8-2017

The Efficacy of an In-Vivo Chaining Procedure Compared to POV-VM Chaining Procedure to Teach a Task to Children with Autism

Elaine M. Turner
Stephen F Austin State University, eturner443@gmail.com

The Efficacy of an In-Vivo Chaining Procedure Compared to POV-VM Chaining Procedure to Teach a Task to Children with Autism

THE EFFICACY OF AN IN-VIVO CHAINING PROCEDURE COMPARED TO POV-VM CHAINING PROCEDURE TO TEACH A TASK TO CHILDREN WITH AUTISM

By

ELAINE MARIE TURNER, Master of Arts in School Psychology

Presented to the Faculty of the Graduate School of

Stephen F. Austin State University

In Partial Fulfillment

Of the Requirements

For the Degree of

Doctor of Philosophy in School Psychology

STEPHEN F. AUSTIN STATE UNIVERSITY

August 2017

THE EFFICACY OF AN IN-VIVO CHAINING PROCEDURE COMPARED TO POV-VM CHAINING PROCEDURE TO TEACH A TASK TO CHILDREN WITH AUTISM

By

ELAINE MARIE TURNER, Master of Arts

APPROVED:

____
Dr. Ginger Kelso, Committee Chair

____
Dr. Glen McCuller, Committee Member

____
Dr. Nina Ellis-Hervey, Committee Member

____
Dr. Amanda Rudolph, Committee Member

____
Dr. Frank Mullins, Committee Member

____
Richard Berry, D.M.A.
Dean of the Graduate School

ABSTRACT

Autism Spectrum Disorder (ASD), is a neurodevelopmental disorder which includes symptoms such as repetitive or restricted patterns of behavior, and deficits in social communication (American Psychiatric Association, 2013) and affects approximately 1 in 68 children (Centers for Disease Control and Prevention, 2012). Children with this disorder face unique challenges when it comes to learning academic and social skills (Gardner & Wolfe, 2013). Chaining is an effective intervention for teaching individuals with disabilities a variety of skills (Cuvo, Leaf, & Borakove, 1978; Horner & Keilitz, 1975; Shrestha, Anderson, & Moore, 2013; Tarbox, Madrid, Aguilar, Jacobo, & Schiff, 2009). Video modeling, where a subject performs a behavior they have previously seen modeled on a videotape (Nikopoulos & Keenan, 2004) and more recently point-of-view video modeling (POV-VM) which provides the instruction from the subject's vantage point may also be effective for teaching children with autism and other disabilities needed skills (Shukla-Mehta, Miller, & Callahan, 2010). There is some empirical evidence that chaining used in conjunction with POV-VM may provide effective intervention (Jowett, Moore, & Anderson, 2012; Moore, et al., 2013; Shrestha, et al., 2013) yet no studies have directly compared a chaining procedure taught by traditional methods to a chaining procedure which is exclusively taught through the use of POV-VM.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1

Introduction

Autism Spectrum Disorder (ASD), sometimes simply called autism, is a neurodevelopmental disorder which consists of symptoms such as persistent deficits in social communication and interaction as well as restricted or repetitive patterns of behavior (American Psychiatric Association, 2013). Symptoms are usually present early in life and may include, but are not limited to, such things as being unable to participate in normal conversations, unusual use of toys (for example: lining trucks all up in a line instead of using them to move things, race, etc.), lack of eye contact, difficulties in maintaining relationships, the inability to adapt well to changes in routine, over-sensitivity to sensory stimuli such as noises or textures, and restricted interests in such things as certain toys, movies, or other activities. These symptoms cause significant problems with normal functioning. According to the latest figures put forward by the Centers for Disease Control and Prevention's Autism and Developmental Disabilities Monitoring (ADDM) Network, approximately 1 in 68 children is diagnosed with autism (Centers for Disease Control and Prevention, 2012).

Autism presents unique challenges when it comes to learning – not just academically but also with daily living skills and appropriate social interactions (Gardner & Wolfe, 2013). Children with autism may have difficulties with shifting attention, auditory instruction, abstract concepts, sequential processing, and comprehension of oral information (Dawson, 1996; Quill, 1997). Strengths include visual perception and visuospatial tasks which are tasks requiring the organization of visual material. Associative memory, or remembering the association between two unrelated items such as the name of someone recently met or the smell of a certain sort of food, and rule-based tasks are also two relative strengths of people with autism. Taking into account strengths and weaknesses, and considering that each child's learning style may vary to some degree, there is evidence that visually-based interventions work well for children with autism (Quill, 1997). Such interventions use visual cues or graphics to aid physical, verbal and gestural instruction and prompts. For example, a child who is being taught communication may receive an intervention in which a word they are trying to associate to an item is not just spoken, but also printed on a card, or a group of pictures is provided to visually represent the item. These types of visual aids may add additional support and can even be available after other prompts are faded.

Two interventions which can be used to teach children with autism skills which can be broken down into a sequence of steps and that focus on visual and spatial prompts are chaining and point-of-view video modeling. Chaining is an intervention in which a task is broken down into smaller tasks that are then taught sequentially (Slocum & Tiger, 2011). During each training session, one additional task is added to the "chain" until the complete task has been trained to mastery. Point-of-view video modeling (POV-VM) involves making a video of the task being completed from the child's point-of-view (Shukla-Mehta, Miller, & Callahan, 2010). Point-of-view video modeling is sometimes used as an intervention in combination with a chaining procedure (Mason, Davis, Boles,

& Goodwyn, 2013). No research directly compares an in-vivo chaining procedure, or chaining taught directly by an interventionist, to a chaining procedure taught using POV-VM.

To further explore this issue, the following literature review will examine chaining as a long-standing research supported intervention for people with a variety of disabilities including autism. In addition, existing research on the efficacy of video modeling and more specifically POV-VM in children with autism will also be reviewed.

CHAPTER 2

Review of Literature

Chaining as an Intervention for Children with Autism and Other Disabilities

Children with autism have distinctive difficulties which can sometime present challenges to learning both social skills and academic skills (Gardner & Wolfe, 2013). Due to this fact, there is a continuing need to find interventions that can be effective for teaching children skills needed for both academic success and social functioning. One intervention which has been shown to be effective to teach a variety of skills to people with various disabilities is response chaining.

Response chaining is an established method of teaching children with disabilities to perform complex or multistep tasks (Slocum & Tiger, 2011). It involves conducting a task analysis to break the task into its component parts and then teaching the parts sequentially until the task is mastered. Response chaining can be divided into three main types: forward chaining, backward chaining, and total task training. Forward chaining teaches the initial step determined from the task analysis until it has been mastered, and then gradually teaches sequential steps until the entire task can be performed. For instance, if the child was being taught how to make a bowl of cereal, the first task to be taught might be getting a bowl out of the cabinet. Then the steps that followed would be completed by the teacher. After the child had mastered getting the bowl out of the cabinet, they would then be taught how to retrieve a spoon from the drawer. The child would then be required to be able to successfully complete these two tasks before the next step is trained. In contrast, backward chaining teaches the final step in a sequence and then previous steps until the task can be performed in its entirety (Slocum & Tiger, 2011). In the previous example, if backward chaining was used, the trainer would complete all of the first steps and then teach the child to do the last step – perhaps pouring the milk. After the child could successfully pour the milk, the preceding step would be trained. In our example, the child would be taught to pour the cereal and then the milk. This process would continue until the child could perform the entire task. Total task training is similar to forward chaining except that each task is trained on every trial (Spooner, 1984). For instance, instead of the trainer doing the steps following the initial task of getting the bowl out of the cabinet, the child would be instructed in every step of the chain during each trial. The most current literature demonstrating that chaining techniques can used as an effective teaching technique for children with disabilities will now briefly be explored.

Chaining is a long-established intervention. For instance, Horner and Keilitz (1975) successfully used task chaining to improve the tooth brushing behavior of children with intellectual disability. Cuvo, Leaf, and Borakove (1978) used the technique to teach janitorial skills to adolescents with intellectual disabilities. Both studies provide early evidence of the effectiveness of chaining and this technique has continued to be a useful intervention for children with disabilities.

Forward chaining has been used successfully to teach complex skills to children with autism and developmental disabilities (Tarbox, Madrid, Aguilar, Jacobo, & Schiff, 2009). Using a multiple baseline across behaviors design, these authors successfully taught increasingly complex echoics, or vocal imitations, to two children with autism and one with developmental delay. During training, each of the targeted words was divided into two components. For example, if the target word was Tuesday, the components would be “Tues” and “day.” One echoic was presented, as rapidly as practicable, in three successive trials. The first trial was modeled with the first component being spoken by the experimenter and the child receiving reinforcement if the component was correctly imitated. Immediately after reinforcement was delivered the second component was modeled for the child. The entire word was then modeled for the child and if the child correctly imitated the word, reinforcement was again delivered. All three children showed an increase in complex vocal imitations and also demonstrated maintenance of the target words after treatment was withdrawn except for one target – “bottle” – which was variable. This study indicated that chaining could be used to increase the complexity of vocal imitations in children with autism.

Slocum and Tiger (2011) sought to discover if children preferred forward or backward chaining, and which was more efficient. Their experiment consisted of teaching four children with developmental and learning disabilities motor tasks. These tasks consisted of organizing motor movements such as touch head, touch eye, touch ear, and so on, into chains which became motor sequences. These sequences were then taught to the children using forward and backward chaining, and a control “no-chaining” condition using an alternating treatment design. All participants were provided with reinforcement items which they themselves chose from a group of items identified during a preference assessment. At the end of the trainings, the children were then asked to pick either forward chaining, backward chaining, or “no-chaining” training in order to learn a new motor sequence. While all of the participants choose a chaining procedure over the training without chaining, the majority showed no preference for either forward or backward chaining. All participants successfully learned the tasks using the chaining procedures, whether forward or backward was used. This more recent study supports the premise that chaining continues to be useful for teaching a variety of tasks to children with disabilities. However, there seems to be a narrower focus in the more recent research with more of an emphasis on interests and issues within chaining techniques.

Expanding the research in chaining, Bancroft, Weiss, Libby, and Ahearn (2011) sought to discover how variations in completion of tasks in forward chaining may affect the learning of children with autism. Teaching a task by using chaining requires that some steps be completed (or left uncompleted) before the training is finished. As the chain progresses through the steps, the student completes already trained steps themselves, followed by training for the next step in the sequence – however, all subsequent steps have not yet been trained. This study used three different variations of task completion of untrained steps to explore how they might affect the chaining task – teacher completion, manual guidance of the student to task completion, or no-completion. Seven children with autism participated in the study. The majority of the children had the fewest number of trials to mastery during the condition in which the students were manually guided to complete the untrained steps in the task. However, two of the participants had the lowest number of training trials during the condition in which the teacher completed the untrained steps. This study suggested that the best approach is to evaluate which type of completion might be best based on student characteristics. For instance, a student who has difficulty with physical contact but has good imitation skills, may benefit more from teacher completion than a child who has poor imitation skills and is able to be physically guided to complete the task. This line of research has further helped clinicians to answer some of the questions involved in the implementation of the chaining procedure. A newer line of research also seeks to answer the question of if chaining will help teach tasks when combined with other techniques.

Shrestha, Anderson and Moore (2013) examined if combining a forward-chaining procedure with point-of-view video modeling would be effective in teaching a 4-year-old boy with autism how to serve himself a snack in the afternoon and clean up afterward without adult prompting. Point-of-view video modeling is a technique whereby the video is produced from the participant’s perspective (and will be discussed at length in future sections of this dissertation). In this case, the task was broken down into a series of steps divided into three phases. Training occurred through viewing of a video demonstrating the steps. Mastery was measured by the child completing three phases, unprompted and with 100% accuracy. The child could then begin the next phase and watch the new point-of-view modeling training. The child was verbally prompted if he forgot a step after watching the video. At the end of the intervention, the child could successfully complete all steps in the chain independently. Further it was demonstrated that this skill was maintained at follow-up, two weeks after the intervention was completed, and that there was some generalization of the skill to other foods and settings.

The usefulness of the chaining procedure continues to grow and be refined as demonstrated by this brief literature review. Chaining is established as an effective way to teach behaviors which can be broken into steps, including such things as complex echoics (Tarbox et al., 2009), motor chains (Slocum & Tiger, 2011), or even fixing a snack (Shrestha, Anderson, & Moore, 2013). More recently, its effectiveness when combined with other techniques such as video modeling has been explored (Shrestha et al., 2013). This supports the premise that chaining continues to be an empirically based effective intervention for teaching a variety of tasks to children with disabilities.

Video Modeling as an Intervention for Children with Autism

Video modeling (VM) is when an observer performs a behavior which they have previously viewed being modeled on a video recording (Nikopoulos & Keenan, 2004). This type of intervention has been used to successfully teach children with autism a variety of skills including conversational skills (Charlop & Milstein, 1989), how to invite other children to play (Nikopoulos & Keenan, 2004), how to take turns when playing (MacDonald, Sacramone, Mansfield, Wiltz, & Ahearn, 2009), toilet training (McLay, Carnett, van der Meer, & Lang, 2015), and naming of facial expressions (Akmanoglu, 2015). Research has indicated that video-modeling is an effective intervention for teaching children with autism daily living skills such as making snacks, folding laundry, or setting the table (Gardner & Wolfe, 2013).

Children with autism have deficits in social functioning and so video modeling may have an advantage over other interventions in that video modeling is a nonsocial activity (Geiger, LeBlanc, Dillon, & Bates, 2010). There is also some evidence that VM may increase generalization to other settings and stimuli (Charlop-Christy, Le, & Freeman, 2000; Haring, Kennedy, Adams, & Pitts-Conway, 1987). This could be due to the fact that a videotape can be constructed to include many settings which are naturalistic but would be difficult to create in training situations which are in-vivo – or modeling with a live model present – or take place within classroom settings (Charlop-Christy, et al., 2000). The trainer also has more control over the modeling as a video can be recreated until the scene is created to an exact specification. In addition, the participant can view the video many times without the trainer being present and one video may be useful in teaching a task to more than one child. This may increase the time and cost effectiveness of VM and make it a better choice than in vivo modeling.

There are several different approaches to video modeling. Traditional video modeling is when the behavior is modeled by a peer, sibling or adult on the video and the individual then watches the video prior to attempting the task (Shukla-Mehta, et al., 2010). Video self-modeling is similar to traditional video modeling, but the individual being taught the task is used as the model in the video. Point-of-view video modeling requires videotaping the task being taught from the visual perspective of the learner. For example, if teaching a task such as hand-washing, the camera would be held over the model’s shoulder to gain the vantage point of the person who is performing the task. This dissertation will focus on Point-of-View Video Modeling (POV-VM or PVM). Point-of-

View Video Modeling has a narrower view of focus and may have advantages such as minimizing external stimuli which may be distracting (Mason, et al., 2013). This may help a child maintain direct attention to the task being taught – a possible advantage over traditional video modeling – while still capitalizing on the strengths in visual learning often found in children with autism. Also, filming from the child's perspective may help avoid the challenges that can sometimes occur with using peer models such as parental support, locating appropriate models, and other uncontrollable variables (Shipley-Benamou, Lutzker, & Taubman, 2002). Although self-as-model is another option for video modeling, it also has challenges such as getting the child to perform the skills without error for the video recording or editing out errors at a later date which can be inefficient and tedious. POV-VM eliminates these challenges as well. This makes POV-VM a viable option for video modeling and its efficacy of teaching a variety of skills has been explored.

Schreibman, Whalen, and Stahmer (2000) investigated if POV-VM could be used to help eliminate disruptive behavior during transitions in children with autism. Using priming, which is manipulating what happens just before an event, they prepared the child for transitions to different environments using POV-VM. Three children with autism, between the ages of 3 years, 3 months, and 6 years, 5 months who had a diagnosis of autism participated in the study. The videos showed changes in the environment that would occur during transition shot from the point-of-view of the child. In other words, the camera would move from one room into another or if needed for a shopping trip, from one store to another. The videos were shown immediately preceding a transition. Session occurred approximately three times per week during this phase. This experiment did produce positive results in reducing problem behaviors for all three children. The children also continued to show reduced rates of problem behaviors after treatment and at follow-up which occurred after one month. Problem behaviors for new transitions were also reduced which suggests a generalization of skills, although this did not occur until their behaviors had decreased significantly in the settings which were originally trained. Limitations included that transitional settings were all originally associated with problem behavior. This study did not compare priming using POV-VM with other strategies to help children with autism transition. It does demonstrate that priming using POV-VM may be a beneficial intervention for reduction of disruptive behaviors which are associated with transition events. Difficulty with transitions is often experienced by children with autism and POV-VM may be an ideal intervention for not only decreasing disruptive behaviors, but teaching needed skills.

Children with autism often do not develop skills when it comes to pretend play and often do not spontaneously play with others (Hine & Wolery, 2006). In their study of two preschool aged girls with autism, Hine and Wolery (2006) used POV-VM to teach skills with two play sets – gardening and cooking. The girls were enrolled in an inclusive, university-based preschool program and met the criteria for autism based on the *Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition* (American Psychological Association, 1994), and were verbal. A modeling video clip was created using a digital camera, with a pair of adult hands demonstrating the activities and depicted from the child's viewpoint, and a female voice announcing, "Play with your toys!" The toys used during the intervention were unfamiliar to the children. During probes prior to watching the POV-VM clip, the children were reinforced with praise and tangible items for staying in the vicinity of the toys but reinforcement was not delivered for specific actions with the toys. After the initial probe, the child viewed a short video clip of a favorite cartoon and then the POV-VM. The watching of the cartoon just prior was used to help the child to pay attention to the training video viewed immediately afterward. Results indicated that the POV-VM intervention was effective in teaching the actions which were modeled on the video and specific to the toys and sensory materials offered. The girls acquired this behavior without the experimenter providing reinforcement for performing the activities, and with no instructional cues. The girls also generalized the gardening task by performing this play activity within the classroom.

This study did have some limitations (Hine & Wolery, 2006). One of the girls stopped responding to the cooking set because of what was believed to be satiation and so an adaptation was made to the procedure at the beginning of the 8th session. First, the child was provided a novel material and a verbal prompt. In addition, during practice sessions a verbal and tangible reward was offered and a statement "Good job! You did what you saw on the video!" was provided. There was also a high number of probes and this could have negatively affected the performance of the actions modeled in the video. Generalization of the skills to the classroom was difficult to measure due to competing activities in which the children were more interested. This study demonstrated that POV-VM could be useful in teaching young children with autism to learn play skills. Results also suggested that perhaps adding specific cues or reinforcement may help children acquire the skills more quickly. These children were also verbal and the question remained of POV-VM's efficacy in children who had limited verbal skills.

Tetreault and Lerman (2010) began to explore POV-VM's efficacy in teaching vocal behavior and eye contact to children with autism. Three children – two boys and a girl - who had been independently diagnosed with mild-moderate to severe autism and aged between 4 years, 4 months and 8 years, 2 months participated in the study. The children were receiving behavior-analytic treatment at a private center and all had language assessments prior to the study. Although all the children could emulate three-to-four word sentence, all performed below age level on expressive and receptive language abilities. In addition, all were chosen for the study due to the fact they did not engage in social initiations spontaneously. The children had not been exposed to video modeling prior to the study. Three scripted videos involving an activity to be initiated by the participants were created from the child's point of view with the camera swiveling to approximate eye contact and natural head movements. Prior to the video there was a brief introduction with a countdown for the initial viewing of the video. There were brief verbal prompts following each viewing of the video and the videos were filmed in a location the children would find unfamiliar. Reinforcement was provided during both training and practice which consisted of food items offered when the child was directing his or her attention to the video. During practice, food items were also offered upon scripted exchanges by the child with the person they were interacting with. Results were inconclusive regarding overall effectiveness of the procedure. One participant acquired all three scripts under the video and reinforcement procedure, one participant learned two of the three with a third script having to be modified, and for one participant response prompts had to be added to the video plus reinforcement procedure. Some generalization occurred but this was mainly limited to eye contact. Few social exchanges occurred with novel materials not shown in the videos. This study suggested that further research should be conducted on the effectiveness of POV-VM in teaching children with autism social skills, as well as the factors which may influence its effectiveness. It is possible that some skills and behaviors may lend themselves more easily to a POV-VM intervention. Teaching of vocal behavior involves auditory processes which cannot be viewed in a video, whereas a task which involves manipulation of materials with the hands, writing, or other motor skills may be better choices for POV-VM. Daily living skills are tasks that require motor skills and may be better suited for POV-VM.

Daily living skills are tasks that allow independence in day-to-day life and children with autism often have difficulty acquiring these skills (Shipley-Benamou, Lutzker, & Taubman, 2002). Shipley-Benamou, et al. (2002) taught skills such as making orange juice, preparing to mail a letter, setting the table, and caring for pets with three children aged 5 years, 1 month to 5 years, 5 months diagnosed with autism. A multiple probe across tasks design was used. Videotaped segments of each task were filmed using POV-VM with an instructional prompt at the beginning of the video. The tasks were broken into steps through task analysis and the video showed each step being completed. For example, preparing a letter to mail involved folding the paper, placing it in the envelope, closing the envelope, etc. Each child was shown the video one time only during each training session and then asked to complete the entire task. Once the video viewing was complete the child was given a verbal instruction to complete the task with materials provided. Praise was provided if the child attended to the task until the child mastered the task. Once this occurred, praise was delivered along with a tangible reinforcer. All three children were able to learn to complete the tasks through the POV-VM intervention, although for one child gestural prompts were needed as a modification of the task. Results were also maintained during a no-video phase, and 1-month follow-up. There were some limitations to this study, including a rather short follow-up and the fact that the same materials were used during all conditions including follow up which made it difficult to measure generalization. This research contributes to the evidence that POV-VM can be useful in teaching children with autism daily living skills however, a wider variety of skills levels and age groups needs to be explored.

Another area where children with autism need support and intervention is often in academic areas (Yakubova, Hughes, & Hornberger, 2015). The efficacy of a POV-VM intervention to teach mathematics was explored by Yakubova, Hughes, and Hornberger (2015). Three male participants attending an urban secondary school participated in a study focused on teaching fraction problem-solving using a video-based intervention. The boys who participated in the study had no prior experience with video modeling in mathematics problem-solving, met diagnostic criteria for autism, and demonstrated difficulty in mathematics problem solving according to their teacher. They were able to demonstrate conceptual understanding of word problems as measured by classroom scores and formative measures, had no hearing or vision difficulty and were willing to participate in the study. Their ages were between 17 and 19 years old. A video clip was recorded using POV-VM which featured an adult's hand solving a fraction word problem. The participants watched the video clip and then used a problem-solving checklist to complete word problems involving fractions. Although the participants were allowed to watch the clip as many times as needed, all chose to watch it only once, but would use the checklist which had been modeled during the video clip. Using POV-VM to teach the fraction word problem-solving technique with the checklist was successful at increasing the participants' accuracy when solving these types of problems. There were some limitations in this study. The students all had a conceptual understanding of the word problem and basic skills in solving mathematics word problems. Also, the students used calculators during intervention and some errors may have occurred from incorrect output due to wrong buttons pushed. Still, results were positive and participants maintained the skills when measured one week after intervention. This research provides support for the usefulness of POV-VM in teaching academic skills.

<u>Video Modeling Combined with Chaining as an Intervention</u>

While POV-VM has been used in isolation to teach a variety of skills, research shows that it is often included in a "package" of intervention elements which may increase its effectiveness. One intervention often used in conjunction with POV-VM is chaining. For instance, Moore et al. (2013) used POV-VM in an intervention package which also included backward-chaining and reinforcement, in order to teach a child with autism to write her name. The participant was 5 years, 5 months old and was diagnosed with autism. While she could correctly hold a pencil and knew the names of the letters, she had been unable to successfully write her name. The video was designed to be from the participant's point-of-view and showed two hands opening a book and writing the letters which had been targeted – the five letters of the little girl's name. Vocal descriptions of the hand movements accompanied the video. Backward chaining was used in addition to POV-VM. For example, in the first video the first four letters were already written and the hand demonstrated how to write the last letter of the name. In the second video the first three letters were present and the last two were written. This process continued until the entire name was written. The participant had a writing book which had been designed for the intervention and which prompted desired behaviors in each phase of intervention – blanks existed where the letters being taught, and ones previously learned, were to be written. The child filled a chart with Velcro "flowers" during training and practice and when ten were earned, received ther chosen reinforcer. The child successfully learned how to write her name by the end of intervention, including learning how to correctly form the letters – previously the letters a, r, and e had been unrecognizable when written by the child. There were several limitations in this study which need to be explored further. Since the effects of a backward chaining procedure alone were not studied experimentally, it is not known how much of the learning process can be attributed to that technique. Additionally, it was necessary to change some of the procedures during intervention which may have affected outcomes. Despite the limitations this study does provide some support for POV-VM in combination with backward chaining as a promising intervention, and demonstrated its use in academic skills such as handwriting.

Further addressing academic skills difficulty in children with autism, a case report put forth by Jowett, Moore and Anderson (2012) evaluated the effectiveness of an tablet-based video modeling package used to teach a child with autism numeracy skills. The package included a video filmed from the student's perspective (as if his own hands were being viewed), gradual fading of video prompts, reinforcement, prompting in real time, and forward chaining. A 5 year, 6 month old boy who had an independent diagnosis of Autism Spectrum Disorder participated in the study. This child had also been independently assessed as having below average intelligence. Time to play a game of Angry Birds was provided at the end of each session if the child attempted or completed the task. Angry Birds was also used to encourage the child to learn the numbers by "counting" the number of angry birds depicted with a finger while the number was viewed. The "hands" on the video would then draw the number. Then the child would attempt to draw the number and was given verbal praise for a correct response or for putting forth effort to draw the number. Once the child could draw the number one, the second session involved him drawing the number one, then training on the number two in a progressive fashion. Skill acquisition was high following intervention of the video-modeling package using POV-VM, and the child successfully learned to draw all the numbers. Generalization into the child's kindergarten classroom and maintenance of the skills also occurred when follow-up data were gathered at 2, 3, 4, 5, and 6 weeks after intervention was stopped. This study contributes further to the evidence that POV-VM in combination with other intervention elements, can be useful in teaching children with autism academic skills.

Revisiting the needed teaching of self-help skills in children with autism, Shrestha, et al. (2013) tested the efficacy of POV-VM combined with forward chaining to teach a self-help skill – serving himself a bowl of cereal. The participant had been diagnosed with mild autistic disorder and observations by the experimenters indicated that he had difficulty completing tasks and following directions. He also appeared easily distracted. The task was divided into three phases which included setting up, eating, and cleaning up. The child's mother was the model for the three POV-VM videos to provide instruction for each of the phases. A voice over was produced as an initial prompt for the child prior to the demonstration of the task on the video and verbal praise was provided at the end of each video along with verbal instructions as the steps were demonstrated. The experimenters used a changing criterion design with three consecutive unprompted completions with 100% accuracy considered mastery. During intervention the child was asked if he was hungry and if he said yes, a training session occurred. He was asked to watch the video and then told to get some cereal. Prompting was provided where necessary. For each phase, verbal prompts were given if he forgot the steps. He was given verbal praise for trying and also received high fives and cuddles from his mother after a phase was complete. It is unclear if the remaining steps were completed or by whom. This study had positive results, and the child did learn to serve himself a bowl of cereal and clean up afterwards. The skill was also maintained at 2-week follow up and did generalize to some other foods and settings although somewhat inconsistently. Combining chaining with POV-VM does seem to provide effective intervention.

When examining the literature overall, Mason, Davis, Boles, and Goodwyn (2013) reviewed the efficacy of point-of-view modeling in their meta-analysis of 14 studies, all of which were conducted between 2002 and 2012. The studies covered three areas for targeted skills – independent living skills, individualized play, and social skills. Forty-six percent of the participants within the studies were diagnosed with Autism Spectrum Disorder, with the remaining 53% having a diagnosis of developmental disability. Some studies used prompting where one step was learned at a time, while others used priming in which the participant viewed the entire task prior to attempting it. Two of the studies compared priming and prompting in combination with POV-VM. This meta-analysis also looked at other factors such as if the POV-VM was implemented alone or within a package. The results were positive with large effect sizes across the fourteen studies. This meta-analysis also found that larger effect sizes existed when prompting was used rather than priming. POV-VM used alone also produced larger effect sizes than when used as part of an intervention package which included such things as planned reinforcement. This meta-analysis did have some limitations in the fact that there was a relatively small number of studies included and in the fact that there was only limited information on participant diagnosis due to the studies not providing diagnostic evidence. Also, ASD has a wide range of severity and symptoms and it is unclear if participants may have had characteristics that affected the outcomes within each study.

Purpose of the Study

Point-of-view video modeling (POV-VM) has been used to teach children with autism how to transition without disruptive behavior (Schreibman, Whalen, & Stahmer, 2000), play skills (Hine & Wolery, 2006), vocal behavior and eye contact (Tetreault & Lerman, 2010), academic skills (Jowett, et al., 2012; Moore et al., 2013; Yakubova, et al., 2015) and daily living skills (Shipley-Benamau, et al., 2002; Shrestha, et al., 2013). Much of the research on POV-VM demonstrates the use of the technique in combination with reinforcement and/or in combination with chaining, prompting, and priming. While some studies have compared whether priming or prompting was more effective when combined with POV-VM (Mason, et al., 2013), none were found during the course of this literature review which directly compared an in-vivo chaining procedure to a POV-VM chaining procedure. This study seeks to compare the efficacy of an in-vivo chaining procedure compared to a POV-VM implemented chaining procedure and extend the literature on the efficacy of POV-VM.

While POV-VM has been used to teach a variety of tasks, including some academic tasks such as math skills (Jowett, et al., 2012; Yakubova, et al., 2015), research on if it may be effective to teach an academic task such as spelling is extremely limited. In fact, the only study found during this literature review which involved a spelling task was a girl with autism learning to spell her name (Moore et al., 2013). This study will also examine if POV-VM combined with chaining may be an effective way to teach spelling.

CHAPTER 3

Method

Participants and Setting

Participants were three children attending elementary school in a rural area of a southern state. One of the participants, Ryan, was recruited through a university based charter school. Ryan is a 7-year-old Caucasian male in the 1st grade. This student had been retained and was repeating first grade. For this student, a diagnosis of Autism Spectrum Disorder was obtained through school records with parental consent.

Two of the participants, Albert and Everett, were recruited through a parallel recruiting method - community contact with parents. Albert is an 11-year-old Caucasian male in the 5th grade and Everett is a 6-year-old Caucasian male in the 1st grade. To gain community contacts, the experimenter visited in person with supervisors in the School Psychology program or fellow graduate students and told them that she was conducting a study for which she needed participants who were preschool or elementary school aged children with autism. She explained her study was about two alternate methods of teaching children with autism a skill to help determine if learning happens more quickly using one method and asked that this information be provided to the parents of potential participants along with the experimenter's contact information. The potential participants' parents could then contact her by phone or email if they were interested.

Parents who contacted the experimenter received further information to explain the study and to determine if the child was eligible for the study based on three main factors: the child could follow one-step directions, the child had a formal diagnosis of autism, and the parents were willing to share records on that diagnosis with the experimenter. If the answers to these three questions were "yes," then the experimenter asked if the parents would be willing to bring the child to a local university campus over a 2-4 week period, for 30-40 minutes, at least twice weekly, to participate in the study. During this conversation, the experimenter shared information including a description of the two learning modalities, how long the process may take, potential risks and benefits, procedures if their child demonstrated frustration or stress, information on if they could be present during sessions, confidentiality, and what was expected to be learned from the study. Parents were also asked if they had any questions prior to deciding if they wanted their child to participate.

For the two participants recruited through community contact, the diagnosis of Autism Spectrum Disorder was verified through documentation provided by the parents. All parents were asked to sign informed consent prior to their child participating in the study.

Factors which determined the eligibility of participants included the child having the ability to follow one-step directions and having a diagnosis of autism. Students were excluded if they spelled the two words targeted for this study with four or more correct letter sequences during baseline. One 2nd grade student at the university based charter school originally selected as a potential participant was excluded based on this exclusion criteria.

Both baseline and training sessions took place either at the university based charter school or in a room located at the local university campus. At the charter school, a small testing room with a two-way mirror accessible through an adjoining room was employed for most sessions. This room has a long table and two chairs and both the participant and the examiner sat facing the wall. During the final week of training, mandatory state testing was occurring at the school and it was necessary to move to another room located in the same building as the university charter school. This room has several small wooden tables and chairs and the participant and examiner sat at one of these small tables to complete training.

At the room located at the local university campus, initial sessions took place in the conference room. This room has a large table and comfortable chairs. The room could be accessed by the parent at any time. Subsequent sessions occurred in a separate room in the same building. The small rooms there are equipped with two-way mirrors on both sides with hallways adjoining where students can be easily observed. They contain a small table and two to four chairs. Parents were invited to stay and observe if they wished.

Materials

A video, made from the child's point-of-view was created for each spelling word using an iPad tablet video recording and playback capability. Video editing software was used to make several shorter videos with each step in succession. Materials also included lined paper and a large circumference pencil for easier grip. The timer function on an iPhone 6 Plus was also used to keep track of the time between sessions. A half sheet of extra wide lined paper was used for all trials and training sessions.

Baseline interobserver agreement (IOA) was obtained using copies of the permanent product which were made prior to scoring. A script was created to ensure that training was implemented with fidelity and contained blanks for the word being taught in that session as well as a place to record the score on each probe prior to training (see appendix A). Script sheets were labeled for in-vivo or POV-VM training and a checkmark was placed next to each step completed. These sheets were provided to the intern who conducted IOA in order that they may also check off each step as it was completed. The sheet also contained a blank so that the Correct Letter Sequences (CLS) on each probe could be recorded by the person obtaining IOA.

Words were obtained through an internet search for irregular word list eventually obtained from www.geocities.jp/novospel21/irregularspellingpatterns.html. *The ABCs of CBM, A Practical Guide to Curriculum-Based Measurement* (Hosp, Hosp & Howell, 2007), was used to reference the scoring technique.

Design

This experiment used an alternating treatments design. This design, which affords a high level of internal validity – or the extent to which change can be attributed to the intervention rather than other factors, - is often used to compare two interventions and helps control for inter-subject variability. Because both treatments were administered to each participant, differences in results which could be attributed to differences between subjects was minimized. This design has the advantage of not needing a withdrawal of treatment as well as the fact that data can be gathered more quickly than a design which requires a treatment withdrawal. During the in-vivo chaining condition the spelling word was taught and demonstrated directly by the experimenter while during the POV-VM procedure basic instructions was provided by the experimenter but the spelling of the word was demonstrated through POV-VM. Each student had one word taught by in-vivo chaining and one taught by a POV-VM chaining procedure. Which word was taught in-vivo and which was taught through POV-VM was decided on a participant by participant basis through the flip of a coin.

Words were counterbalanced across participants to help control extraneous variables. During training, whether the participants were trained on the in-vivo chaining procedure or POV-VM chaining procedure was determined for each session through random assignment decided by the flip of a coin. A child received no more than two consecutive types of intervention before automatically moving to the other treatment.

Procedure

Prior to implementation pairs of irregular words were selected that were similar in topography in order that they would require a similar degree of fine motor skill. The words had to have five letters each and the child had to have a score of three or less CLS on an initial probe of the word for it to be selected. The two words eventually selected were “laugh” and “yacht.” These words were similar enough to be broken down into the same number of steps and required a similar degree of motor skill. For instance, both had one letter that would hang below the line, and two letters that were “tall.”

Baseline was conducted by completing a probe identical to the one to be conducted prior to each training session. The experimenter sat at a table with the participant to the right and the materials in front of her. The materials were identical to those used during training. The experimenter then stated, “Today we are going to spell the word _________.” She then placed the paper and pencil in front of the participant and directed, “Spell the word _______.” The permanent product was then collected, dated, and marked with the probe number. A blank space was provided for both the score and the interobserver agreement score. A copy was made prior to scoring to be provided to the intern completing IOA so as the score would be unknown by them. IOA was completed for 30% of baseline sessions.

Training involved teaching correct letter sequences. For instance, if the student could spell “yacht” as “ya” during the first probe, the training would occur at “yac.” One or two sessions occurred each day for each of the participants. If two sessions were conducted in close temporal proximity, at least 15 minutes of a different activity, such as playing with playdoh or playing a video game, was allowed prior to the second session.

General procedures for training included having the materials set in appropriate places prior to the training session. The paper was set on the table in a stack in front of the experimenter’s chair with the pencils next to it so that paper and pencil could be easily handed to the child and picked up after the session was complete. If an iPad session was occurring, the iPad was set to the video storage section where the video could be easily selected. The iPad had a cover and this was left closed until intervention began. It was then propped up on a stand horizontally in front of the student prior to beginning the video to maximize the screen size. Each time the video was complete the experimenter turned the iPad around so the word being spelled was not visible to the child. During in-vivo sessions the experimenter wrote the word with the hand closest to the child, in pencil, and using the same type of paper, and mimicked the video as closely as possible when modeling.

The child was brought into the room by the experimenter was asked to be seated at a table to the right of the experimenter. The experimenter in both the in-vivo and the POV-VM training procedures made sure the child was comfortably seated and ready to begin. A verbal introduction such as “today we are going to” and name the task that has been chosen for training that session was then made for both conditions. Prior to both in-vivo and POV-VM training sessions, probes were conducted to determine number of correct letter sequences completed correctly without assistance and this number was recorded. These probes were identical to those conducted during baseline. A step was recorded as incorrect if the student wrote an incorrect letter, did not write the next letter within 5 seconds of completing the prior letter, or if the letter was illegible. Steps skipped or completed incorrectly were not corrected or modeled. Training than began with the entire chain being modeled up to and including the new letter to be trained.

Figure 1:1 Session Flowchart

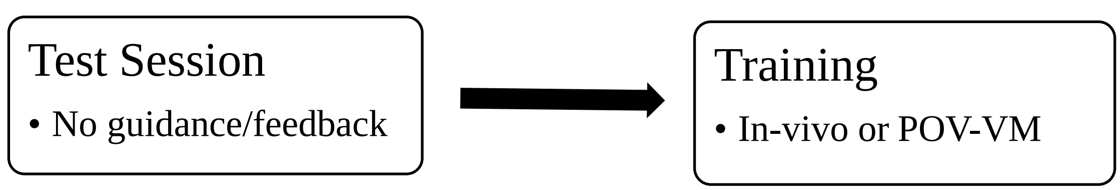
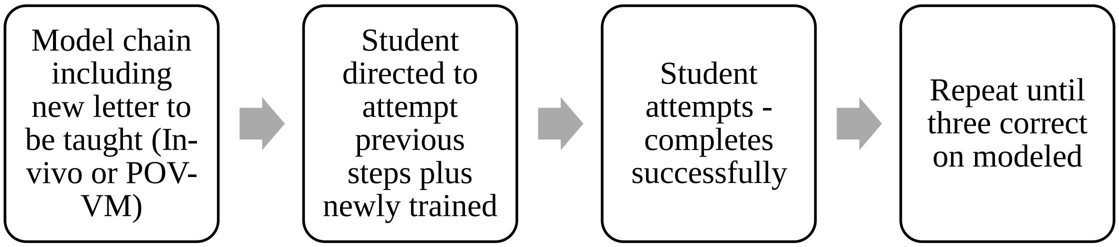
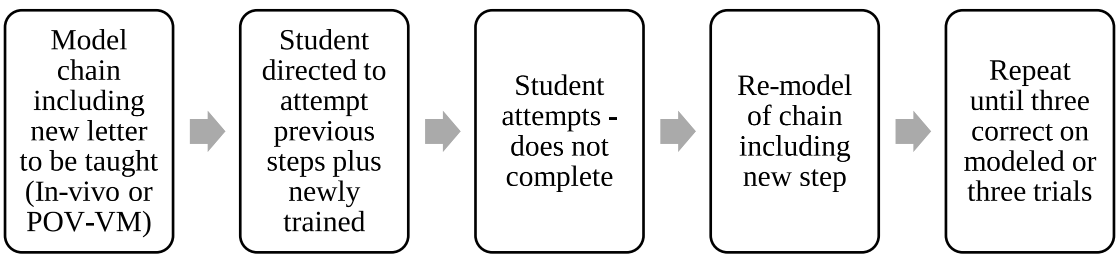


Figure 1:2 Training Flowchart

Successful attempt



Unsuccessful attempt



In-Vivo Modeling. During in-vivo modeling, training began with the experimenter modeling the chain up to and including the next letter to be trained. The experimenter stated, “Watch me” and modeled the previous letter or letters with the next letter in the sequence included. The student was then handed a sheet of paper and the pencil and told “Now you try.” If the child completed the letters previously taught with the new letter included, positive verbal feedback was provided such as “Yes, that’s right.” If the child was not able to complete the new step correctly the statement “Let’s try again,” was given and the experimenter again modeled the sequence including the new letter being trained, replace the materials, and then verbally direct the child with a statement “Now you try.” This continued for three trials. Upon entry into the following session a probe for number of letter sequences correctly completed without assistance was again completed, and training began with the entire chain being modeled up to and including the letter which was missed or completed incorrectly. Untrained letters were left uncompleted.

POV-VM modeling. During POV-VM chaining, the first step consisted of the aforementioned general procedure followed by a deviation from the in-vivo procedure. Just prior to setting up the tablet in front of the child, the experimenter made the statement "Let's watch this video." With the materials in place, the experimenter set the tablet in front of the child with the video set-up to show the entire sequence with the new step to be trained included and started the video for the child. After completion of the video, the experimenter removed the tablet and stated "Now you try," orienting the child to the materials with gestures if necessary. If the child completed previous letters and the newly trained letter correctly, positive verbal feedback was provided such as "Yes, that's right." If the child is not able to complete the newly trained letter correctly the statement "Let's try again," was given, the materials were replaced and the training was repeated. This continued for three trials. Upon entry into the following session a probe for number of steps correctly completed without assistance was again conducted and training began with the entire chain modeled up to and including the first letter missed or left uncompleted, even if that letter was a letter previously trained. Untrained steps were left uncompleted.

Reinforcement for participation was stickers which could be exchanged for a prize from a box at the end of each week. Specific reinforcers were used only with school and teacher approval. Steps completed correctly received verbal reinforcement only.

Dependent Measures and Data Collection

The primary dependent measure was the number of correct letter sequences completed without assistance. The secondary dependent measure was the number of trials to mastery. Scoring for spelling was based on a technique from the book *The ABC's of CBM: A Practical Guide to Curriculum Based Measurement* (Hosp, Hosp, & Howell, 2007), called Correct Letter Sequences (CLS). This technique was selected due to the fact it is more sensitive to improvement in spelling than a traditional method based on words spelled correctly. Included in correct letter sequence scoring is beginning space to first letter, letter to letter, last letter to space, letter to punctuation, and punctuation to letter. Correct letter sequences are designated by an upper caret. Therefore, each five-letter word had six possible points. For example, on the word "yacht" the correctly spelled word scoring would appear ^y^a^c^h^t^. If the child spelled "yacht" as "yat" it would be scored ^y^at^ and he would receive a score of 3. Mastery of the spelling word was indicated when the child, without assistant, obtained a score of 6 CLS on probes for three consecutive sessions.

During baseline a copy of the permanent product was made prior to scoring so that interobserver agreement on the CLS score could be obtained. During intervention, data was collected on a printed form and the experimenter completed probes prior to training measuring number of correct letter sequences completed without assistance (see

Appendix A). Data was also collected on treatment fidelity using a checklist which paralleled the form used by the experimenter (see Appendix B). IOA was established through an additional observer recording information on correct letter sequences for baseline and treatment for 30% of the sessions. IOA on CLS for baseline and training was 100%. Treatment fidelity for training implementation was was 98%.

Social validity was examined through a questionnaire developed by the researcher and completed by the teacher or parent. This questionnaire included questions such as if the respondent believed the intervention was effective, if they thought that it could be used within a classroom/home, and if they felt that it was beneficial to the student (see appendix C).

CHAPTER 4

Results

This study sought to compare the efficacy of an in-vivo chaining procedure compared to a Point-of-View Video Modeling (POV-VM) chaining procedure. While research has examined the efficacy of POV-VM in teaching children with autism various skills, no studies were found in the literature which directly compared POV-VM with in-vivo modeling. Three children with a diagnosis of autism participated in the study – Ryan, Albert and Everett.

For the first baseline session Ryan (Figure 1) obtained one Correct Letter Sequence (CLS) on the POV-VM word probe and two on the in-vivo word probe. On the second and third baseline probes for the POV-VM he obtained a CLS score of two. On the second and third baseline probe the in-vivo condition word also scored a CLS of two.

During the in-vivo training condition Ryan's word was "yacht." Ryan obtained zero CLS (Figure 1) during the first four sessions. His mean CLS score for the in-vivo condition for the first four sessions was zero. During the POV-VM training condition Ryan's word was "laugh." Ryan initially obtained a CLS score of three during the initial training. His scores then fell into a range between two and three for the next three sessions. Ryan's mean CLS score for the first four training sessions was 2.50. Ryan needed 12 sessions to obtain a final CLS score of four for the in-vivo condition. He also received 12 sessions for the POV-VM condition but only obtained two CLS by his final training session.

At session eight, it was felt an additional prompt was needed as Ryan seemed to have some confusion about which word he was supposed to spell. Therefore, the question, “What word are we going to spell?” was added and he was required to verbally repeat the word prior to the initial probe for each session. His scores for the in-vivo condition then fell into a range between one and three CLS until the final session when he obtained a score of four. For the final eight sessions, Ryan had a mean CLS of 2.75 for the in-vivo condition. For the POV-VM condition Ryan’s CLS stayed consistent at two with one exception. He scored three CLS on session 11 prior to his score returning to a two for sessions 12 through 15. His mean CLS for the POV-VM condition over the last eight sessions was 2.13.

On Albert’s first baseline session (Figure 2) he obtained a CLS score of three for the in-vivo word and one on the POV-VM word. On his second baseline session, his CLS score was two for the in-vivo word and zero for the POV-VM word. During the third baseline session, his CLS score was two for both words.

During the in-vivo training condition Albert’s word was “laugh.” His scores for the in-vivo condition fell into a range between two and four CLS with a mean CLS score of 2.75. During the POV-VM training condition Albert’s word was “yacht.” His CLS scores fell into a range between two and three, with a mean of 2.5 for this condition. Albert needed eight in-vivo session to reach four CLS which was the closest score he got to mastery. He obtained a consistent score of three CLS over his last two in-vivo sessions.

Everett scored zero CLS on his initial baseline session for the POV-VM condition and two CLS on the initial session for the in-vivo condition (Figure 3). Subsequent baseline sessions resulted in scores of 2 CLS on both conditions. Everett also scored two CLS in each session across both conditions. His mean CLS for the in-vivo condition and the POV-VM condition was 2.0. He received six sessions under each training condition but never obtained a CLS higher than two.

Results on the social validity survey indicated that the parents believed it was somewhat important to know which method was more effective, while the teacher believed it was very important. One parent indicated it was “somewhat likely” they would use video modeling at home while the other indicated that it was “not likely.” The teacher however indicated it was “very likely” that she would use video modeling to teach multistep skills in the classroom. On the question regarding choosing to use video modeling or direct modeling one parent, choose direct modeling, while the teacher and other parent wrote in an answer of “both.” In regards to if the child benefitted from intervention, one parent and the teacher indicated “yes”, and the other parent indicated “not sure.” Overall, these results indicate that this study was socially valid, with particularly positive responses from the teacher.

CHAPTER 5

Discussion

This study sought to directly compare the efficacy of an in-vivo chaining procedure and a Point-of-View Video Modeling (POV-VM) chaining procedure used to teach a skill to children with autism. While there is literature on the usefulness of a POV-VM intervention combined with chaining to teach a variety of skills to children in this population (Hine & Wolery, 2006; Jowett, et al., 2012; Moore et al., 2013; Schreibman, et al., 2000; Shipley-Benamau, et al., 2002; Shrestha, et al., 2013; Tetreault & Lerman, 2010) and chaining has been used to directly teach skills to children with various disabilities as well (Shrestha et al., 2013; Slocum & Tiger, 2011; Tarbox et al, 2009), there is no literature that was found that directly compared the efficacy of one method to the other. This study sought to extend the current literature on POV-VM by comparing these methods to teach spelling, using an alternating treatments design.

While one child, Everett, did not respond to the intervention at all, the other two children, Albert and Ryan showed the most improvement with the in-vivo condition. These results support the current literature on chaining demonstrating it can be an effective intervention for children with autism for tasks that lend themselves to be broken down into steps (Slocum & Tiger, 2011; Tarbox et al., 2009; Shrestha et al., 2013).

Ryan received the highest number of training sessions to reach a score of 4 CLS for the in-vivo condition. He required 12 sessions to reach 4 CLS. During the initial trainings for the POV-VM condition Ryan alternated between 3 and 2 CLS. When the treatment was changed and he was asked to spell the in-vivo word, he would initially spell it using the letters he had learned during the POV-VM condition and obtain a score of zero. On session 8, a prompt was added to the probe in both conditions to help him determine which word he was expected to spell. Once the prompt was added Ryan's score steadily increased to 3 CLS for the in-vivo condition, where it remained for 5 sessions until he reached 4 CLS on the final session. While Ryan's mean score for the in-vivo condition (1.83 CLS) is lower than his mean score for the POV-VM condition overall (2.25 CLS), it is important to note that the mean is affected by the original scores of 0 during that condition and therefore not an ideal measure of improvement for this child. Ryan's mean scores for after the added prompt were 2.5 for the in-vivo condition and 2.13 for the POV-VM condition. Once the prompt was added his in-vivo CLS indicated a faster rate of improvement then the POV-VM condition.

Several factors may have contributed to Ryan needing the additional prompt. For instance, children with autism can have difficulty with shifting attention (Dawson, 1996; Quill, 1997). Due to the alternating treatment design chosen for this study, Ryan received no more than two training sessions in a row on one treatment. This may have led to the confusion about which word he was expected to spell. In addition, although visually-based interventions work well for children with autism they often still employ physical, verbal and gestural prompts (Quill, 1997). Ryan may also have needed more sessions due to his younger age and more limited exposure to irregular spelling words such as those used in this study due to the fact that spelling irregular words such as the ones used in the study are not a part of the first-grade curriculum.

Albert also performed better in the in-vivo condition. He required 8 in-vivo training sessions to reach 4 CLS and his mean score for the in-vivo condition was 2.75 – slightly higher than his mean score of 2.50 for the POV-VM condition. Of note when examining these results however is that Albert received two more trainings on the in-vivo condition than the POV-VM condition. With his POV-VM CLS at 3 when training ended, it is impossible to know if he would have reached 4 CLS under that condition as well with two additional trainings. Albert, a 5th grade student, may have needed less sessions since he had more academic experience. He also verbally expressed interest in learning to spell the words and was well engaged in the task.

Everett did not respond to the intervention at all and maintained baseline scores throughout intervention. This could in part be because Everett had the least intense intervention as far as successive sessions. His family lived some distance from the training location and even excluding weekends, he often was unable to come on consecutive days. He also did not seem engaged in the task and had some difficulty building rapport with the experimenter.

Results do support the extensive literature that chaining is an effective intervention to teach tasks which can be broken into multiple steps (Slocum & Tiger, 2011). This study provided results which do not support current literature suggesting that because children with autism often have social deficits, video modeling may provide a nonsocial way to learning which would be an advantage over other interventions (Geiger et al., 2010). Both participants performed better in the in-vivo condition than the POV-VM condition for the task of learning to spell irregular words. It is not known if the same results would have become evident in other skills such as functional skills. However, it seemed to at least lend some minimal support to current literature that POV-VM may minimize distraction and help the child maintain attention to the task (Mason et al., 2013). Based on the observed number of times his attention had to be redirected to the task, one of the children, Ryan, was observed to maintain better attention to the video in the POV-VM session than to the experimenter in the in-vivo session. Albert and Everett seemed to be able to maintain attention about equally under both conditions. Because there are no existing studies which compare an in-vivo chaining procedure to a POV-VM chaining procedure it cannot be said if this study directly supports current literature on the efficacy of one intervention as compared to the other.

Limitations

There are some limitations to this study which may have affected the results. For instance, while POV-VM has been used alone to teach some academic skills such as mathematics (Yakubova, et al., 2015), and in combination with chaining to teach skills such as spelling a name (Moore et al., 2013) and numeracy skills (Jowett et al., 2012), no studies were found that used POV-VM to directly teach spelling words. Therefore, the task may have not been well-suited to a POV-VM intervention. Since no other studies used irregular words and there is not enough existing research to determine which skills are best suited to this type of intervention.

Another limitation may have been that forward chaining was used and the word left uncompleted which meant that the children only saw part of the word during each session. There is research to suggest that children do not show a differential preference for either forward or backward chaining and that they can successfully learn tasks when either is used (Slocum & Tiger, 2011). There has been further research however, which suggests that variations in completion of the task may affect learning (Bancroft, et al., 2011). Since subsequent steps have not been completed when using forward chaining, it must be decided if the examiner will complete them, the student will be guided to complete them, or if they will be left un-completed. In a study by Bancroft et al. (2011) it was found that children with autism in the study with the fewest trials to completion had either teacher completion or were guided to completion of the task. The researchers suggested that perhaps students should be evaluated for characteristics and skills which may be more conducive to one type of completion. In addition, the one study which involved spelling of any type combined with POV-VM was conducted by Moore et al. (2013), and involved teaching a child with autism to write her name. This study employed backward chaining which allowed for the child to see the entire name as she completed additional steps. During the design of the present study, the additional steps were left uncompleted to better evaluate the learning of the various chains and make a comparison of the two methods. But, the fact that the children in this study could not see the entire word until all steps had been completed by the student themselves may have contributed to the length of time it took for the children to acquire the task in both in-vivo and POV-VM conditions. It is important to note that it was felt that leaving the task uncompleted was necessary to get valid results. Using teacher completion or guided completion during the POV-VM treatment would have introduced an element of in-vivo modeling into the training and may have tainted the effects of the POV-VM treatment.

The study design may also have contributed to the number of sessions it required for the children to reach their final CLS under both conditions. While an alternating treatments design is beneficial in minimizing intra-subject variability, and increases internal validity, children with autism sometimes have difficulty in the areas of sequential processing and shifting attention (Dawson, 1996; Quill, 1997). Especially with Ryan, he seemed to have great difficulty moving from one condition to the other and would continue to spell the initially trained word. While it wasn't apparent that Albert had this same confusion, he was older and may have had more of the skills required to be able to more easily switch interventions. The alternating treatments design may have also contributed to Everett's non-responsiveness.

There are other single subject designs which may be used to compare the effects of the two treatments. For example, employing an ABC design may have minimized the confusion over which word was being taught. In an ABC design, A represents baseline, B the first intervention, C the second intervention. Using this alternative design may have minimized the confusion over which word was being taught during a session. For example, in an ABC design, Ryan would have had one entire word taught under a specific condition before beginning to learn the other word under the new condition. It should be noted that the reason this design was not selected originally is because its use would also create major limitations, the most important being that experimental control cannot be achieved (Horner, et al., 2005). In single subject research, experimental control can be achieved only through withdrawal of the intervention (reversal), introduction of the intervention at different points in time (multiple baseline), or manipulation of the intervention across observation periods (alternating treatments). Therefore, while an ABC design would help with the confusion which may have existed, the alternating treatment design offered the best choice for providing internal validity and experimental control.

Having stronger reinforcement for successful spelling of the word may also have improved performance, especially for Everett who did not respond to either treatment. The only reinforcement received during training was a verbal reinforcement. While stickers were earned after each session with a tangible reinforcer provided at the end of the week, successful completion of the trained steps received only verbal feedback. Several studies on the effectiveness of POV-VM used with and without chaining employed food items (Tetreault & Lerman, 2019), tangible reinforcers (Shipley-Benamou, et al.), or preferred activities earned for successful completion of a task (Jowett, et al., 2012). Selecting reinforcers based on interviews with the children or parents which may have provided more motivation for participation may have promoted attention to and learning of the task.

An additional limitation may have been that outside of an autism diagnosis, not much other information on individual differences was obtained. While an alternating treatments design helps control intra-subject variability and increases internal validity, it is impossible to control all variables. Because there can be variations in all children's learning styles and they may have individual strengths and weaknesses it may have been helpful to know information such as IQ, academic performance, or other co-morbid diagnosis which may have existed. Operational descriptions of the participants which provided more information may not only have helped to explain some of the variations in the data obtained as well as helping future researchers replicate this study and provide additional evidence on the efficacy of these types of interventions (Horner, et al., 2005).

Implications

While we can make only conservative conclusions regarding the results of this study, there is some suggestion that the usefulness of POV-VM is more limited than research seems to indicate. Perhaps some children with autism can benefit more from direct teaching than from POV-VM. In addition, specific individual differences may be an important factor in deciding if POV-VM will be a successful intervention for a specific child.

It is possible that spelling tasks may not be well-suited to a chaining procedure or may be more sensitive to the type of chaining procedure used. Whether the word is completed as well as the type of completion chosen for the procedure may also be important. Given that there is no existing research to inform the use of chaining and video modeling interventions for teaching irregular spelling words it is unclear if either technique would be more helpful in teaching spelling words than traditional methods.

More research is needed to see if POV-VM combined with chaining is useful for teaching academic tasks such as spelling. POV-VM as a useful intervention for other tasks should continue to be explored as well. If future studies support the usefulness of POV-VM over in-vivo, the implications for parents, teachers, and practitioners could be substantial. POV-VM videos could be mass-produced to be used across multiple settings to help children learn needed academic tasks, reducing the amount of individual intervention needed. With current technology, there may be reduced expense as well.

CHAPTER 6

Conclusion

Chaining is a long-standing effective intervention for children with autism and other disabilities and is useful when teaching tasks that can be broken into steps (Slocum & Tiger, 2011). More recently, video modeling and more specifically Point-of-View Video Modeling (POV-VM) has emerged as an intervention which may help minimize external stimuli and help children with autism maintain attention to task (Mason et al., 2013). This method may also help minimize other problems which can occur with traditional video modeling such as the necessity of finding appropriate peer models, parental support or difficulties with self-modeling (Shipley-Benamou et al., 2002). In addition, POV-VM can be used with other established interventions such as chaining (Jowett et al., 2012; Moore et al., 2013; Shrestha, et al., 2013). This study sought to directly compare a chaining procedure taught directly by a person, to a chaining procedure taught using POV-VM and further extend the literature on the efficacy of POV-VM.

Results from this study are tentative, but suggest that some children with autism may learn more quickly from an in-vivo intervention. Two different children with autism of different ages and in different grades seemed to more quickly learn the word taught in-vivo. While this tentative conclusion provides some useful information, results should be interpreted with caution.

There were many limitations such as limited research supporting POV-VM's usefulness in teaching skills such as spelling, leaving the chaining procedure unfinished, and the lack of additional information on each child which may have contributed acquisition of the task, among others. In addition, a different research design may be suggested. While an alternating treatments design increases internal validity, it may not be the best design for children with autism who often have difficulty shifting attention and with sequential processing (Dawson, 1996; Quill, 1997). Perhaps an ABC design could provide more insight into the efficacy of the interventions.

More research in this area is needed before it can be determined if POV-VM chaining can be as or more effective than a chaining intervention taught directly by a person. Future research should seek to address the limitations of this study and further the research on POV-VM as an effective intervention.

REFERENCES

Akmanoglu, N. (2015). Effectiveness of teaching naming facial expression to children with autism via video modeling. *Educational Sciences: Theory & Practice*, *15*(2), 519-537. doi:10.12738/estp.2015.2.2603

American Psychiatric Association. (1994). *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.). Arlington, VA: American Psychiatric Publishing.

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Bancroft, S.L., Weiss, J.S., Libby, M.E., & Ahearn, W.H. (2011). A comparison of procedural variations in teaching behavior chains: Manual guidance, trainer completion, and no completion of untrained steps. Journal of Applied Behavior Analysis, 44(3), 559-569. doi: 10.1901/jaba.2011.44-559

Centers for Disease Control and Prevention (2012). Retrieved from: http://www.cdc.gov/features/dsautismdata/index.html

Charlop-Christy, M. H., Le, L., & Freeman, K. A. (2000). A comparison of video modeling with in vivo modeling for teaching children with autism. *Journal of Autism and Developmental Disorders, 30*(6), 537-552.

Charlop, M. H., & Milstein, J. P. (1989). Teaching autistic children conversational speech using video modeling. *Journal of Applied Behavior Analysis, 22*(3), 275–285. http://doi.org/10.1901/jaba.1989.22-275

Cuvo, A. J., Leaf, R. B., & Borakove, L. S. (1978). Teaching janitorial skills to the mentally retarded: Acquisition, generalization, and maintenance. *Journal of Applied Behavior Analysis, 11*(3), 345-355.

Dawson, G. (1996). Brief report: Neuropsychology of Autism: A report on the state of the science. *Journal of Autism and Developmental Disorders, 26,* 179-184.

Gardner, S., & Wolfe, P. (2013). Use of video modeling and video prompting interventions for teaching daily living skills to individuals with Autism Spectrum Disorders: A review. *Research & Practice for Persons with Severe Disabilities, 38*(2), 73-87.

Geiger, K. B., LeBlanc, L. A., Dillon, C. M., & Bates, S. L. (2010). An evaluation of preference for video and in vivo modeling. *Journal of Applied Behavior Analysis, 43*(2), 279–283. http://doi.org/10.1901/jaba.2010.43-279

Haring, T. G., Kennedy, C. H., Adams, M. J., & Pitts-Conway, V. (1987). Teaching generalization of purchasing skills across community settings to autistic youth using videotape modeling. *Journal of Applied Behavior Analysis, 20*(1), 89–96. doi.: 10.1901/jaba.1987.20-89

Hine, J. F., & Wolery, M. (2006). Using point-of-view video modeling to teach play to preschoolers with autism. *Topics in Early Childhood Special Education, 26*(2), 83-93.

Horner, R. D., & Keilitz, I. (1975). Training mentally retarded adolescents to brush their teeth. *Journal of Applied Behavior Analysis*, *8*(3), 301–309. doi: 10.1901/jaba.1975.8-301

Horner, R. H., Carr, E. G., Halle, J., McGee, G., Odom, S., Wolery, M. (2005). The use of single-subject research to identify evidence-based practice in special education. *Exceptional Children, 71*(2), 165-179.

Hosp, M. K., Hosp, J. L., K & Howell, K. W. (2007) *The ABCs of CBM: A practical guide to curriculum based measurement.* New York: Guilford Press.

Jowett, E. L., Moore, D. W., & Anderson, A. (2012). Using a tablet-based video modeling package to teach numeracy skills to a child with an autism spectrum disorder. *Developmental Neurorehabilitation, 15*(4), 304-312. doi:10.3109/17518423.2012.682168

List of Irregular Spelling Patterns in English. (n.d.). Retrieved from: www.geocities.jp/novospel21/irregularspellingpatterns.html

MacDonald, R., Sacramone, S., Mansfield, R., Wiltz, K., & Ahearn, W. H. (2009). Using video modeling to teach reciprocal pretend play to children with autism. *Journal of Applied Behavior Analysis*, *42*(1), 43–55. http://doi.org/10.1901/jaba.2009.42-43

Mason, R. A., Davis, H. S., Boles, M. B., & Goodwyn, F. (2013). Efficacy of point-of-view video modeling: A meta-analysis. *Remedial & Special Education, 34*(6), 333-345. doi:10.1177/0741932513486298

McLay, L., Carnett, A., van der Meer, L., & Lang, R. (2015). Using a video modeling-based intervention package to toilet train two children with autism. *Journal of Developmental & Physical Disabilities, 27*(4), 431-451. doi:10.1007/s10882-015-9426-4

Moore, D., Anderson, A., Treccase, F., Deppeler, J., Furlonger, B., & Didden, R. (2013). A video-based package to teach a child with autism spectrum disorder to write her name. *Journal of Developmental & Physical Disabilities, 25*(5), 493-503.

Nikopoulos, C. K., & Keenan, M. (2004). Effects of video modeling on social initiations by children with autism. *Journal of Applied Behavior Analysis, 37*(1), 93–96. http://doi.org/10.1901/jaba.2004.37-93

Quill, K. A. (1997). Instructional considerations for young children with autism: The rationale for visually cued instruction. *Journal of Autism & Developmental Disorders, 27*(6), 697-714.

Schreibman, L., Whalen, C., & Stahmer, A. C. (2000). The use of video priming to reduce disruptive transition behavior in children with autism. *Journal of Positive Behavior Interventions, 2*(1), 3-11.

Shipley-Benamou, R., Lutzker, J. R., & Taubman, M. (2002). Teaching daily living skills to children with autism through instructional video modeling. *Journal of Positive Behavior Interventions, 4*(3), 165.

Shrestha, A., Anderson, A., & Moore, D. (2013). Using point-of-view video modeling and forward chaining to teach a functional self-help skill to a child with autism. *Journal of Behavioral Education, 22*(2), 157-167. doi:10.1007/s10864-012-9165-x

Shukla-Mehta, S., Miller, T., & Callahan, K. J. (2010). Evaluating the effectiveness of video instruction on social and communication skills training for children with autism spectrum disorders: A review of the literature. *Focus on Autism & Other Developmental Disabilities, 25*(1), 23-36. doi:10.1177/1088357609352901

Slocum, S. K. & Tiger, J. H. (2011). An assessment of the efficiency of and child preference for forward and backward chaining. *Journal of Applied Behavior Analysis, 44*(4), 793-805. doi:10.1901/jaba.2011.44-793

Spooner, F. (1984). Comparisons of backward chaining and total task presentation in training severely handicapped persons. *Education and Training of the Mentally Retarded, 19*(1), 15-22.

Tarbox, J., Madrid, W., Aguilar, B., Jacobo, W., & Schiff, A. (2009). Use of chaining to increase complexity of echoics in children with autism. *Journal of Applied Behavior Analysis, 42*(4), 901-906. doi: 10.1901/jaba.2009.42-901

Tetreault, A. S., & Lerman, D. C. (2010). Teaching social skills to children with autism using point-of-view video modeling. *Education & Treatment of Children, 33*(3), 395-419.

Yakubova, G., Hughes, E., & Hornberger, E. (2015). Video-based intervention in teaching fraction problem-solving to students with autism spectrum disorder. *Journal of Autism & Developmental Disorders, 45*(9), 2865-2875. doi:10.1007/s10803-015-2449-y

Figure 1. Correct Letter Sequences for Ryan.

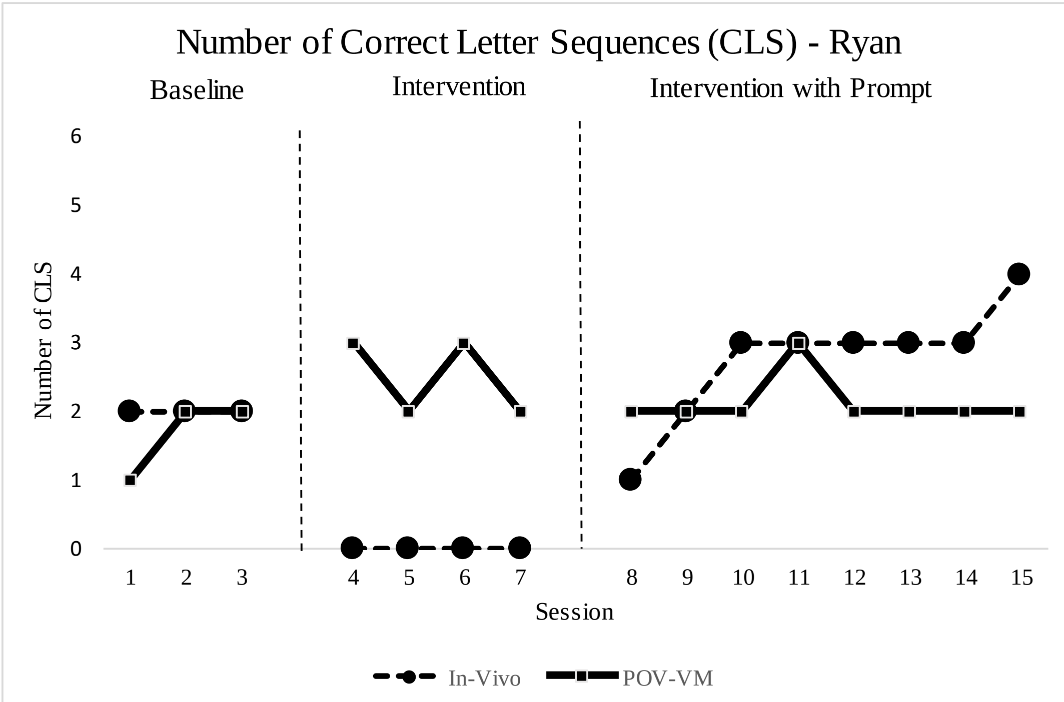


Figure 1. Note change in intervention in session 8. The addition of the prompt to the probe began during this session.

Figure 2. Number of Correct Letter Sequences (CLS) for Albert.

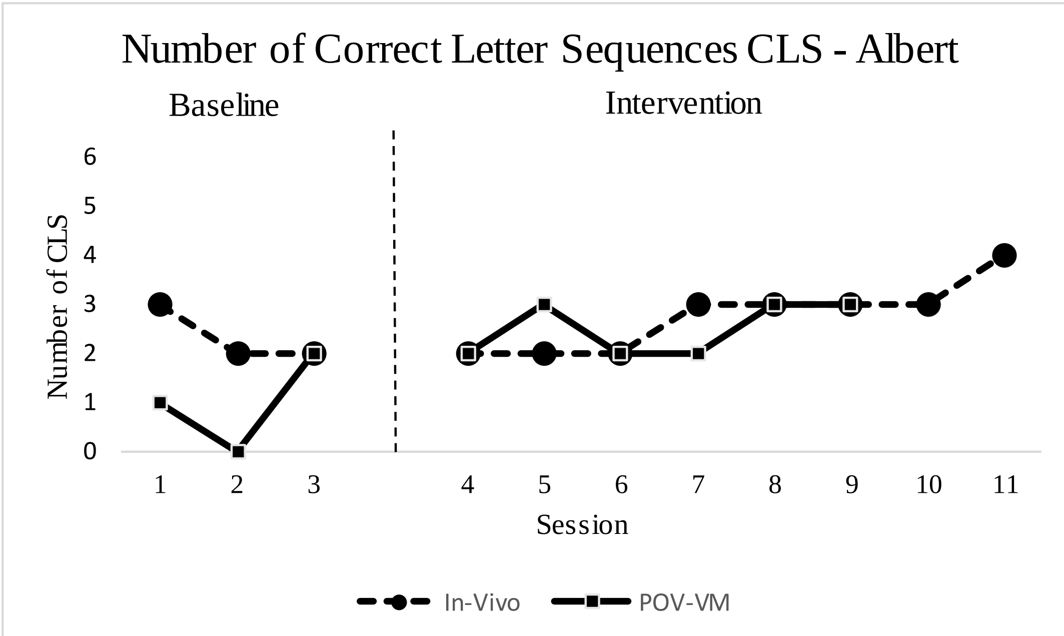
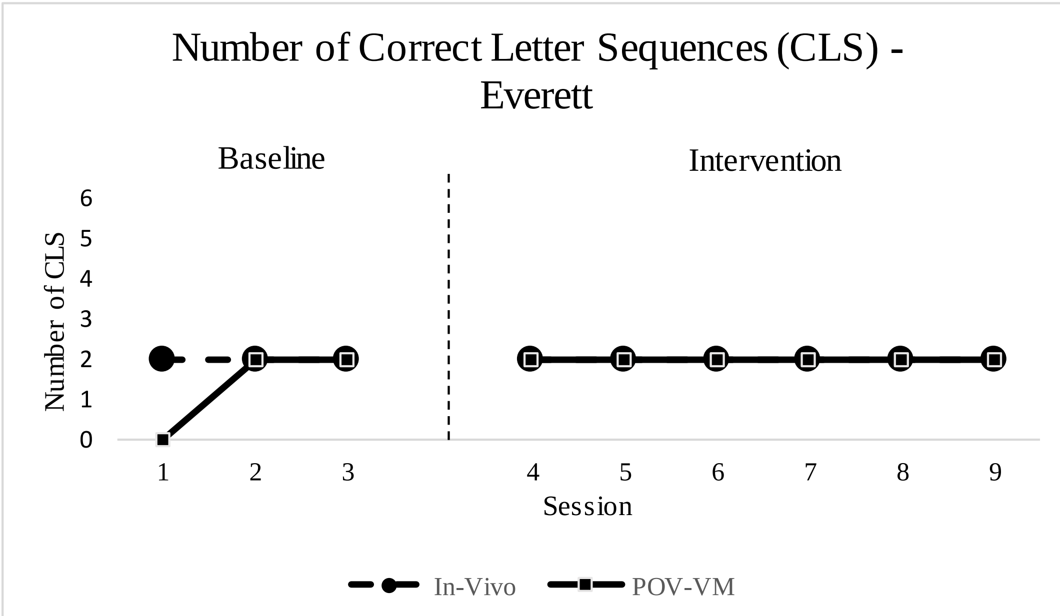


Figure 3. Number of Correct Letter Sequences (CLS) for Everett.



APPENDIX A

<u>In-Vivo Training Session</u>

Participant ID: ______________

Date: ________________

Session #: _____________

1. Examiner: "Today we are going to learn to spell the word __________ (laugh or yacht)."
2. Examiner: "What word are we going to spell?" – Have student repeat word.
3. "Spell the word _____________."
4. Probe for number of steps completed correctly without assistance and record: _____
    a. Step recorded as incorrect if not performed within 5 seconds or letter is illegible
5. Modeling begins
6. Examiner: "Watch me."
7. Model steps up to number of steps completed correctly (see above) and 1 new step
8. Examiner: "Now you try."
9. Feedback: Correct = "That's right." Incorrect = "Let's try again."
10. Return to step 5 –
    a. 3 CORRECT responses end session
    b. 3 TRIALS end session

<u>POV-VM Training Session</u>

Participant ID: _______________

Date: _________________

Session #: ______________

1. Examiner: “Today we are going to learn to spell the word __________ (laugh or yacht).”
2. Examiner: “What word are we going to spell?” – Have student repeat word.
3. “Spell the word ______________.”
4. Probe for number of steps completed correctly without assistance and record: _____
    a. Step recorded as incorrect if not performed within 5 seconds or letter is illegible
5. Modeling begins
6. Examiner: “Let’s watch the video.”
7. Show video of steps completed correctly (see above) and 1 new step
8. Examiner: “Now you try.”
9. Feedback: Correct = “That’s right.” Incorrect = “Let’s try again.”
10. Return to step 5 –
    a. 3 CORRECT responses end session
    b. 3 TRIALS end session

APPENDIX B

<u>POV-VM Training Session – IOA Checklist</u>

<u>Initial each step observed as completed.</u>

Participant ID: _______________

Date: _________________

Session #: ______________

___ 1. Examiner: "Today we are going to learn to spell the word __________ (laugh or yacht).

___ a. "What word are we going to spell?" Have student repeat word.

___ 2. "Spell the word ______________."

___ 3. Probe for number of steps completed correctly without assistance and record: _____

Step recorded as incorrect if not performed within 5 seconds or letter is illegible

___ 4. Modeling begins

___ 5. Examiner: "Let's watch the video."

___ 6. Show video of steps completed correctly (see above) and 1 new step

___ 7. Examiner: "Now you try."

___ 8. Feedback: Correct = "That's right." Incorrect = "Let's try again."

___ 9. Return to step 5 –

3 CORRECT responses end session

3 TRIALS end session

In-Vivo Training Session – IOA Checklist

Initial each step observed as completed.

Participant ID: _______________

Date: _________________

Session #: ______________

___ 1. Examiner: “Today we are going to learn to spell the word __________ (laugh or yacht).

___ a. “What word are we going to spell?” Have student repeat word.

___ 2. “Spell the word _____________.”

___ 3. Probe for number of steps completed correctly without assistance and record: _____

Step recorded as incorrect if not performed within 5 seconds or letter is illegible

___ 4. Modeling begins

___ 5. Examiner: “Watch me.”

___ 6. Model steps up to number of steps completed correctly (see above) and 1 new step

___ 7. Examiner: “Now you try.”

___ 8. Feedback: Correct = “That’s right.” Incorrect = “Let’s try again.”

___ 9. Return to step 5 –

3 CORRECT responses end session

3 TRIALS end session

APPENDIX C

Social Validity Questionnaire:

Recently either your child, or a child in your class, participated in a research study on teaching multistep behaviors. Please let us know your opinion on this study by filling out the questions below:

Please check one:

___ I'm a parent of a child in the study
___ I'm a teacher of a child in the study

This study involved teaching spelling words by using chaining, or teaching one letter at a time in sequence. The study involved comparing if children would learn how to spell more quickly if taught directly by a person, or by watching a video.

Please circle your answers below:

How important is it to you to know whether teaching in person or by video is more effective?

Not Important   Somewhat important   Very important

Teachers only: How likely are you to use video modeling in your classroom to teach multistep skills?

Not likely   Somewhat likely   Very likely

Parents only: How likely are you to use video modeling at home to teach multistep skills?

Not likely   Somewhat likely   Very likely

As a parent/teacher, if you could choose between direct modeling by a person or video modeling, which would you choose to use?

Direct Modeling   Video Modeling

Do you feel as if the child benefitted from receiving this intervention?

yes   no   not sure

VITA

Elaine Marie Turner resides at 2625 Pinecrest Drive, Nacogdoches, Texas, 75965. She graduated from Nacogdoches High School in Nacogdoches, Texas, in 1988. In December 1993 she received her Bachelor of Business Administration with a degree in Marketing from Stephen F. Austin State University. Elaine began graduate school in Summer 2012 and received a Masters Degree in School Psychology in May 2015. She will be receiving her Doctor of Philosophy in School Psychology in August 2017.

Style manual designation: American Psychological Association – modified in order to meet graduate school requirements

This dissertation was typed by Elaine Marie Turner