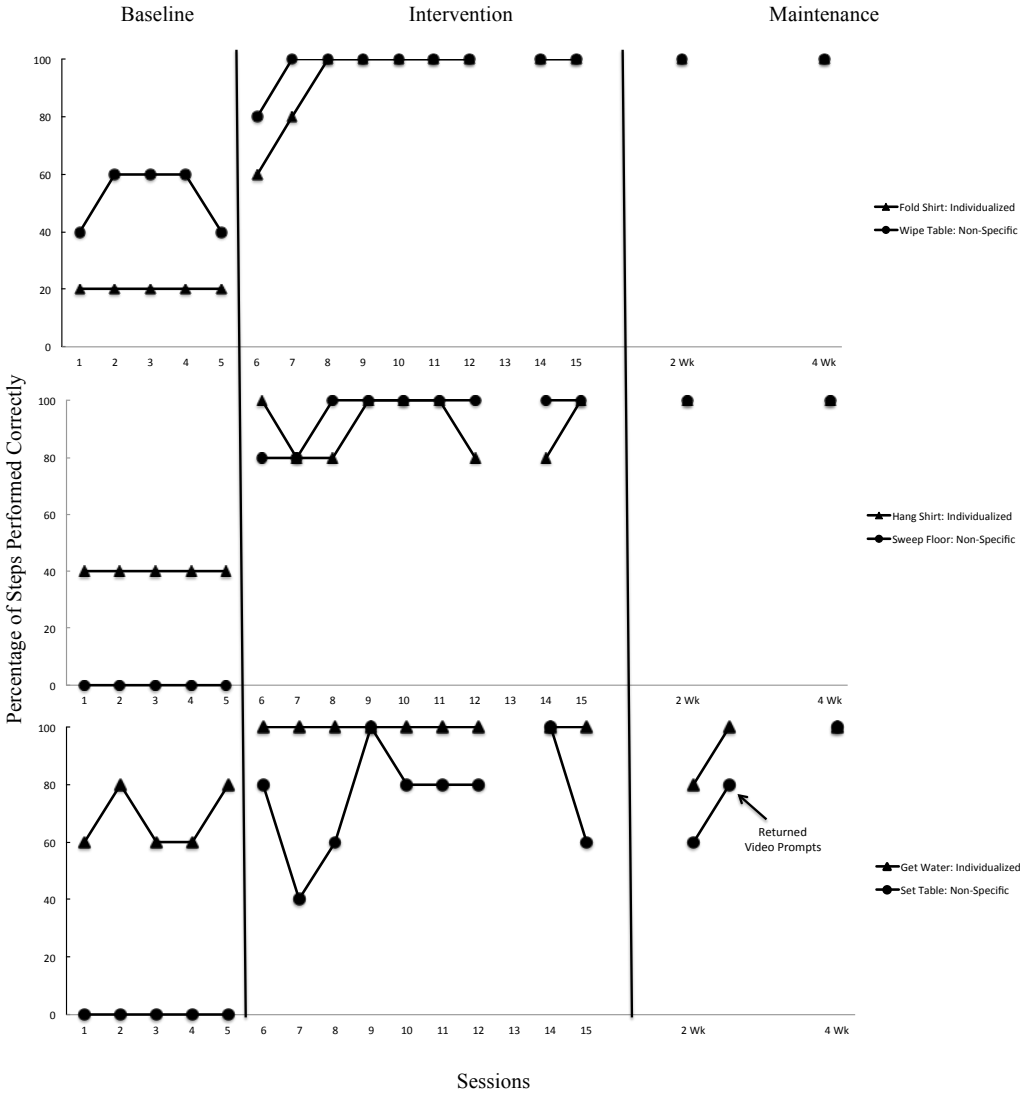

Figure 2. Percentage of steps performed correctly by Chris across baseline, intervention, and maintenance phases for the individualized video prompts (triangles) and non-specific video-prompts (circles). Target skills were counter-balanced in all sessions.

Non-Specific Video-Prompts. The target skills that Chris watched non-specific video-prompts for included wiping a table, sweeping the floor, and setting the table. Chris's average performance during baseline for wiping the table was 52% correct. Chris increased to 100% correct after two instructional sessions and maintained this level of

performance throughout the intervention phase. For the sweeping the floor task, Chris increased from an average of 0% steps performed correctly during baseline to 100% in three instructional sessions. Chris's performance on the task of the setting the table displayed the most variability. Chris's baseline average for this task was 0% correct. After four instructional sessions, Chris performed the task with 100% of steps performed correctly, however, he was only able to repeat this level of performance at one other session during the intervention phase (Session 14). Using non-specific video-prompts, the average number of sessions for Chris to reach 100% correct for the three target skills was 3 sessions. Chris's average NAP for skills taught using non-specific video-prompts was also 100%.

Maintenance. Two weeks after the intervention, Chris was able to maintain 100% accuracy for four of the six target skills without the use of video-prompts. When the video-prompts were reintroduced for the setting the table and getting a drink of water tasks, Chris's performance increased. Four weeks after the intervention, Chris was able to perform all six target skills without the use of the video-prompts.

Nolan

Individualized Video-Prompts. Nolan's results can be seen in Figure 3. The target skills that Nolan viewed using individualized video-prompts were wiping the table, sweeping the floor, and setting the table. Nolan's performance increased from an average of 12% for wiping the table during baseline to 100% after six instructional sessions. Nolan continued to perform this skill with 100% accuracy for the remainder of the intervention phase. For the sweeping the floor task, Nolan's baseline average was 0% correct and he increased to 100% after three sessions. Nolan had one drop in his

performance to 80% during Session 13. Nolan's average baseline performance for setting the table was also 0% correct. Like Chris, Nolan displayed the most variability with this task. He met the 100% criterion after seven sessions, but his performance dropped immediately afterwards to a low point of 40% correct during Session 14. The average number of sessions for Nolan to reach 100% accuracy with individualized video-prompts was 5.33 sessions. Nolan's average NAP for skills taught using individualized video-prompts was 100%.

Non-Specific Video-Prompts. Nolan watched non-specific video-prompts for folding a shirt, hanging a shirt, and getting a drink of water. Nolan's baseline average for folding a shirt was 20%, with an increase to 100% after six sessions during the intervention phase. Nolan had a drop to 80% correct for Sessions 14 and 15. For hanging a shirt, Nolan increased from a 20% average in baseline to a maximum of 80% correct at Session 15. Nolan never performed this task with 100% of steps performed correctly during the intervention phase, but did reach criterion during the two week maintenance session. The average baseline performance for Nolan for getting a drink of water was 40%. Nolan reached 100% accuracy with this task after five instructional sessions, with drops in performance to 80% during Sessions 11 and 14. Using non-specific videos, the average number of sessions to meet criterion for Nolan was 7.33 sessions. Nolan's average NAP for non-specific video-prompts was 93% (folding a shirt: 95%, hanging a shirt: 85%, getting a drink of water: 100%).

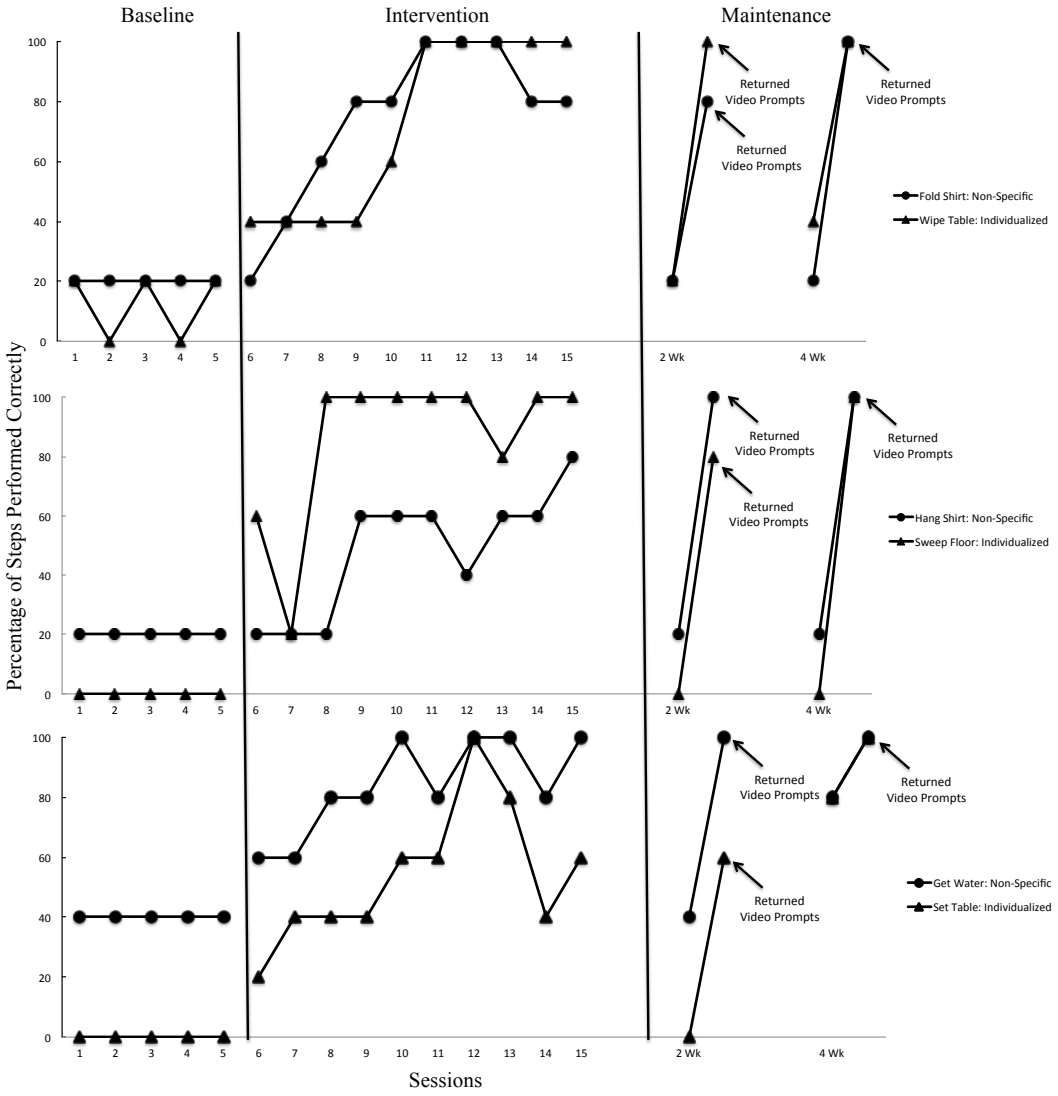

Figure 3. Percentage of steps performed correctly by Nolan across baseline, intervention, and maintenance phases for the individualized video-prompts (triangles) and non-specific video-prompts (circles). Target skills were counter-balanced in all sessions.

Maintenance. During the two-week maintenance session, Nolan's performance dropped sharply to baseline levels without the use of video-prompts. When the video-prompts were reintroduced, Nolan's performance increased to 100% for wiping the table,

hanging a shirt, and getting a drink of water. He reached 80% using the video-prompts for folding a shirt and sweeping the floor, and 60% for setting the table. At the four-week maintenance session, Nolan again displayed a decrease in performance without the video-prompts, but upon reintroduction of the video-prompts, achieved 100% accuracy for all six target skills.

Zack

Individualized Video-Prompts. Zack's results can be seen in Figure 4. The target skills that Zack viewed using individualized video prompts were folding a shirt, hanging a shirt, and getting a drink of water. Zack's average performance for folding a shirt during baseline was 20% correct. He reached 100% correct after three instructional sessions, but had variable performance after that point, dropping below 100% for Sessions 9 and 11. For hanging a shirt, Zack showed more gradual gains, increasing from 20% at baseline to 100% correct after seven sessions. Zack's performance on getting a drink of water increased from 52% at baseline to 100% correct after four instructional sessions. Zack maintained this level of performance for the remainder of the intervention phase. The average number of sessions required for Zack to reach 100% correct using individualized video-prompts was 4.66 sessions. The average NAP for Zack using individualized prompts was 96% (folding a shirt: 100%, hanging a shirt: 88%, getting a drink of water: 100%).

Non-Specific Video-Prompts. The target skills that Zack watched non-specific video-prompts for included wiping a table, sweeping the floor, and setting the table. The baseline average for Zack for wiping the table was 0% correct, and he increased to 100%

Zack

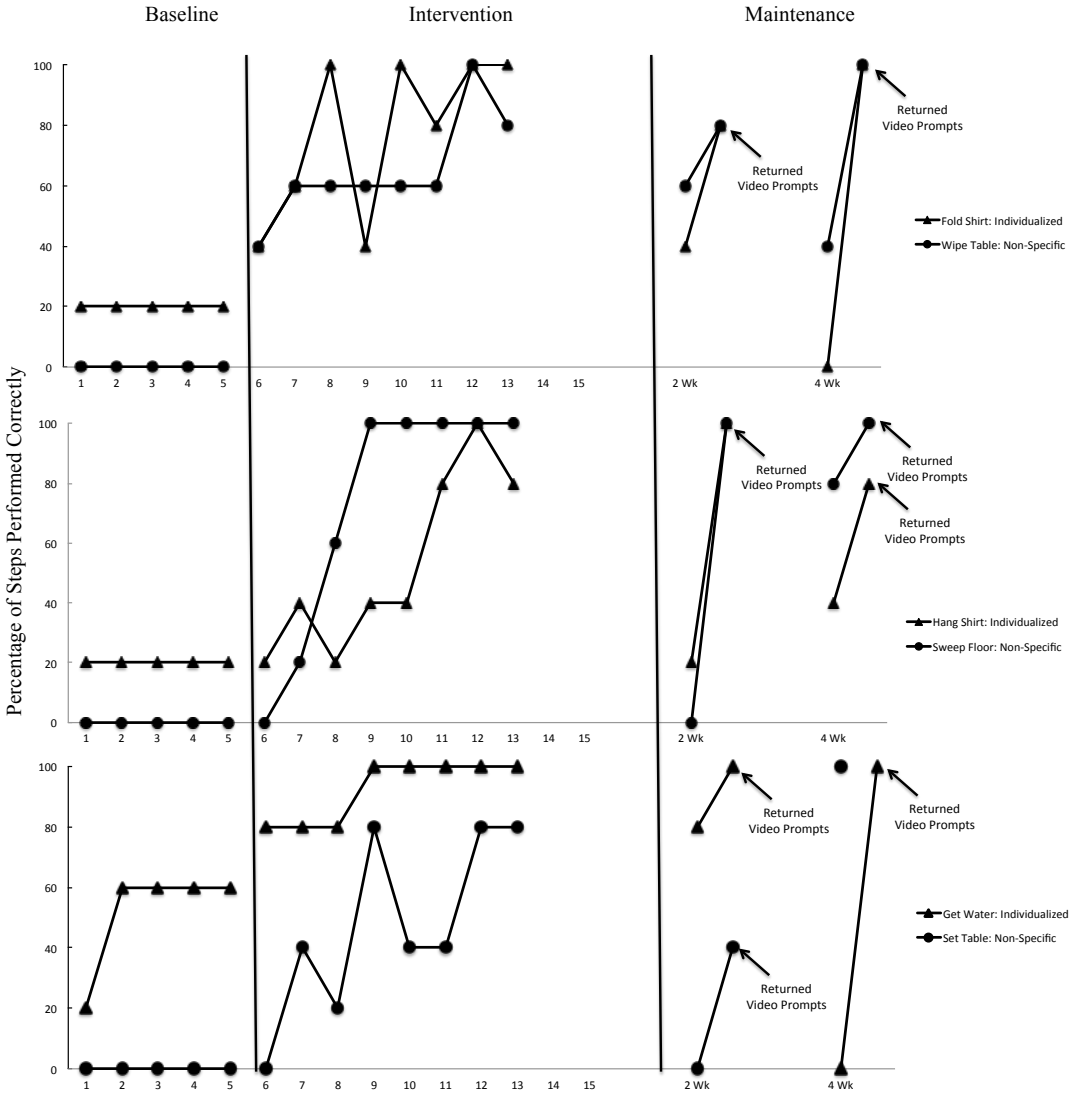

Figure 4. Percentage of steps performed correctly by Zack across baseline, intervention, and maintenance phases for the individualized video prompts (triangles) and non-specific video-prompts (circles). Target skills were counter-balanced in all sessions.

correct after seven sessions. Zack's performance sweeping the floor increased from 0% correct in baseline to 100% correct after four sessions. Zack continued to perform at 100% correct on this target skill for the remainder of the intervention phase. For the

target skill of setting the table, Zack showed gradual improvement from his baseline average of 0% correct, but he never met 100% correct for this skill during the intervention session. He was able to complete all steps correctly, however, four weeks post-intervention. Using non-specific video-prompts, the average number of sessions for Zack to reach 100% correct for the three target skills was 7 sessions. Zack's average NAP for skills taught using non-specific video-prompts was also 96% (wipe table: 100%, sweep floor: 94%, set table: 94%).

Maintenance. Zack's performance at the two-week maintenance session varied greatly. When asked to perform the skills without the use of the video-prompts, Zack's performance dropped for all target skills, with some returning to baseline levels (hanging a shirt, sweeping the floor, setting the table). When the video-prompts were reintroduced, performance levels increased for all skills, with Zack reaching 100% correct for hanging a shirt, sweeping the floor, and getting a drink of water. During the four-week maintenance session, Zack's performance improved on most tasks. He completed one task without the use of video-prompts (setting the table) and met 100% correct with the reintroduction of the video-prompts for all tasks except for hanging a shirt (80% correct).

Social Validity

The classroom teacher stated that she would use video self-prompting in her classroom, noting that her students seemed very interested in the intervention and that in general they are sometimes more successful with video-based instruction than face-to-face instruction. She shared that she would chose to use individualized prompts rather than non-specific prompts, because she thought it would help her students become more successful. The teacher noted, however, that it would be more difficult and time-consuming to create the

individualized video-prompts. When asked about the acceptability of the outcomes, she responded that she felt as though her students benefited and she could see their level of independence increase. The teacher shared that she also felt the goals and intervention were acceptable and appropriate, stating that the goals would help her students “be a more active participant in the community and become more independent at school and home.”

Chapter 4

Discussion

The study aimed to expand the current literature on video-prompting by comparing the effects of the level of individualization on student outcomes, effects of video self-prompting with error correction procedures, maintenance of target skills, and social validity. These topics, in addition to limitations of the study, implications for teachers, and directions for future research will be discussed in the remainder of this chapter.

Level of Individualization

Adjusting the level of individualization of video-prompts can be viewed as a way of programming common stimuli, which may improve student performance (Stokes & Baer, 1977). Individualizing features of the model so that he or she more closely mirrors the student in terms of gender, age, and ability-level, may also help the student to imitate the skill (Bandura, 1977). This study compared the effects of individualized and non-specific video-prompts to determine if the level of individualization of the video-prompts affected student outcomes.

Using the components of efficiency defined by Wolery, Gast, and Hammond (2009), both interventions were shown to be efficient in terms of reliably producing learning. All students showed gains in performance with both individualized and non-specific video-prompts for all target skills. One student was able to reach 100% correct for all six skills. The other two students were able to reach 100% correct for five of the

six target skills. All three students had high levels of NAP for both conditions (range: 93-100%), demonstrating little overlap between the baseline and intervention data.

In terms of dimensions of superiority (Wolery et al., 2009), individualized video-prompts were more efficient than non-specific video-prompts when looking at the rapidity of learning; the mean number of sessions to reach 100% accuracy was higher for all participants. These results mirror those of Mechling et al. (2013), which showed four students made positive gains using commercial and custom-made prompts, but had faster skill acquisition using the custom-made (individualized) prompts. In this study, the average NAP across participants for the two conditions was also slightly higher for the individualized video-prompts (individualized: 99%, non-specific: 96%). Despite the similarities across participants, the students in the current study did display individual differences in performance.

Chris. Chris's performance using the individualized and non-specific video-prompts was very similar. Chris did display a slightly higher increase in his mean level of performance from baseline to intervention using non-specific video-prompts (individualized: 52%, non-specific: 72.7%). This difference could be attributed to the fact that Chris displayed lower baseline averages for the skills taught using non-specific video-prompts, allowing him to show steeper gains in his performance level. The skill that Chris had the most variability with was setting the table, which was taught using non-specific video-prompts. The researcher noted that Chris (and others) struggled with this particular task due to steps 3 and 4, that required the student to either know directional terms (left and right) or imitate the video model. Imitating the video model in

this scenario was challenging, due to the reversed image. This issue is discussed further in the implications for educators portion of this chapter.

Nolan. Unlike Chris, Nolan had a slightly higher increase in mean level of performance from baseline to intervention using the individualized video-prompts (individualized: 66.7%, non-specific: 42%). This could again be attributed to lower baseline averages for the individualized skill set. One skill that Nolan did not reach 100% correct was sweeping the floor. This skill was taught to Nolan using non-specific video-prompts. Nolan struggled with two steps on this task, placing the shirt on the table with the buttons facing up and buttoning the buttons. Although the teacher reported that Nolan had above average fine motor skills, he often asked for help with this step. The inability to meet criterion on this task was likely due to skills deficits (fine motor), rather than the type of video-prompts being used. As Nolan watched the video for this step, he understood what was being modeled in the video, but didn't have the skill set to complete the step. The level of difficulty for this task could have been too advanced for Nolan.

Zack. Zack's mean level of performance from baseline to intervention was almost the same for individualized and non-specific video-prompts (individualized: 61.7%, non-specific: 62.3%). Like Chris, the skill that Zack struggled with the most was setting the table. Zack never met 100% correct for this skill, which could be due to difficulty with directional terms and concepts. Another reason Zack didn't meet criterion could have been due to his absences; Zack was absent two of the ten intervention sessions.

Effects of Video Self-Prompting with Error Correction Procedures

In addition to comparing individualized and non-specific video-prompts, this study sought to expand the research on video self-prompting with error correction procedures. Limited research exists on if students are able to control the video-prompts themselves, instead of a teacher or researcher navigating through the prompts. All three participants in this study were able to control the video-prompts, which mirrors results of Mechling, Gast and Seid (2009) and Payne, Cannella-Malone, Tullis, and Sabielny (2012). Bereznak and colleagues (2012) also found that two of their three participants were able to self-prompt. This study is the second study to show that elementary-age students are able to self-prompt (Domire, 2015).

Although students were able to navigate the video-prompts independently, they often required external prompts to attend to the technology. The researcher noted that all three students required several external prompts (i.e., watch the video) to focus on the videos during the intervention phase. Van Laarhoven and Van Laarhoven-Myers (2006) also found that participants required external prompts to attend to the intervention package that included video-prompting.

One explanation for the need for external prompts to use the technology could be the setting of the intervention. Sessions were conducted in the students' classroom to mimic daily instruction, and classroom activities, peers, and objects in the room often distracted students. Future studies should consider using a setting free from distractions such as these until students become more proficient at self-prompting. Receiving external prompts, although not directed at the target skills themselves, decreases the level of independence for the students.

Error correction procedures were used to ensure that students learned to perform the skill correctly and did not practice the error itself. Error corrections procedures have been shown to improve skill acquisition (Cannella-Malone et al., 2011; Goodson et al., 2007). In this study, errors were interrupted and modeled correctly throughout the intervention. Participants displayed a number of errors using both the individualized and non-specific video-prompts. Some students struggled with certain tasks (setting the table and sweeping the floor), indicating that the level of difficulty may not have been equal.

One of the most challenging aspects of using an adapted alternating treatments design (AATD) is the determination of skills of equal difficulty (Wolery et al., 2009). Skills in this study were selected due to the similar level of difficulty and number of steps required, but error patterns indicate that some skills may have been too advanced. Future studies can use one of the methods outlined by Wolery and colleagues (2009) to ensure behavior sets are equal in difficulty. These methods include: experimental evaluation of the difficulty, select behaviors from pools of responses where norms exist, conduct a logical analysis of the difficulty of the responses and discriminations required, ask experts to rate the difficulty, and evaluate participants' performance on related behaviors. Adopting one of these methods may reduce the number of errors shown by participants.

Maintenance

Another dimension of superiority when comparing interventions is the extent of maintenance and generalization (Wolery et al., 2009). Only one student was able to perform the majority of target skills (five) at two and four-week post-intervention sessions without the use of video-prompts. The other students were only able to reach 100% correct during these sessions with the use of the video-prompts. The level of

individualization of the video-prompts did not affect student performance during maintenance sessions, with all students displaying similar results for target skills that were taught using individualized video-prompts as those taught using non-specific video prompts. The need for the reintroduction of the video-prompts for most students indicates that students were still prompt-dependent after the intervention phase.

Results on maintenance of target skills in the video-prompting literature offers mixed results. Some researchers have found that students were able to maintain the skills post-intervention (Sigafoos et al., 2007; Van Laarhoven & Van Laarhoven-Myers, 2010; Van Laarhoven et al., 2010). Others have found similar results to this study, wherein students were unable to maintain skills without the use of video-prompts (Mechling et al., 2009; Sigafoos et al., 2007; Bereznak et al., 2012). This could be due to the abrupt removal of prompts without systematically fading the support for students, the reinforcing nature of using the technology, or skill deficits.

Sigafoos and colleagues (2007) addressed the fading of support by creating a procedure they termed "video-chunking." Video-chunking involves systematically combining the video-prompts to contain multiple steps. In their study, ten video-prompts were merged to form four videos, then two videos, and finally one video. Using this procedure, two of the three participants were able to maintain the skill after the final video was shown. Another way to address the issue of fading has been to transition the students to visual supports or schedules that would allow participants to remember the sequence of the steps with a less intrusive prompt.

Another possible barrier to maintenance of the target skills is the reinforcing nature of the technology. One student in this study (Chris) demonstrated that he was able

to perform the target skills without video-prompts, however, he asked for the videos for every skill during maintenance sessions. This behavior could show that the act of watching the videos is reinforcing to the student, even after mastery of the steps has been achieved. Although informally addressed, Bereznak et al. (2012) reported that the participants demonstrated interest in the portable technology used, "boasting" about using the iPhone to teachers and family members. This interest in the technology could make fading video-supports challenging.

Skill deficits, such as fine motor delays or memory impairments, could also affect the maintenance of target skills. Students in this study, as well as others (Mechling et al., 2009), self-adjusted their prompting level after mastery of certain steps. Two of the three participants (Chris and Nolan) began skipping videos they didn't need to watch in order to perform that step. An example of this behavior occurred when watching the videos for getting a drink of water. Students often skipped the videos for most of the steps mastered, but needed the final video to perform the last step (throwing away the cup). Teachers and researchers could eliminate clips as students master them, shortening the amount of time needed for the intervention. Reducing the amount of time needed improves the efficiency of the intervention and frees times for the student to engage in other activities. Eliminating clips as students master them also serves as a way to systematically fade support, which may improve maintenance of the target skill. Providing students with access to these prompts in multiple settings is easier than ever, with recent advancements in portable technology. Due to increased social acceptance in portable devices (Kagohara et al., 2013), students could also face less social stigmatization accessing prompts in this way as opposed to receiving external prompts from an educator or parent.

Social Validity

The classroom teacher was asked a series of questions about the acceptability of the goals, intervention, and outcomes of the study; she responded favorably to all three components. The teacher's statement that it would be more difficult and time-consuming to create individualized video-prompts as opposed to using commercial (non-specific) video-prompts mirrors the responses of two teachers in another study (Domire, 2015). These teachers shared that they would rather purchase videos than create them, due to time constraints of the classroom. The level of individualization (individualized vs. non-specific) required for students to be successful in learning skills using video-prompting has important implications for the feasibility of the intervention. If students are able to acquire the target skill with the same or similar results for both types of videos, teachers may be more likely to use the intervention. In addition to assessing teachers' perceptions on the intervention, future research should include the attitudes and opinions of students and peers.

Limitations

One limitation of this study is that two of the students had prior exposure to video self-prompting (Chris and Nolan). This previous experience could have affected their performance navigating through the video-prompts. It should be noted, however, that Nolan performed similarly (in terms of number of sessions to meet 100% correct) to Zack, who had no prior exposure to video-prompts.

Another threat to interval validity for this design is multi-treatment interference due to comparison of two interventions. This may be true for this study because

interventions were administered on the same day. Alternating sessions by day and probing a control group may help minimize multi-treatment interference (Wolery et al., 2009).

Implications for Educators and Future Research

In an era where technological resources are accessible in seconds, it is important that educators and researchers assess their efficiency and effectiveness related to teaching needed skills. Research has shown video-prompting to be an effective method for teaching a variety of skills, including daily living skills. When interpreting the results of these studies, however, there are several considerations for both teachers and researchers.

Teachers should consider the strengths and weaknesses of their students before beginning video-prompting methods. Video self-prompting may also be best suited for students that don't have trouble focusing on a task, as external prompting was necessary to use technology. Teachers also should consider their students' strengths and weaknesses when selecting the target skills that will be addressed using video-prompts. Certain skill deficits such as fine motor delays may limit the results of the intervention.

Further research is needed on video self-prompting in a number of areas. Replication studies should be conducted to better understand the effects of individualized and non-specific video-prompts. In addition, more research is needed that examines maintenance techniques and prompt-fading procedures. While this study and Mechling and colleagues (2013) both showed individualized video-prompts to be slightly more effective, neither study can identify which components of the individualized study affected performance. Research should be conducted that isolates components of the

individualized video-prompts (e.g., setting, materials, model) to determine if certain components affect results more than others.

Summary

The literature base on video-prompting has shown it to be an effective and efficient intervention for teaching students a variety of skills (Domire & Wolfe, 2014). This study expanded the literature on video-prompting, by answering questions related to the effects of individualized and non-specific video self-prompting on daily living skills, effects of video-self prompting with error correction procedures on skill acquisition, effects of level of individualization on maintenance, and teacher perceptions on the usability and acceptability of the intervention.

Students demonstrated improved performance using both individualized and non-specific video-prompts, although they required fewer sessions to reach 100% correct using the individualized video-prompts. The average NAP across students, or the percent of data that improved between baseline and intervention phases (Vannast & Davis, 2013), was also slightly higher for the individualized condition (individualized: 99%, non-specific: 96%). Although results showed individualized video-prompts to be superior to non-specific video-prompts when looking at the rapidity of learning (Wolery et al., 2009), these results should be tempered by usability of the interventions. Teachers have voiced concern over the time required to make individualized videos (Domire, 2015). If teachers are reluctant to use individualized video-prompts due these time limitations in the classroom, non-specific video-prompts, which were also shown to be effective in teaching target skills for all participants, offer a viable alternative.

In terms of self-prompting and error correction, students were able to self-prompt but often required external prompts to use the technology. This study extended the literature by showing that elementary-aged students were capable of self-prompting. Error analysis showed that some skills may have been too advanced for students (e.g., setting the table) and future studies should consider addressing this limitation by taking additional measures to ensure behavior sets are equal in difficulty.

One student maintained target skills without the use of video-prompts, but the other students required video-prompts to maintain target skills. The level of individualization of the prompts did not affect performance during the maintenance sessions. Possible reasons for the decline in performance during maintenance include removal of prompts without systematically fading, the reinforcing nature of using the technology, and skill deficits. Fading strategies should be implemented to improve student performance after removal of the video-prompts.

Finally, the teacher shared positive perceptions on the acceptability of the goals, outcomes, and intervention, but perceived creating individualized prompts to be time-consuming. Teacher's perceptions on the usability of the interventions should be researched more. Future research should also include the attitudes and opinions of students, peers, and caregivers.

Educators have stated that finding evidence-based practices is overwhelming (Simpson, 2005). The expanding literature on video-prompting and video self-prompting should allow teachers to feel confident about using this intervention in their classrooms. Although more research will strengthen our understanding of the intervention, results of

this study and others show video-prompting to be a promising intervention for teaching daily living skills to students with ASD.

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Appendix A

Review of Relevant Literature

Effects of Video Prompting Techniques on Teaching Daily Living Skills to Children with Autism Spectrum Disorders: A Review

The most recent report published by the Center for Disease Control (2014), states that one in every 68 children has been diagnosed with autism spectrum disorders (ASD). Autism is a neurodevelopmental disorder that is often characterized by social impairments, communication delays, and non-typical behaviors such as repetitive motor movements or strong attachment to routines (Volkmar & Pauls, 2003). Delays in these areas often lead to lower academic performance, maladaptive behavioral issues, and deficits in functional living skills (Gillham, Carter, Volkmar & Sparrow, 2000). Given such high incidence rates, many families will deal with the daily challenges of having a family member with ASD.

Acquisition of independent living skills is a primary concern for parents and families of individuals with ASD (Heiman, 2002). Many individuals with developmental disabilities, including ASD, display deficits in the daily living skills required for independence (Jacobson & Ackerman, 1990; Kraijer, 2000). Daily living skills include, among others, self-care skills (e.g. dressing), hygiene (e.g. brushing teeth), household chores (e.g. mopping), cooking, and community living skills (e.g. grocery shopping). Failure to teach these skills can lead to learned helplessness, poor self-esteem, and overall low quality of life (Parmenter, 1994; Curtis, 1989; Hayden, 1997). Although identifying

best practices to teach daily living skills to individuals with ASD is of utmost importance, teachers have stated that identifying such practices is overwhelming (Simpson, 2005).

Video modeling has been identified as an established, evidence-based intervention to teach personal responsibility skills to individuals with ASD by the National Autism Center (Wilczynski et al., 2009). Video modeling involves creating a video of someone performing a target skill. The video is then shown to the student and the student is asked to perform the behavior (Cannella-Malone, Sigafoos, O'Reilly, & Lancioni, 2006). Video modeling has been used to teach such skills as conversation (Sherer et al., 2001), vocational (Van Laarhoven, Johnson, Van Laarhoven-Myers, Grider, & Grider, 2009), play (D'Ateno, Mangiapanello, & Taylor, 2003), and daily living (Graves, Collins, Schuster, & Kleinert, 2005). Charlop-Christy, Le, & Freeman (2000) conducted a study comparing video modeling to in vivo instruction (live model) to teach developmental skills (e.g. independent play, conversational speech) to children with ASD. Results showed that the video modeling condition led to faster acquisition and generalization of the target skills than the in vivo modeling condition.

Video modeling to teach target behaviors can be viewed through the framework of social learning theory (SLT) whereby individuals learn by observing, imitating, and modeling others (Bandura, 1977). Bandura postulates that there are four necessary elements needed for successful modeling: attention, retention, reproduction, and motivation. Student attention refers to various factors that contribute to a student's ability to focus. Retention refers to the process of remembering the steps in a task and performing those steps independently. Reproduction occurs when a student performs the

skill. In the context of this review, reproduction also refers to a student's ability to generalize the skill to another setting, task, or set of materials. Motivation refers to the individual's desire to perform the task. Bandura also states that the model of the video is an important factor in imitation, stating that the most effective models are similar to the students in terms gender, age, and ability-level. Thus, according to SLT students will be more likely to attend to a video where the model was similar to themselves or if the student themselves modeled the behavior.

Video modeling and other types of video-based instruction provide many benefits to both the instructor and the learner. For the instructor, video-based instruction allows more consistent and precise teaching methods to occur (Ayres & Langone, 2005). As classroom sizes continue to expand, the ability to provide direct instruction by video is not only effective but also efficient in terms of instructional time required. Teachers can use video modeling with classroom instructional assistants and substitute teachers to ensure that students are receiving the same model. Some studies have examined student-controlled video instruction (Mechling, Gast, & Seid, 2009; Van Laarhoven, Kraus, Karpman, Nizzi, & Valentino, 2010), wherein the student starts and stops the video and can replay the video as necessary. Student-controlled instruction permits the teacher more time to focus on other demands while giving the student a sense of autonomy. Another benefit of video-based instruction is portability. With advancements in today's technology, instruction is possible in students' homes, workplace, grocery stores, community parks, etc. (Van Laarhoven & Van Laarhoven-Myers, 2006).

Although there are several benefits of video modeling for students with ASD, one limitation is well-documented memory impairments (Quill, 1997; Matson & Smiroldo,

1999). Specifically, video modeling requires the student to watch the entire skill being performed which can be several minutes in length (Canella et al., 2006). Video prompting is a form of video modeling in which the task is broken into discrete steps on the video rather than showing the target skill presented in its entirety. Participants watch clips on the video depicting the task sequence that is typically less than 30 seconds in length and are then asked to perform that step before the next step is viewed (Cannella-Malone et al., 2006). While video prompting is a form of video modeling in the broad sense that instruction is being delivered via videos, researchers in the field have used the terms "video modeling" and "basic video modeling" to refer to the presentation of the entire task at once, and the term "video prompting" for presentation of the task in short segments (Wong et al., 2013). This article will also use the terms in that way, consistent with the 12 studies included in the review.

The short segments presented in video prompting incorporates the procedure of response chaining, wherein complex tasks are broken into attainable units (O'Donohue & Fisher, 2009). The goal is for the student to perform skills in the chain of tasks independently at the end of instruction. The literature on response chaining suggests that video prompting leads to a more rapid acquisition of skills than video modeling techniques (Duker, Didden, & Sigafoos, 2004), because students are being asked to process smaller amounts of information all at once. Video prompting is a promising instructional technique for individuals with ASD due to their deficits in short-term working memory, (Williams, Goldstein, Carpenter, & Minshew, 2005; Poirier, Martin, Gaigg & Bowler, 2011) and these deficits become more apparent as tasks become more complex (Minshew & Goldstein, 2001). When information is presented to students in

small amounts, it can be processed more effectively and efficiently (Minshew & Williams, 2008). Video prompting allows students to gradually attain the steps required to perform the desired skill while gaining confidence regarding their performance (Cihak & Schrader, 2008). Although promising, there is a lack of research related to video prompting for individuals with ASD (Rayner, Denholm, & Sigafoos, 2009).

The purpose of this review was to determine the effectiveness of video prompting for teaching daily living skills to individuals with ASD. In addition, other research questions were developed using essential elements of social learning theory. Review questions included examining factors that may affect student:

1)attention to the video

2)retention (performance) of target behavior

3)reproduction (generalization) of target behavior

4) motivation (maintenance of target behavior)

Methods

The focus of this literature review centered on video prompting techniques. A systematic electronic search of the Educational Research Information Center (ERIC), PsychINFO, PsychARTICLES, and ProQuest databases was conducted. Combinations of the following key words were used in the search: *video prompting, video instruction prompting, daily living skills, functional living skills, autism, and autism spectrum disorders (ASD).* These terms were found as keywords for many of the articles that were reviewed. The original search resulted in six studies. One study was excluded because the authors used video modeling rather than video prompting techniques. An ancestral search

of the resulting articles was conducted to find additional studies that were relevant to the review; three additional studies were located. Finally, upon discussion with colleagues and researchers in the field, an additional six studies were identified. Two of these studies were excluded from the review because the participants were not diagnosed as having autism, but rather described as having "mild autism traits." A timeframe of 2005- 2013 was selected for this review of the literature based on a previous review of video instruction conducted in 2005 (Ayres & Langone, 2005). Banda, Dogoe, and Matuszny (2011) also conducted a review of the literature on video-prompting. This review expands their findings by including several studies and also aims to focus specifically on individuals with autism rather than the broad category of "developmental disabilities."

Articles included in this review met specific inclusion and exclusion criteria. First, the articles were published in a peer-reviewed journal. Second, to be included in the review, at least one participant in the study had to be identified as having ASD. Finally, the intervention had to target functional living skills (e.g., grooming, daily chores, cooking). A total of twelve articles met inclusion criteria. Information about the studies, including participants, experimental design, video-perspective, settings, target skills, and results are included in Table 1. Due to the complexity of the comparison studies included in this review, detailed information regarding the independent and dependent variables can be found in Table 2.

Results

Results and data provided only include the participants in the studies that were diagnosed with ASD. There were a total of 38 individuals in the 12 studies that met the

inclusion criteria. Three of these individuals were female. Participants in nine of the studies also were diagnosed as having mild or moderate intellectual disabilities (Cannella-Malone et al., 2006; Mechling & Gustafson, 2008; Goodson, Sigafoos, O'Reilly, Cannella, & Lancioni, 2007; Mechling et al., 2009; Rayner, 2011; Sigafoos et al., 2005; Sigafoos et al., 2006; Van Laarhoven &Van Laarhoven-Myers, 2006; Van Laarhoven, Kraus, Karpman, Nizzi, & Valentino, 2010). Participants in the three of the studies were diagnosed as having moderate to severe intellectual disabilities (Cannella-Malone et al., 2011; Cannella-Malone, Wheaton, Wu, Tullis, & Park, 2012; Bereznak, Ayres, Mechling, & Lawrence, 2012).

Age of the participants ranged from 9 years to 41 years. Seven studies included middle and high-school age students (Bereznak et al., 2012; Cannella-Malone et al., 2011; Cannella-Malone et al., 2012; Mechling & Gustafson, 2008; Mechling et al., 2009; Van Laarhoven & Van Laarhoven-Myers, 2006; Van Laarhoven et al., 2010). Four studies included adults (19-41 years) with autism (Cannella-Malone et al., 2006; Goodson et al., 2007; Sigafoos et al., 2005; Sigafoos et al., 2006). One study included elementary school age participants (Rayner, 2011).

Settings

Three studies (Cannella-Malone et al., 2006; Sigafoos et al., 2005; Sigafoos et al., 2006) were conducted in the vocational rooms of the community-based group homes in which the participants resided. Another study was conducted in a vocational training center that the participants attended (Goodson et al., 2007). The remaining eight studies were conducted in a variety of settings within a school environment including classrooms, cafeterias, living-rooms, laundry-rooms, and teacher workrooms (Bereznak

et al., 2012; Cannella et al., 2011; Cannella-Malone et al., 2012; Mechling & Gustafson, 2008; Mechling et al., 2009; Rayner, 2011; Van Laarhoven & Van Laarhoven-Myers, 2006; Van Laarhoven et al., 2010)

Target Skills

Cooking related tasks were targeted in six studies (Bereznak et al., 2012; Mechling & Gustafson, 2008; Mechling et al., 2009; Sigafoos et al., 2005; Van Laarhoven & Van Laarhoven-Myers, 2006; Van Laarhoven et al., 2010). Of these studies, two tasks focused on operating a conventional oven or stove (Mechling & Gustafson, 2008; Mechling et al., 2009) and the others focused on operating a microwave oven. Other daily living skills targeted included setting a table (Goodson et al., 2007) and putting away groceries (Cannella-Malone et al., 2006), washing dishes (Cannella-Malone et al., 2011; Sigafoos et al., 2006), washing laundry (Bereznak et al., 2012; Cannella-Malone et al., 2011), folding laundry (Van Laarhoven & Van Laarhoven-Myers, 2006; Van Laarhoven et al., 2010), washing a table (Canella-Malone et al., 2011; Van Laarhoven & Van Laarhoven-Myers, 2006), using a copy machine (Bereznak et al., 2012), shoe-tying (Rayner, 2011), and sweeping (Cannella-Malone et al., 2011).

Research Design

Single-case research methods were used in all of the studies included in this review. Single-case research designs typically incorporate several features including: the participant acting as his or her own control, detailed descriptions for replication, clearly defined variables, baseline data collection, experimental control, and social validity measures to address practicality (Horner et al., 2005).

Horner and colleagues (2005) have used these features of single-case research to develop a list of 21 quality indicators. These indicators were designed to determine if the study "meets the minimally acceptable levels that permit interpretation" (p. 173) and cover seven different categories: a) description of participants and settings, b) dependent variable, c) independent variable, d) baseline, e) experimental control/internal validity, f) external validity, and g) social validity. All twelve studies were reviewed in accordance to their adherence to the 21 quality indicators. A yes or no response was given for each indicator. Every study had at least 19 of the quality indicators. Two studies that did not adhere to all 21 of the indicators did not collect multiple measurements during baseline; they conducted a pre-test of the skill being taught (Van Laarhoven & Van Laarhoven-Myers, 2006; Van Laarhoven et al., 2010). Repeated, consistent measurement of the dependent variable during baseline allows the researcher to predict future responding (Horner et al., 2005).

Seven of the studies used an adapted alternating treatments design (Cannella-Malone et al., 2006, Cannella-Malone et al., 2011; Cannella-Malone et al., 2012; Mechling & Gustafson, 2008; Rayner, 2011; Van Laarhoven & Van Laarhoven-Myers, 2006; Van Laarhoven et al., 2010), where different interventions were alternated (e.g. video modeling, video prompting, picture prompting, video-prompting with error correction). Bereznak et al. (2012), Cannella-Malone et al. (2006), Canella-Malone et al. (2011), Cannella-Malone et al. (2012), Goodson et al. (2007), Rayner (2011), Sigafoos et al. (2005), and Sigafoos et al. (2006) all utilized a multiple-probe across subjects design, while Mechling et al. (2009) implemented a multiple-probe across skills design.

Effectiveness of Video Prompting/Performance of Target Behavior

All twelve studies included in the review reported gains in target skills after instruction via video prompting to varying degrees. Upon visual inspection of the graphs provided, seven of the twelve studies had 100% non-overlapping data for the video prompting condition for all participants with ASD (Bereznak et al., 2012; Mechling & Gustafson, 2008; Mechling et al., 2009; Sigafoos et al., 2005; Sigafoos et al., 2006; Van Laarhoven &Van Laarhoven-Myers, 2006; Van Laarhoven et al., 2010). Participants in Goodson et al. (2007) displayed 100% non-overlapping data when video prompting was combine with error correction procedures. Percentage of non-overlapping data (PND) is used to determine the proportion of data points that are shared between baseline and intervention conditions (Scruggs, Mastropieri, & Casto, 1987). Kazdin (1978) states that, "If performance during an intervention phase does not overlap with performance during the baseline phase when these data points are plotted over time, the effects usually are regarded as reliable" (p. 637). Five studies did not have 100 percent PND for all participants with ASD. Cannella-Malone and colleagues (2011) had one participant with one overlapping data point, giving that particular student a PND score of 89 percent. In another study, two students had one overlapping data point as well, however, both of these students experienced this overlap on the first day of the intervention phase (Cannella-Malone et al., 2006). These two students had PND scores of 93 and 95 percent.

Of the three participants in the Rayner (2011) study, one had 100% non-overlapping data, another had 75% non-overlapping data, and another had 78% non-overlapping data. Overall, the participants were unable to meet criterion with video-

prompting alone, however, and required in vivo instruction with backward chaining to master the target skill (shoe-tying). The three participants with autism in the Goodson et al. (2007) study also had varying degrees of over-lapping data. Two students displayed 100% non-overlapping data and the other had 0% non-overlapping data when the skill was taught with video-prompting alone. When error correction was combined with video prompting, however, the student displayed 91% non-overlapping data.

Bereznak et al. (2012), Sigafoos et al. (2005), and Sigafoos et al. (2006) all looked at the efficacy of video prompting alone, without comparing it to other interventions. The dependent variable for these studies was the number or percentage of correct responses. The participant with autism in the Sigafoos et al. (2005) study advanced from a 0 to 20% independent responding rate during baseline to a 100% rate during video prompting within five sessions. Sigafoos et al. (2006) also reported large gains in the percentage of steps performed independently immediately after the introduction of video prompting. These high levels of performance were attained within 10 sessions. Bereznak et al. (2012) noted gains upon introduction of video-prompting as well, with two of the three students in this study navigating through the video-prompts independently. Two studies evaluated video-prompting with error correction procedures (Cannella-Malone et al., 2012; Goodson et al., 2007). Both of these studies reported that error correction improved skill acquisition. The participant with autism in the Cannella-Malone et al. (2012) study, however, did not meet criterion for one of the target skills (sweeping) and required in vivo instruction.

Video Prompting Compared to Static Picture Prompts

Mechling and Gustafson (2008) and Van Laarhoven et al. (2010) compared video prompting to static picture prompts (static photographs of an individual completing the target skill). The two studies noted that both interventions were effective, although video prompting resulted in a greater number of independent correct responses. Mechling and Gustafson (2008) reported that this difference in percentage of correct tasks was 78.2% when video prompting was used and 39.2% when static picture prompts were used. In addition to reporting gains in independent correct responses, Van Laarhoven et al. (2010) also looked at the number of external prompts required to use technology. The authors found that fewer external prompts were required in the video prompting condition. Video prompting and static picture prompts also were analyzed in terms of efficiency, number of error correction prompts, and number of sessions to reach criteria. The authors compared the amount of time required to create the instructional materials for both conditions with the ratio of growth for each participant. The video prompting condition was the most efficient condition in terms of this efficiency measure. Video prompting was also shown to have a lower percentage of error correction prompts (6%) compared to picture prompts (14%) and required the same number of sessions to meet criterion as the picture prompting condition.

Mechling et al. (2009) studied student-controlled prompting in which the participants had the option of self-selecting either picture, auditory, or a video prompt based on personal preference. Results showed an immediate improved performance using the prompting device in terms of independent correct responding. The study also looked

at the percentage of prompt levels selected by the students and reported that participants selected the video prompting condition more than the picture prompts with audio. After multiple sessions, however, students self-adjusted their prompting level to the picture condition, suggesting an ability and desire to systematically fade prompts after skill acquisition.

Video Prompting Compared to Video Modeling

Three of the studies compared video prompting to video modeling (Cannella-Malone et al., 2006; Cannella-Malone et al., 2011; Van Laarhoven & Van Laarhoven-Myers, 2006). Cannella-Malone et al. (2006) and Cannella-Malone et al. (2011) reported positive gains for students using video prompting in terms of percentage of correct independent responding. Three participants in the Cannella-Malone et al. (2011) study, however, required error correction procedures using video prompts and in vivo demonstrations. Video modeling was shown to be generally ineffective in both studies.

Van Laarhoven and Van Laarhoven-Myers (2006) also found that an intervention package with video prompting was more effective than video modeling. Researchers in this study compared video modeling, video modeling followed by picture prompts, and video modeling followed by video-prompts. Dependent variables included: percentage score for levels of assistance, percentage of independent correct responses, number of prompts to use instructional materials, number of sessions to reach criterion. The only participant with ASD in this study displayed a higher percentage of correct independent responses and more independence on levels of assistance measures when presented with the video modeling plus video prompting condition as opposed to video modeling alone.

Video modeling with video prompting and video modeling with picture prompting both resulted in faster acquisition of the target skills than the video modeling condition.

Contradictory to the Van Laarhoven et al. (2010) study, participants in Van Laarhoven and Van Laarhoven-Myers (2006) study required more external prompts to attend to the intervention package that included video prompting. The authors noted that this could have been due to the student self-fading prompt levels after the skill was already acquired.

Student Attention to the Video and Perspective

Another factor to consider for the each of the studies is the model that was used in the videos. Possible options for the model or person completing the task are peer models, adult models, or self-models. Students are more likely to attend to a model that is most similar to themselves and their experience (Bandura, 1977). Adult models were used in all but one of the studies. Rayner (2011) utilized both adult and peer models. In addition, this study used a twin sibling as a model for one of the students. Participants in this study did not display a significant difference in performance regardless of the model used.

None of the studies presented a direct comparison of the point-of-view of the video presented. Studies that used a performer-based perspective filmed the video so that the viewer was watching the skill be conducted with only the hands and arms of the model being shown. The six studies that used video prompts filmed only from the perspective of the performer (Bereznak et al., 2012; Cannella-Malone et al., 2006; Cannella-Malone et al., 2011; Rayner, 2011; Sigafoos et al., 2005; Sigafoos et al. 2006), all showed positive gains in the targeted skills. Studies that used a spectator-based perspective filmed the video so that the viewer was watching the skill be conducted by

another person in the room. Mechling and Gustafson (2008), Mechling et al. (2009), Cannella-Malone et al. (2012), and Goodson et al. (2007) all used videos filmed from the perspective of the spectator and reported comparable findings to the studies above in regards to acquisition of target skills and independent correct responding. Similarly, the two studies that used a combination of both performer and spectator perspectives noted positive gains (Van Laarhoven & Van Laarhoven-Myers, 2006; Van Laarhoven et al., 2010).

Student Reproduction (Generalization) & Motivation (Maintenance)

Conflicting results were reported in the twelve studies in regards to the generalization and maintenance of target skills. Sigafoos et al. (2005), Van Laarhoven and Van Laarhoven-Myers (2006), and Van Laarhoven et al. (2010) all noted that students were able to maintain the target skills after the removal of video prompting. Sigafoos et al. (2005) collected maintenance data at two, six, and ten weeks, and the participant continued to perform between 80-100% of the target skills independently. Some authors conducted maintenance and generalization data collection six weeks after the removal of the intervention (Van Laarhoven & Van Laarhoven-Myers, 2006; Van Laarhoven et al., 2010). Both studies gave post-tests in novel environments using different materials but the same skill. The participant in the Van Laarhoven and Van Laarhoven-Myers (2006) study had higher post-test scores in the skills where video prompting was used in combination with video modeling compared to those who were taught using video modeling alone or video modeling with photo prompts. Participants in the Van Laarhoven et al. (2010) performed similarly, with students demonstrating a higher percentage of independent correct responding during the post-generalization tests

for the skill taught using video prompting rather than picture prompts. One of the students in the study only maintained the skill that was taught using video prompting.

Three studies reported difficulties with maintenance of target skills post-intervention (Mechling et al., 2008; Sigafoos et al., 2006). Of the six participants in the Mechling (2008) study, three displayed a drop in performance when video prompting was removed in comparison to two who regressed when picture prompts were removed in the same study. It is of interest to note that one student regressed after the withdrawal of video prompts and refused to participate without the DVD player and video prompting. Sigafoos et al. (2006) also reported a deterioration of performance when video prompting was removed. To address this issue, the authors of this study created and implemented a procedure that they called *video-chunking*. Video-chunking was a 3-step procedure where the video prompts were systematically combined to create multi-step videos. The ten video prompts were merged to form four videos, then two videos, and finally one video. Two of the three participants continued to perform with 90-100% accuracy after the one "chunk" video was withdrawn. Two participants in the Bereznak et al. (2012) study displayed a decrease in performance during maintenance sessions. After reintroduction of the iPhone, the students were able to rebound to criterion-level performance.

Several studies did not provide information about maintenance data (Cannella-Malone et al., 2006; Cannella-Malone et al., 2011; Cannella-Malone et al., 2012; Goodson et al., 2007;Mechling et al., 2009). Cannella-Malone et al. (2006) and Mechling et al. (2009) reported that participants maintained high levels of performance for the target skills after video-prompting was removed, but neither study gave information about when these maintenance sessions were conducted. Cannella-Malone et

al. (2011) was limited by the time restraints of the school year and was unable to collect maintenance data.

Social Validity

Only Van Laarhoven et al. (2010), Rayner (2011), and Mechling et al. (2009) formally looked at social validity. In Van Laarhoven et al. (2010), participants were asked which intervention they preferred; all participants stated that they preferred video prompting to picture prompts. Parents were also asked about the intervention effects and all replied favorably. Rayner (2011) provided classroom teachers with a survey regarding the intervention. Teachers had varying responses regarding the importance of the skill being taught, the student level of independence after being taught the skill, and the perceived interest of the students for the intervention. Although informally addressed, Bereznak et al. (2012) reported that the participants demonstrated interest in the portable technology used, "boasting" about using the iPhone to teachers and family members.

Discussion

The need for evidence-based practices in school systems is of growing concern while daily classroom demands often make it difficult for teachers to identify empirically-based interventions independently (Simpson, 2005). The goal of this review was to determine if video prompting techniques are an effective intervention, as well as to examine the factors that may affect student attention, retention (performance) of target behavior, production (generalization) of target behavior, and motivation (maintenance of target behavior). The data analyzed in this review illustrated that video prompting is a promising intervention for teaching daily living skills to individuals with ASD.

Attention

Participants were able to attend to the video prompts better than the full-length video required for video modeling. Cannella-Malone et al. (2006) observed that students appeared to be more engaged in the video clips that typically were less than 30 seconds in length, and often looked away during the full-length video modeling component that was typically several minutes in length. This finding mirrors previous research supporting evidence that students with ASD have impairments in attention (Allen & Courchesne, 2001; Ames & Fletcher-Watson, 2010). These deficits are seen across many domains of attention but are most pronounced for social attention skills, which involve looking and focusing on other people (Ames & Fletcher-Watson, 2010). Video instruction requires student attention to the teacher model via video which could be problematic due to attentional delays. Breaking skills into smaller units could make the skill more attainable. The smaller video segments also allow students to attend to the most salient features of the tasks which often is difficult for children with ASD (Quill, 1997).

In addition to attention deficits, video prompting may also address documented deficits in information processing, memory, and imitation (Minshew & Williams, 2008; Williams et al., 2005; Poirier et al., 2011; Rogers & Pennington, 1991) Due to impairments in short-term memory, shortened video prompts may ensure that the student's memory is not taxed (Poirier et al., 2011). Minshew and Williams (2008) state that when tasks contain multiple components or have increased time demands, performance for individuals with ASD deteriorates. Whole task presentation such as that done in video modeling places a demand on information processing and imitation skills that are already delayed (Minshew & Williams, 2008; Rogers & Pennington, 1991).

Individuals with ASD have been found to be significantly impaired in overall imitation abilities in many domains compared to their typically-functioning peers, even after controlling for developmental levels (Rogers, Hepburn, Stackhouse, & Wehner, 2003). Therefore, students with ASD may be more successful imitating smaller segments than the whole task presentation.

Further rationale for shortened segments is research centered on central coherence, which states that smaller units of information are desirable for individuals with ASD. Weak central coherence is a term used to describe impairments in perceiving parts as a whole and a bias towards detail-focused processing (Happe & Frith, 2006). This characteristic is so common in individuals with ASD, that it was included as part of the criteria for diagnosing autism (Happe and Frith, 2006). Specifically, the criteria states that individuals with ASD can have a 'persistent preoccupation with parts of objects' (DSM-IV, APA, 2000, p. 70). Forward chaining tasks allow a student to focus on these small details rather than the entire task and thus aids in central coherence development. To avoid prompt dependence as students gain mastery in the small steps, prompts need to be systematically faded (O'Donohue & Fisher, 2008). Future research should look at fading procedures such as the "video-chunking" procedure described by Sigafoos et al. (2006) to help students put these skills together.

Other components that could affect student performance in video prompting instruction are voiceover and the model used in the video. All of the studies included audio or text voiceover in their video prompts. Without isolating this component, one is unable to determine if the voiceover narration is partly responsible for the intervention effects. It is of interest to note, however, that one of the participants in the Cannella-

Malone et al. (2011) study was diagnosed as having a bilateral hearing loss and showed high levels of performance under the video prompting condition. This suggests that the audio voiceover may not have interfered with the effectiveness of video prompts. Other research has shown that audio voiceover on video models increases student performance in terms of independent correct performance (Mechling & Collins, 2012).

As noted previously, participants are more successful in attending to a task when the models and experiences are similar to themselves (Bandura, 1977). Following the SLT, a video using a performer-based perspective would most closely resemble the experience of the student. However, studies included in this review demonstrated similar intervention results for both performer and spectator-based videos suggesting that students were able to attend to both perspectives. This mirrors other findings related to video perspective (Ayres & Langone, 2007; McCoy & Hermansen, 2007; Mechling & Moser, 2010). Although they differed in terms of perspective, eleven of the twelve studies used adults as models rather than peers who were similar to the participants or the participants themselves (video self-modeling). In a study by Cihak (2008), individuals with ASD were taught vocational skills using video-based instruction. The author compared video adult-modeling as well as video self-modeling. Although results in terms of performance varied, all of the participants stated that they liked to watch the self-model video more than the adult model. Given these mixed findings, future research should look at the effect of using video self-modeling or peers that are similar to the participants in the video prompts.

Although it has been shown that students with ASD perform better with smaller units of information, little research has been done to determine the optimal length of

video segments or number of steps presented. Eight of the twelve studies in this review reported video segment length (Cannella-Malone et al., 2006; Cannella-Malone et al., 2011; Cannella-Malone et al., 2012; Goodson et al., 2007; Mechling & Gustafson, 2008; Mechling et al., 2009; Sigafoos et al., 2005; Sigafoos et al., 2006). Video segment length varied from 3 to 42 seconds. In the studies that compared to a video modeling condition, video modeling ranged from 1 minute, 37 seconds to 2 minutes, 42 seconds (Cannella-Malone et al., 2006; Cannella-Malone et al., 2011). Future research should look at optimal video segment lengths for skill acquisition, due to memory and attention span deficits for individuals with ASD. Similarly, the number of steps in each task could play a role in the success of the student. Just as in a task analysis, decisions need to be made on how much information students can understand in each step. Analyzing which components of video prompting are most effective, such as segment length and number of steps in a task, will help maximize student achievement.

Retention/Performance

Video prompting resulted in improved student performance in several realms. In two studies, students displayed an increased rate of independent responses in less than 10 sessions (Sigafoos et al., 2005; Sigafoos et al., 2006). In terms of number of correct independent responses, video prompting techniques were shown to be more effective than static picture prompts (Mechling & Gustafson; 2008; Van Laarhoven & Van Laarhoven-Myers, 2006; Van Laarhoven et al., 2010) and video modeling (Cannella-Malone et al., 2006; Cannella-Malone et al., 2011; Van Laarhoven & Van Laarhoven-Myers, 2010).

Video prompting was shown to be effective for a wide age range of students (9-41 years) yet only one study examined using video prompting with elementary-aged

children. This could be due to the nature of the daily living skills that were being taught. Typically skills such as cooking and household chores are taught to older children that will be making the transition to independent living. Although this review looked only at using video prompting with individuals with ASD, the studies also included participants with other developmental disabilities such as intellectual disabilities (Cannella-Malone et al., 2011; Sigafoos et al., 2005; Van Laarhoven & Van Laarhoven-Myers, 2010), Down syndrome (Van Laarhoven & Van Laarhoven-Myers, 2010), and fragile X syndrome (Cannella-Malone et al., 2011). Participants with other disabilities performed similarly to those with ASD, suggesting that video prompting is a useful intervention for other populations. It is of interest to note that other studies (Cihak, Alberto, Taber-Doughty, & Gama, 2006) have found video prompting to be slightly less effective than picture prompts for individuals with attention-deficit/hyperactivity disorder (ADHD). One potential explanation for this is that students with ADHD could lose focus during the video prompts due to movement of the video, environmental distractors, and irrelevant information in the video (Alberto, Cihak, & Gama, 2005).

The majority of the participants in this review had mild to moderate disabilities. Mechling and Gustafson (2008) proposed more research be done involving disability level and video prompting, posing the question whether video-based instruction would be an effective intervention for students with poor imitation skills who required higher-level, physical prompts. In this review Cannella-Malone et al. (2011) were the only researchers who reported on individuals with more severe delays and although the participants saw positive gains, they did not find the high acquisition rates of the other studies. Speed of acquisition is an important factor when considering the effectiveness of an intervention.

The faster a student acquires a skill, the faster a teacher can move on to teaching new material. For students that are already far behind their typically-functioning peers, this could mean that a student has a greater chance of "catching up." High acquisition rates in the video prompting conditions could have been due to student preference for the video prompting conditions. Shorter time segments and video based instruction could have optimized information processing. Reinforcement also could be an explanation. Several studies discussed that the technology component itself was reinforcing. In addition, many of the studies required students to prepare or cook a snack that they were then allowed to consume. This tangible reinforcer could have motivated students to work to perform the task quickly.

Reproduction/Generalization

In addition to being effective for a wide age and disability range, video prompting procedures also were effective in a variety of environments including school, home, and residential settings. When collecting maintenance data, three of the studies used novel settings and materials (Rayner, 2011; Van Laarhoven & Van Laarhoven-Myers, 2006; Van Laarhoven et. al, 2010). Participants were able to perform the target task independently in these situations, however, none of the studies used the video prompts for instruction in community setting (e.g., grocery store or restaurant).

Motivation/Maintenance

Many of the participants were able to retain the skills demonstrated in the video for up to ten weeks after the prompts were removed (Sigafoos et al., 2006; Van Laarhoven and Van Laarhoven-Myers (2010), Van Laarhoven et al., 2010). The video component may have made the information related to the skill easier to maintain due to

the visual strengths of individuals with ASD (Hayes et al., 2010, Quill, 1977). In some visual skills, such as visual searching, individuals with ASD have been shown to perform better than their typically-functioning peers (O'Riordan, Plaisted, Driver, & Baron-Cohen (2001). After acquiring the target skill, one participant in the Van Laarhoven and Van Laarhoven-Myers (2006) study stated that he didn't need to watch the video prompts anymore because he could "play the video in his head" (p. 377). Students who had difficulty maintaining target skills showed improvements using the more gradual fading procedure termed "video-chunking" (Sigafoos et al., 2006).

Limitations

Horner et al. (2005) indicated quality performance indicators for research studies using a single-subject design. While the studies included in this review met most of these indicators (e.g. description of participants and settings, reliability and inter-observer agreement data), one indicator that was consistently overlooked was social validity. Only three studies, (Van Laarhoven et al., 2010; Rayner, 2011; Mechling et al., 2009), formally looked at social validity measures. The students in one study were asked which intervention they preferred, and parents and teachers were asked if they believed the procedure had a positive effect. Students, teachers, and parents all responded favorably (Van Laarhoven et al., 2010). In the Rayner (2011) study, however, teachers had varying responses in terms of the validity of the intervention. Another limitation, as previously stated, is that studies should collect multiple data points during baseline to allow for trend prediction. Future studies should look at social validity measures to determine if the target skill is socially important, as well as conduct repeated measurement of the dependent variable during baseline.

Implications for Practice and Future Research

Teachers who wish to use video prompting in their classroom could see a number of benefits. In addition to providing consistency for instruction, the potential for self-directed learning could be beneficial in many environments. The use of video prompts would decrease the time needed to train para-professionals to teach these skills. The prompts could then be used as an error correction procedure if the skill was not maintained over time. Despite the many benefits of video prompting, teachers in the Van Laarhoven et al. (2010) study reported that even though video prompting was shown to be more effective than static picture prompts, teachers were more likely to use picture prompts because they were more familiar. Teachers should be provided with effective professional development and support on the use of technology in their classrooms (Schrum, 1999).

With technology becoming more portable, teachers also could use video prompts to provide instruction in the grocery store, in public transportation, workplace etc. Video prompting has been shown to improve employment-related skills for an individual with a developmental disability using an iPod (Van Laarhoven et al., 2009). In this study, the employers of this individual believed that the video prompting techniques on the iPod were very beneficial. Future research should look at using more portable devices such as these so that instruction can take place in community settings. Portable devices such as iPods and iPads are so common in today's society that students could use video prompting to gain independence in settings where typical instruction does not occur

Error correction procedures and external prompting should also be considered when reporting future research. The two studies that formally compared error correction procedures (Cannella-Malone et al., 2012; Goodson et al., 2007) both noted that error correction improved skill acquisition. Two studies offered conflicting evidence of the need for external prompts to use the technology presented during video prompting (Van Laarhoven & Van Laarhoven-Myers, 2006; Van Laarhoven et al., 2010). The use of external prompts could affect the efficacy of the intervention. Future studies should consider the impact of external prompting on skill acquisition, especially when comparing video prompting to other interventions such as video modeling or in vivo instruction.

Overall, the data presented in the studies suggested that video prompting has the potential to teach a wide array of skills to individuals with developmental disabilities, and autism in particular. The chaining task allows the student to feel self-efficacious throughout instruction, hereby motivating the student to attempt more challenging tasks (Bandura, 1994). Students were successful in attaining, generalizing, and maintaining the target skills taught using video prompting. Video prompting also was shown to be more effective than static picture prompts and video modeling techniques that are commonly used interventions. Recent advances in technology offer great potential for improving the independence of students with ASD through video prompting methods.

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Appendix B

Permission to Participate in Research

Title of Project: Generalization Effects of Video Self-Prompting on Teaching Daily Living Skills to Students with Autism Spectrum Disorders

Principal Investigator: Sarah Domire, Doctoral Student

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1. **Purpose of the Study:** The purpose of this research study is to determine if student-controlled video-prompts are effective in teaching daily living skills to individuals with ASD. This study will look at using the iPad to teach students how to perform daily living skills.
2. **Procedures to be followed:** Students will be instructed via videos presented on the iPad on steps to perform daily living skills. The student will follow the steps under the supervision of the researcher.
3. **Discomforts and Risks:** There are no risks in participating in this research beyond those experienced in everyday life.
4. **Benefits:** The students participating in this study will hopefully learn the target skills. It is the hope of the researcher that this skill will generalize to other settings and scenarios. This will increase independence of the child which improves self-esteem. Students will also gain knowledge of portable technology and will be able to use it for instructional purposes.

5. **Duration:** Students will be participating in this study for approximately 3 weeks, for 15-30 minutes a day.

6. **Statement of Confidentiality:** Your participation in this research is confidential. The data will be stored and secured at CEDAR building in a password protected file. The Pennsylvania State University's Office for Research Protections, the Institutional Review Board and the Office for Human Research Protections in the Department of Health and Human Services may review records related to this research study. In the event of a publication or presentation resulting from the research, no personally identifiable information will be shared.

7. **Right to Ask Questions:** Please contact Sarah Domire at (814) 867-2296 with questions, complaints or concerns about this research. You can also call this number if you feel this study has harmed you. If you have any questions, concerns, problems about your rights as a research participant or would like to offer input, please contact The Pennsylvania State University's Office for Research Protections (ORP) at (814) 865-1775. The ORP cannot answer questions about research procedures. Questions about research procedures can be answered by the research team.

8. **Voluntary Participation:** Your decision for your child to participate in this research is voluntary. You can stop at any time. You do not have to answer any questions you do not want to answer. Refusal to take part in or withdrawing from this study will involve no penalty or loss of benefits you would receive otherwise.

You must be 18 years of age or older to take part in this research study. If you agree to take part in this research study and the information outlined above, please sign your name and indicate the date below.

You will be given a copy of this consent form for your records.

_____	_____
Participant Signature	Date
_____	_____
Person Obtaining Consent	Date
_____	_____
Student Assent Witness	Date

Appendix C

Data Collection Sheet

Name: _____ Date: _____

Fold t-shirt: Items: shirt, basket

1) Take shirt out of bin _____
2) Lay shirt flat on table _____
3) Fold the left side of the shirt to the right side (match sleeves) _____
4) Fold the bottom of the shirt to the top of the shirt _____
5) Move the shirt to the side _____

Notes: _____

Set the table: Items: plate, cup, fork, knife

1) Get plate, fork, knife, and cup off shelf _____
2) Place the plate in front of a chair _____
3) Place the fork on the left side of the plate _____
4) Place the knife on the right side of the plate _____
5) Place the cup on the top, right side of plate _____

Notes: _____

Hang up shirt (hanger): Items: button down shirt, hanger

1) Take shirt out of bin _____
2) Place shirt on table _____
3) Place hanger in neck of shirt _____
4) Button the top three buttons _____
5) Hang up shirt in closet _____

Notes: _____

Sweep the floor: Items: broom, paper, dustpan

1) Get the broom and dustpan _____
2) Sweep paper into pile (5 pieces) _____
3) Sweep paper into dustpan _____
4) Dump paper into trash _____
5) Put broom and dustpan away (where you found it) _____

Notes: _____

_____

_____

Wipe the table: Items: paper towels, spray

1) Take 1 paper towel from roll _____
2) Spray table 3 times _____
3) Wipe the whole table _____
4) Throw away the paper towel _____
5) Put spray and paper towels on shelf _____

Notes: _____

_____

_____

Get a drink of water: Items: large bottle of water, cup

1) Unscrew cap _____
2) Pour water into cup _____
3) Put cap back on water _____
4) Drink water _____
5) Throw away cup _____

Notes: _____

_____

_____

Appendix D

Procedural Integrity Checklist

Student: _____ Date: _____

Target Skill: _____

Baseline Videos:

1) Gave initial prompt to complete target skill _____
2) If student did not initiate step in 10s, researcher prompted again _____
3) If student initiates set but does not complete, research asks "Are you finished?" Ends if student says "Yes" _____

Intervention Videos:

1) Gave initial prompt to complete target skill _____
2) If student played video **and** watched, but did not initiate step after 10 seconds, researcher modeled the step _____
3) If student played video **and** watched, and began to perform the step incorrectly, researcher interrupted the error and modeled the step _____
4) If student plays the video and **doesn't watch**, researcher prompts to watch the video again _____
5) If student begins to perform the step but does not complete within 30 seconds, the researcher modeled the step _____

Maintenance Videos: (NO Video Prompts)

1) Gave initial prompt to complete target skill _____
2) If student did not initiate step in 10s, researcher prompted again _____
3) If student initiates set but does not complete, research asks "Are you finished?" Ends if student says "Yes" _____

Maintenance Videos: (Video Prompts)

1) If student does not perform 100% during first maintenance session, he is provided with the video prompts _____
2) If student played video **and** watched, but did not initiate step after 10 seconds, researcher modeled the step _____
3) If student played video **and** watched, and began to perform the step incorrectly, researcher interrupted the error and modeled the step _____
4) If student plays the video and **doesn't watch**, researcher prompts to watch the video again _____
5) If student begins to perform the step but does not complete within 30 seconds, the researcher modeled the step _____

VITA

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Education

PhD	2015	The Pennsylvania State University	Special Education
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BS	2004	The Pennsylvania State University	Communication Disorders

Publications

Domire, S. C., & Wolfe, P. (2014). Effects of Video Prompting Techniques on Teaching Daily Living Skills to Children With Autism Spectrum Disorders: A Review. *Research & Practice For Persons With Severe Disabilities*, 39, 211-226.

Domire, S. (In preparation) Effects of Supported Video Self-Prompting Techniques on Performance of Microwave-Use for Students with Autism Spectrum Disorders.

Wolfe, P. & **Domire, S.** (In preparation) Review of content of socio-sexual curriculum for students with Autism Spectrum Disorders.

Wolfe, P. & **Domire, S.** (In preparation) Instructional strategies to teach socio-sexual curriculum for students with Autism Spectrum Disorders.

Recent Presentations

Domire, S. & Wolfe, P. (April 2015). *Video Self-Prompting to Teach Daily Living Skills to Students With ASD.* Presented at the International Council for Exceptional Children Conference, San Diego, CA.

Wolfe, P. & **Domire, S.** (April 2015). *Meta-Analysis of Academic Interventions in Inclusive Settings for Students With Severe Disabilities.* Presented at the International Council for Exceptional Children Conference, San Diego, CA.

Domire, S. & Wolfe, P. (December 2014). *Using Video-Prompts to Teach Microwave Use to Students with Autism Spectrum Disorders.* Presented at the TASH Conference, Washington, D.C.

Wolfe, P. & **Domire, S.** (October 2014). *Teaching About Sexuality Using Direct Instruction and Social Stories.* Presented as a TASH webinar in the Sexuality, Education and Support for People with Intellectual and Developmental Disabilities Series.

Domire, S. & Wolfe, P. (April 2014). *Video Prompting Techniques on Teaching Daily Living Skills to Children with ASD: What We Know and Next Steps.* Presented at the International Council for Exceptional Children Conference, Philadelphia, PA.

Professional Experience

2011-2015	The Pennsylvania State University: Graduate Assistant, Professional Development Portfolio Assistant, Field Supervisor, Teaching Assistant
2006-2011	New York City Public Schools: Alternate Assessment Coach, Special Education Classroom Teacher; Students with Disabilities (K-6)