Effects of Video Modeling and Video Modeling Plus Prompting and Reinforcement on the Daily Living Skills of a Student with Autism

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Abstract

Video modeling (VM) is an intervention that may be implemented to improve the daily living skills of students with autism. A multiple probe across behaviors design was employed to examine the effects of VM and VM plus prompting and reinforcement (VM+P&R) on the daily living skills of one elementary student with autism. The percentage of correctly completed steps according to a task analysis for each of three target daily living skills was measured across each condition. Results showed the student improved performance under the VM condition. However, further improvement was demonstrated under the VM+P&R condition. Implications for practitioners choosing between VM and VM+P&R and directions for future research are discussed.

Keywords: video modeling, daily living skills, elementary, autism, prompting, reinforcement

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Many children with autism spectrum disorders demonstrate deficits in daily living skills compared to peers without autism (Liss et al., 2001). Children who struggle with daily living tasks are more likely to allow parents or others to perform the tasks for them (Drahota, Wood, Sze, & Van Dyke, 2010). As such, children with autism are particularly susceptible to becoming over-reliant on adults (Giangreco & Broer, 2007).

Smith and Targett (2009) asserted that improving independence with critical daily living skills could help children with autism become more self-reliant adults. Others have found that ability to perform critical daily living skills is directly tied to overall quality of life in adulthood (Liss et al., 2001; Taylor & Mailick, 2013; Klinger, L., Klinger, M., Mussey, Thomas, & Powell, 2015). With the strong connection between increased ability to perform daily living skills and improved adult outcomes, finding the most effective and most time, cost, and resource efficient interventions to improve such skills is critical. Video modeling (VM) has been identified as an evidence-based practice and has been shown to be effective in improving the daily living skills of students with autism (Bellini & Akullian, 2007; Plavnick, 2013).

VM is an intervention in which a student watches a video of a model performing a skill in its entirety. The student is then expected to complete the same skill in the same way (LeBlanc et al, 2003). Noted benefits of VM include time and cost effectiveness (Charlop-Christy, Le, & Freeman, 2000), an increased likelihood of skill generalization and maintenance (Haring, Kennedy, Adams, & Pitts-Conway, 1987), and greater consistency in how skills are modeled and taught to students (Mason et al., 2013). Additionally, VM is often appealing because many children, especially those with autism, respond favorably to the use of technology (Rosenberg, Schwartz, & Davis, 2010). Finally, VM may provide students with opportunities to work more independently as the strategy relies primarily on the use of a video to deliver instruction rather than a teacher or parent (Hume, Loftin, & Lantz, 2009).

VM can be used to improve the daily living skills of students with autism (Ayres & Langone, 2005) and has reportedly been effective as a stand-alone intervention as well as one paired with other instructional strategies (Plavnick, 2013). Researchers have used VM alone (e.g., Ayres & Langone, 2007; Charlop-Christy, Le, & Freeman, 2000; Rosenberg, Schwartz, & Davis, 2010) and Mechling (2005) reported that positive effects were seen across studies primarily examining the effects of VM alone. Conversely, researchers have demonstrated the effectiveness of VM as a package intervention (e.g., Alcantara, 1994; Haring, Kennedy, Adams, & Pitts-Conway, 1987; Keen, Brannigan, & Cuskelly, 2007; Lee, Anderson, & Moore, 2013).

Overall, positive effects are seen when VM, alone or paired with other interventions, is used to address daily living skill deficits of students with autism; however, the differential effects of VM when used in isolation compared to VM paired with additional strategies remains unclear. Identifying the differential effects may give researchers a better understanding of the critical components of VM (Ayres & Langone, 2005). Practitioners would also benefit from more research on the critical components of VM when deciding how to implement VM interventions with their students. With the numerous and widely varying needs of many students with autism,

finding the most efficient and effective VM interventions would benefit teachers aiming to prepare students for successful adult lives.

Purpose and Research Question

While a substantial amount of VM research exists, few investigators have looked specifically at the effects of VM as an isolated intervention as well as VM as a packaged intervention (McCoy & Hermansen, 2007; Murzynski & Bourret, 2007). Prompting and reinforcement are often paired with VM but such strategies can be effective in changing the behavior of students with autism when used in and of themselves (Hendricks et al., 2009). The purpose of this pilot study was to investigate the effects of VM alone (VM) and VM plus prompting and reinforcement (VM+P&R) on the percentage of correctly completed steps on three daily living tasks. The primary research question was: Will VM improve the daily living skills of a student with autism? A second research question was: Will VM+P&R produce further increases in the student's performance of daily living skills?

Method

Participant and Primary Investigator

Jimmy (pseudonym) was a 10-year-old Caucasian male with autism. Jimmy was selected for participation because he (a) was an elementary-aged student diagnosed with autism by a licensed professional, (b) received special education services under the eligibility category of autism, (c) was described as having deficits in daily living skills by his parent and teacher, (d) was able to sit and watch a video for at least five minutes, (e) could read at the kindergarten level or higher, (f) was not typically absent from school more than 5 days during each grading period, and (g) did not have a physical disability that might impede his ability to complete target daily living skills. Jimmy did not have previous experience with the VM intervention; however, he regularly used iPads at home and at school. According to results of the *Vineland Adaptive Behavior Scales, 2nd Edition* (VABS-II) parent and teacher questionnaires, Jimmy's adaptive levels in the daily living skills domain were in the low range for most subdomains (see Table 1). Jimmy did not engage in problem behavior other than occasional work refusal. Verbal and gestural redirection and systems of reinforcement were often used to encourage appropriate behavior during his typical classroom instruction. The first author was a third-year doctoral student with 5 years of special education teaching experience at the time of the study.

Table 1. VABS-II: Daily Living Skills Domain

	Parent	Teacher
Personal	Low	Low
Domestic	Moderately Low	Low
Community	Low	Low
Total Standard Score	66	50

Setting

Jimmy attended a suburban public school in western Pennsylvania serving primarily students from middle-class families. Total school enrollment was 331 students. The school district consisted of four elementary schools, one middle school, and one high school. Jimmy received most of his instruction in a special education classroom that primarily served students with autism and sessions took place in this classroom. The back corner of the classroom was conducive to completing daily living tasks. There was a sink, a snack/work table, and a storage area for vacuums and brooms. Jimmy watched the videos on an iPad® Mini while sitting at a table next to the previously described area.

Materials

The daily living skills targeted were cleaning a table, vacuuming under and around the table, and sharpening two pencils. Materials needed for the target skills included a table and five chairs, a supply bin with a spray bottle filled with water and a towel, a manual vacuum, pencils, two bins for pencils, and an automatic pencil sharpener. Other materials included a video camera to record all sessions, an iPad® Mini, and a variety of potentially reinforcing items. Data sheets were used to record performance during study sessions and to gather interobserver agreement and procedural integrity data. Surveys were created to assess the social validity of the interventions and procedures.

Experimental Design

A single-subject multiple-probe experimental design across behaviors (Horner & Baer, 1978) was used to evaluate the research questions. The participant's performance on three daily living skills was measured across three conditions: baseline, VM, and VM+P&R. Baseline probes were administered for at least of 5 sessions for each skill. Skills were introduced to the intervention conditions in a staggered format (Kennedy, 2005). Visual analysis of the level, trend, and variability of each skill was used to determine when a skill moved from baseline to intervention (Horner et al., 2005). Further, a criterion was set to make decisions regarding the introduction of VM+P&R. If Jimmy did not improve by at least one step per session across five sessions, VM+P&R was introduced for a particular skill.

Procedures

Sessions occurred 2 to 4 times per week for 5 to 25 minutes per session over approximately 18 weeks. All sessions were recorded using a video camera so that sessions could be viewed and rescored at a later time by the first author as well as a second observer. On days when multiple skills were probed during a session, the skills were presented in a random order.

Dependent measures. Target skills were selected based on results of the VABS-II and teacher/parent surveys. Additionally, the first author met with Jimmy's parent and teacher on several occasions to discuss the most appropriate target skills. See Table 2 for a task analysis of each target skill. The Murdoch Center Program Library (Wheeler et al., 2001) served as the basis of each task analysis in addition to parent and teacher input. The dependent variable under investigation was the percentage of steps according to each task analysis that were performed correctly and independently. Using a data sheet detailing the task analysis of each skill, the first author coded each step as 1 to indicate the step was performed correctly and independently or 0 to indicate an error was made or the step was not completed.

Table 2
Task Analysis of Target Skills

Step #	Cleaning the Table	Vacuuming	Sharpening Pencils
1	Walk to supply bin.	Walk to table.	Walk to pencil sharpener.
2	Pick up bottle and towel.	Pull out chairs.	Pick up one pencil from "Not Sharp" bin.
3	Go to table.	Walk to vacuums.	Insert pencil into sharpener.
4	Spray table.	Pick up manual vacuum.	Push pencil tip into sharpener.
5	Wipe table (left).	Take vacuum to table.	Hold pencil in sharpener for no more than 5 seconds.
6	Wipe table (center).	Push and pull vacuum around and under table (front).	Pull pencil out of sharpener.
7	Wipe table (right).	Push and pull vacuum around and under table (right).	Put pencil in "Sharp" bin
8	Walk to supply bin.	Push and pull vacuum around and under table (back).	Pick up second pencil from "Not Sharp" bin.
9	Put bottle and towel in bin.	Push and pull vacuum around and under table (left).	Insert pencil into sharpener.
10		Stop vacuuming.	Push pencil into sharpener.
11		Walk back to vacuum storage area.	Hold pencil in sharpener for no more than 5 seconds.
12		Return vacuum to original position.	Pull pencil out of sharpener.
13		Push in chairs.	Put pencil in "Sharp" bin.
Total	9 steps	13 steps	13 steps
Video Length	0:53	1:53	0:49

A more detailed version of the scoring procedures described by Shipley-Benamou, Lutzker, and Taubman (2002) was used to code each step as correct or incorrect. A step was considered correct if Jimmy completed a particular step independently (without any type of prompt) and his behavior matched the description of the step in the task analysis and the model's behavior in the video. Any response other than what was described in the task analysis and shown on the video was considered incorrect. A skipped step was also considered incorrect as well as steps or components of a step that were unnecessarily repeated. However, if Jimmy correctly completed a step that occurred later in the sequence, he was given credit for completing that step. Generally, the steps within each of the tasks required Jimmy to complete the previous step before he could move on to the next step. A step was also scored as correct if Jimmy self-corrected. Jimmy was

given 30 seconds to complete each step and a session was discontinued if Jimmy did not attempt to perform the next step after this time.

Video development. Videos of an adult model (the first author) completing each skill according the task analyses were created using a Kodak HD 1080p Pocket Video Camera. An adult model was used as previous research has shown this can be an effective model type (e.g., Charlop-Christy et al., 2000; Shipley-Benamou et al., 2002). After school hours in Jimmy's classroom, the first author used a tripod stand to film all videos. The videos for each task were filmed using a combination of first and third person points-of-view. A first-person perspective, also known as POV perspective (Mason, Davis, Boles, & Goodwyn, 2013), was used to focus in on certain components, materials, or actions of the task. For example, when the model was supposed to pick up the bottle and towel, the video included footage of the supply bin with the bottle and towel and the model's hands picking up the items. When POV was not used, a third-person point of view was used. Jimmy watched the full body of the model completing portions of the task. For example, when the model was supposed to remove chairs from under the table, the video included footage of the model moving around the table and pulling out each chair from under the table.

All videos included text labeling each step of the task. For example, "Go to bin" appeared on the screen when the model was shown walking to the supply bin to get the spray bottle and towel. The videos also included the narration of each step. For example, Jimmy heard, "Pull out chairs" when the model was removing the chairs from under the table. Videos ranged in length from 49 seconds to 1 minute and 52 seconds and Jimmy viewed the videos at "real-time" speed (i.e., the videos were not viewed in slow motion or at a fast pace) on an iPad® Mini.

Baseline. During baseline sessions, Jimmy was directed to the table near the area of the room in which he performed all skills. After Jimmy was seated at the table, an initial verbal and gestural prompt to complete a skill was delivered. For example, the first author would say, "Okay, Jimmy, clean the table" while pointing to the supply bin with the spray bottle and towel. The gesture prompt was provided to encourage Jimmy to stand up from his chair. No further prompts were provided. Jimmy had to begin performing the first step of a skill within 30 seconds of receiving the initial prompt otherwise the session was terminated. If Jimmy began the initial step of the task, he continued performing steps of the skill until he did not move on to the next step after 30 seconds, at which point the session was terminated. No instruction was provided on how to perform any steps during baseline. Neither praise nor reinforcement was delivered when Jimmy performed steps correctly and no feedback was given when Jimmy made an error. After all probes were conducted, a session was complete and Jimmy was told that he was finished.

Video modeling (VM). In the VM condition, the procedures described in the baseline condition were replicated with one addition: Jimmy viewed a video model. After Jimmy was seated at the table, an iPad® Mini was placed in front of Jimmy. Jimmy received one verbal prompt to watch the video while the first author started the video. When the video ended, he was prompted to begin the target skill (e.g., "Okay, Jimmy, clean the table" while gesturing to the supply bin). From here, the baseline procedures were replicated.

Data on Jimmy's performance in the VM condition were visually analyzed after each session and compared to a criterion set to determine if and when VM+P&R should be implemented. If Jimmy did not improve by an average of at least one new step per session across five consecutive sessions, then VM+P&R was implemented for that skill. The criterion was set in an attempt to numerically represent stabilization or decline in performance.

Video modeling plus prompting and reinforcement (VM+P&R). In the VM+P&R condition, reinforcement and error correction procedures were used in addition to the video model. Prior to implementing this condition, the researcher conducted a series of multiple-stimulus without replacement (MSWO; see DeLeon & Iwata, 1996) preference assessments. The entire MSWO procedure was conducted multiple times until one item emerged as the most preferred item. Based on this assessment, Swedish Fish® presented as the most preferred item for Jimmy which was consistent with what Jimmy's teacher and paraprofessionals often used during his typical instruction.

Once the reinforcer was identified, VM+P&R was implemented. In this condition, after Jimmy had checked his visual schedule and was seated at the table, he was prompted to watch the video. After watching the video, the initial verbal and gestural prompt was delivered. As part of VM+P&R, any time an error was made or if Jimmy failed to begin performing a step after 30 seconds, a least-to-most prompting procedure was implemented. A modified version of a least-to-most prompting procedure used by Parsons, Reid, and Lattimore (2009) was used. If Jimmy (a) did not respond to the initial prompt within 30 seconds, (b) did not move on to the next step within 30 seconds, or (c) if Jimmy made an error on a step, the prompting procedure was implemented. First, a "say and point" prompt was delivered. For example, if Jimmy was supposed to pick up the spray bottle and the towel, but only picked up the bottle, the first author would say, "Pick up towel" and point to the towel. The first author would then watch Jimmy for three seconds before delivering the next prompt. If Jimmy was unable to perform the step with a say and point prompt, the first author delivered a "touch to guide" prompt. For example, the first author would guide Jimmy's hand to pick up the towel. Jimmy would then move on to the next step in the task analysis and the prompting procedure was implemented when an error or no response occurred. In the VM+P&R condition, Jimmy completed all steps of a task analysis either independently or with prompting. Once Jimmy had completed the last step of the task analysis in the VM+P&R condition, he was immediately given a Swedish Fish® and verbal praise, which concluded the probe or session.

A modified VM+P&R procedure was implemented for cleaning the table on three of the sessions in response to Jimmy's performance on the fourth step of the task analysis. Jimmy consistently needed a touch to guide prompt to stop spraying the table and move on to wiping the table. In the modified procedure, Jimmy was given a touch to guide prompt before spraying the table and an extra reinforcer was delivered immediately after Jimmy stopped spraying and began wiping the table. On the graph of Jimmy's results, arrows indicate sessions in which the modified VM+P&R procedure was used (see Figure 1).

Interobserver agreement and procedural reliability. The third author was trained in the coding procedure and interobserver agreement (IOA) data were collected on 33% of sessions across all conditions. Training was conducted during multiple sessions and consisted of

reviewing task analyses of similar skills, watching videos of students other than Jimmy completing the skills, coding steps of the task analysis as correct or incorrect, and recording whether a prompt was needed. A criterion of 90% agreement or higher was set for the training modules and 93% agreement was achieved during training. A booster training session was provided to ensure both coders were accurately identifying correct and incorrect steps. Point-by-point agreement was calculated by dividing the number of agreements by the sum of agreements and disagreements and multiplying by 100 (Johnston & Pennypacker, 2009). IOA was 94.0% (81.8% - 100%). The research assistant also used a checklist to collect procedural reliability data on 33% of sessions across all conditions. Procedural reliability was 99% (96%-100%).

Social validity. Jimmy, his mother, and his teacher responded to brief three-point Likert Scale surveys once sessions were complete. One week after the final intervention session, the first author met with Jimmy, his mother, and his teacher to review the results. During this meeting, the first author verbally asked Jimmy to respond to questions regarding his experiences. Jimmy's mother and teacher completed surveys separately and mailed them to the first author.

Results

Visual analysis of Jimmy's graph show an increase in the percentage of correct steps across all three skills when Jimmy moved from baseline to VM, however, he did not reach, or even approach, the mastery criterion of 100% accuracy with VM. Jimmy further increased the percentage of correct steps with the introduction of VM+P&R. See Figure 1 for a graph of Jimmy's results. Overall, data showed a functional relation between the dependent variables and 1) VM on two out of three replications and 2) VM+P&R on three out of three replications.

Cleaning the Table

Jimmy did not complete any steps of the task analysis to clean the table during baseline. All sessions were scored as 0% of steps correct. When VM was implemented, he immediately increased the percentage of steps completed correctly. Jimmy was able to perform between 22% and 44% of steps correctly. Overall, a slight upward trend was seen in this condition, however Jimmy's performance stabilized over the three sessions prior to implementing VM+P&R.

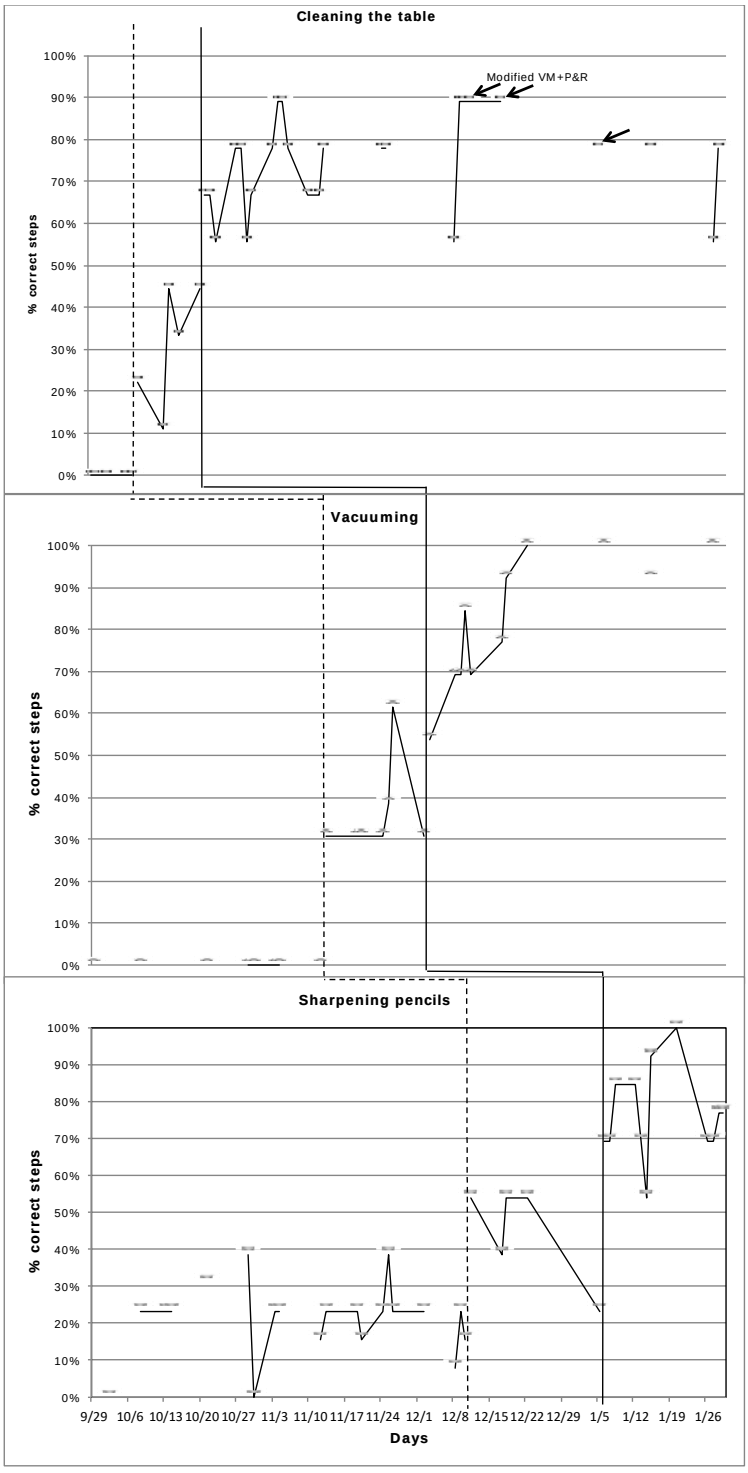

Figure 1. Results: Percentage of steps performed independently

Further, criteria of improved performance of the acquisition of at least one new step per session across five sessions was set for the VM condition. Jimmy did not perform an average of at least one new step per session across five sessions; therefore VM+P&R was implemented. An immediate improvement was seen in performance in the VM+P&R condition. Jimmy was able to perform between 56% and 89% of steps correctly and independently.

Vacuuming

As with cleaning the table, Jimmy was unable to perform any steps of the task analysis for vacuuming during baseline. All sessions were scored as 0% of steps correct. When VM was implemented for vacuuming, Jimmy immediately improved his performance. His performance was relatively stable at 31% of steps correct across most sessions with the exception of one outlier on November 26 when he completed 62% of steps correctly. Again, Jimmy did not perform an average of at least one new step per session across five consecutive sessions and VM+P&R was implemented for vacuuming. With the implementation of VM+P&R, performance immediately improved. Jimmy performed between 54% and 100% of steps correctly and independently.

Sharpening Pencils

During baseline, Jimmy demonstrated some ability to sharpen pencils. He could perform up to 38% of steps for sharpening pencils. When VM was implemented, Jimmy made some improvement and completed up to 54% of steps correctly. Jimmy did not increase his performance by at least one new step across five consecutive sessions in the VM condition. His performance was stable or decreasing during the last five VM sessions and VM+P&R was implemented. In the VM+P&R condition, Jimmy immediately increased his performance and, overall, performed between 54% and 100% of steps correctly and independently.

Social Validity

Jimmy indicated that he liked doing each of his jobs and that he liked watching the videos. Additionally, the first author met with Jimmy's mother and teacher to review the results and display videos from some of the sessions. After reviewing the results and watching videos of Jimmy performing skills during various conditions, Jimmy's mother and teacher completed a survey. According to results of the adult survey, Jimmy's mother and teacher both felt that the target skills selected were appropriate, Jimmy improved his ability to perform the skills, the interventions were beneficial, and the interventions were an acceptable way to teach Jimmy new skills. Also, both were interested in trying the interventions at home or in the classroom.

Discussion

Overall, Jimmy increased the percentage of correctly completed steps across all three skills with the introduction of VM. He also increased the percentage of steps completed correctly when P&R was added to VM. Jimmy was able to perform two of the three targets skills with 100% accuracy during at least one session.

Results add to previous research supporting the use of VM interventions to teach students with autism daily living skills (e.g., Mechling, 2005; Ayers & Langone, 2005; Bellini & Akullian, 2007). However, these results suggest a contradiction when compared to some of the existing research examining the use of VM as an isolated intervention (e.g., Charlop-Christy, Le, & Freeman, 2000; Rosenberg, Schwartz, & Davis, 2010) as the student did not meet criteria when performing daily living skills in the VM condition. Across all skills in the VM condition, Jimmy did demonstrate immediate increases in the percentage of correct steps completed; however, after several sessions of VM, performance appeared to stabilize or decrease. Moreover, when VM+P&R was introduced, Jimmy immediately increased the percentage of correctly completed steps across all skills. Performance either continued to improve or was maintained at an increased level. While Jimmy did improve his performance under the VM condition, further improvement was demonstrated under the VM+P&R condition.

Notable observations were made with regard to each of the target skills. First, when Jimmy was asked to clean the table he consistently made an error on the fourth step (i.e., spray the table). Jimmy perseverated on this step and consistently needed a touch to guide prompt to stop spraying and begin the next step. This issue was reflected in the data, preventing Jimmy from reaching criterion of completing 100% of the steps correctly and independently. In an attempt to address Jimmy's persistent spraying, a modified prompting and reinforcement procedure was put in place during the VM+P&R condition to see if a change in performance occurred. In the procedure, a touch to guide prompt to spray the table correctly was delivered before Jimmy made an error (as opposed to waiting for Jimmy to make the error), followed by the delivery of a reinforcer immediately after Jimmy stopped spraying and began wiping the table. This procedure was implemented for 3 sessions. There was no apparent effect on his performance after the modified prompting and reinforcement procedure was removed. If Jimmy's fascination with spraying were known prior to creating the task analysis, an alternative way to clean the table would have been devised. It is also interesting to note that cleaning the table was the task with the fewest steps and the shortest video, yet the task was the most challenging for Jimmy.

Regarding Jimmy's vacuuming performance, there was one outlying data point during the VM condition in which Jimmy was able to perform 62% of steps correctly, which was much higher than his performance during all other VM sessions. However, Jimmy did not meet the criteria to remain in the VM alone condition. Because of the stability seen in across all other data points and because Jimmy did not meet the criteria for continuing his sessions with VM: VM+P&R was implemented, despite the outlying data point.

Finally, while Jimmy's baseline performance for cleaning the table and vacuuming was consistently 0%, it is apparent that Jimmy had some pre-existing skills with sharpening pencils, although he had never formally been asked to complete the task before baseline. It may be due to the fact that Jimmy observed pencils being sharpened more often than he observed tables being cleaned or the floor being vacuumed in his classroom prior to his participation in the study. His somewhat variable baseline performance for sharpening pencils could have been due in part to natural observational learning that occurs in the classroom.

Implications

Based on results of the pilot study, a practitioner may consider implementing VM+P&R over VM alone as Jimmy was able to perform more steps of the task analysis across all skills under the VM+P&R condition. When VM was implemented an improvement was seen in Jimmy's performance; however his ability to complete steps of the task analysis appeared to level off or decrease after at least five sessions.

With that said, an increase in performance level from baseline to VM was seen across all three skills. If a student is performing at a relatively high baseline level, but needs a slight boost in learning or mastering the remaining steps of a task, it is possible that the boost in performance Jimmy demonstrated could be replicated for other students. In this case, it may be more efficient for a practitioner to use VM.

With regard to VM interventions as a whole, a practitioner may consider using video models to incorporate opportunities for students to complete tasks with greater independence (Mechling, 2005). While the effects of viewing a live model versus a video model were not compared, the video model essentially replaced a live model, giving Jimmy an opportunity to work more independently rather than rely on an adult to model a task. Additionally, while an adult was needed to deliver prompts during the VM+P&R condition, the amount of prompting needed generally decreased over time, allowing Jimmy to become more independent, especially for vacuuming and sharpening pencils.

Directions for Future Research

Results add to existing literature supporting the use of VM based interventions to improve daily living skills for students with autism. However, more research is needed to identify the critical components of VM as well as the use of additional strategies that are often paired with VM. Specifically, more research investigating the effects of VM+P&R compared to the effects of P&R alone would be beneficial in identifying the differential effects of the two interventions. Additionally, the effects of VM+P&R on a student's baseline performance rather than his or her performance in an alternative VM intervention should be investigated. For example, an adapted alternating treatments design (Sindelar, Rosenberg, & Wilson, 1985) or a parallel treatments design (Gast & Wolery, 1988) would compare the effects of VM+P&R to a student's baseline level of performance. Such designs could also account for any potential sequence effects that may have impacted the results.

Finally, videos models included components such as text, narration, a combination of first and third-person perspectives, an adult model, and were viewed at real-time speed on an iPad® Mini. Studies have been conducted to begin to investigate the differential effects of some of these components (e.g., Ayres & Langone, 2007; Bennett, Gutierrez, Honsberger, 2013; Biederman et al., 1999; Mechling & Ayres, 2012), however additional research is needed to determine the critical components to be included or excluded from videos used in VM interventions to address daily living skills for students with autism.

Limitations

Although effects of VM and VM+P&R were replicated across most skills and findings support the hypothesis that VM and VM+P&R can be used to improve daily living skill performance,

there were a number of limitations. First, only one participant was involved. Research comparing the effects of VM and VM+P&R across multiple participants is needed. Second, the design did not allow for several important comparisons. The design cannot account for any potential sequence effects (Kazdin & Hartmann, 1978) VM may have had on VM+P&R. Because performance in the VM condition was compared to performance in baseline and performance in VM+P&R was compared to performance in VM, claims regarding the effects of VM+P&R on student baseline performance cannot be made. Additionally, the design cannot account for the possibility that P&R without VM could have been just as effective as VM+P&R. To restate, it is possible that the P&R component of the intervention was more powerful than the VM component.

Next, it is important to consider factors related to Jimmy's performance and ability level. It is possible that Jimmy's ability to complete steps of each task analysis was not reflected in the VM condition. Because prompts were not provided in the VM condition, Jimmy could have been able to perform steps at the end of the sequence, but because the session was terminated before he reached the later steps, there was no opportunity for him to perform the later steps.

A fourth limitation was the omission of a measure to assess the quality of Jimmy's work. In a study conducted by Biederman et al. (1999), independent observers viewed students with autism performing various tasks taught via VM and rated the quality with which students performed the tasks. There were instances when Jimmy would make an error on several steps when sharpening pencils, but in the end, the pencils were sharp. To the other extent, during one session Jimmy completed all steps of the vacuuming task analysis correctly and independently but a few strips of paper remained on the floor. A quality measure would add to the natural application of the VM and VM+P&R interventions and may support the use of the interventions to teach students to complete jobs accurately and efficiently.

Conclusion

Findings add to existing literature supporting the use of VM interventions to improve daily living skills of students with autism. Moreover, results begin to fill a gap within the literature base regarding the investigation of VM alone. Results indicate VM+P&R may be a more effective intervention than VM alone as the participant performed at a higher level with the addition of prompting and reinforcement. More research is needed to determine the critical components of VM interventions including the inclusion of additional strategies (i.e., prompting, reinforcement, visual aids, in vivo modeling) as well as critical components that should be included or excluded from the video model (i.e., text, narration). VM interventions have the potential to not only improve the daily living skills of students with autism, but also offer practitioners and students opportunities to use technology to build independence when completing critical functional skills that may lead to overall improved quality of life.

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