ACCURACY OF LETTER REPRODUCTION USING VIDEO MODELING VERSUS IN VIVO MODELING IN CHILDREN WITH AUTISM

A THESIS

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BY

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To the Dean of the Graduate School:

I am submitting herewith a thesis written by Ivette Acevedo entitled "Accuracy of Letter Reproduction Using Video Modeling Versus In Vivo Modeling in Children with Autism." I have examined this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts with a major in Occupational Therapy.

Catherine Candler

Catherine Candler, PhD, Major Professor

We have read this thesis and recommend its acceptance:

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ABSTRACT

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This study was designed to explore which modeling approach, in vivo or video would develop accuracy on letter imitation in children with autism. A multiple baseline AB design across participants was used. The independent variable was video modeling utilizing the *Alphamation* handwriting video. Accuracy of letter imitation of the different participants was the dependent variable. Each participant was asked to copy a letter that was randomly selected from a pool of unlearned letters. In vivo modeling as the traditional and generalized approach for teaching handwriting skills served as baseline. The three participants were randomly assigned to 3, 5, or 7 baseline sessions. Results suggested no advantages to video modeling. There were variable trends associated with the introduction of video modeling within participant or across participants on the accuracy of letter imitation. The celeretion line test indicated no statistical significance change at the .5 level on the accuracy of letter imitation in children with autism with the introduction of the video.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER I

ACCURACY OF LETTER REPRODUCTION USING VIDEO MODELING VERSUS IN VIVO MODELING IN CHILDREN WITH AUTISM

Writing is a fine motor skill which involves identification and reproduction of letters in order to create words. Imitation skills are an important component in the development of handwriting skills; however, children with autism demonstrate significant difficulties imitating fine and gross motor movements (Ingersoll & Schreibman, 2006). Iacoboni and Mazziotta (2007) found that children with autism show signs of dysfunction in the mirror neurons system located in the parietal side of the brain and in the pre motor cortex. In children without disabilities, the mirror neurons become active during the pre- motor imitation phase of any motor activity that is observed or performed by an individual. Children with autism show limited mirror neuron activity while imitating or observing an individual perform an action. This is called the broken mirror theory and it might explain the difficulties that children with autism have imitating actions (Ramachandran, & Oberman, 2008).

There have been different approaches to help children with autism develop imitation skills. Visual instructional methods such as picture prompts, in vivo modeling and video modeling have been utilized. In vivo modeling by teachers has been the traditional method to teach handwriting imitation skills in the schools. Video modeling has also been used to teach handwriting skills in children with and without disabilities. Handwriting videos such as *Pencil Pete, Alphamation, Alpha Beat* are some of the handwriting CD's currently in the market.However, educators and occupational therapist do not have an educational best practice on handwriting approaches in children with autism. There is a need for research on the acquisition of basic handwriting foundation such as letter imitation skills in children with autism. Children with autism prefer a visual style approach when learning a new task; the need for structure, consistency, predictability in their routine matches the characteristics of video modeling. The purpose of this study is to find out which modeling approach, in vivo or video will develop accuracy on letter imitation in children with autism.

CHAPTER II

REVIEW OF THE LITERATURE

Autism Spectrum Disorder

Children with autism challenge the education system. Autism Spectrum Disorder (ASD) is composed of a variety of characteristics that differ from one child to another. Some of the most common characteristics include; limited social, communication skills and restricted repetitive and stereotyped patterns of behavior (American Psychiatric Association, Diagnostic and statistical manual of mental disorders, 2000). Provost, Heimerl and Lopez (2007) noted that the majority of children with ASD demonstrate delays in gross and fine motor development. Children with autism also display difficulties with attention to task and writing skills (Mayes and Calhoun, 2007). The reproduction of letters entails imitation of fine motor movements and the manipulation of a writing instrument. Imitation skills are a key component in the handwriting process. According to Williams, Whiten and Singh (2004) there are two main ways to categorize imitation in children. The first one is imitation of an action using an object and the second is imitation of gestures. Handwriting skills fall into the first classification which is imitation of movements, lines and curves to form letters using a writing tool.

Visual Preferences

Although the learning styles are characterized by a multi-sensory approach a visual learning style seems to be a preferred way of learning (Grandin, 1995; Rao, Gagie, 2006).

Three fundamental instructional techniques facilitate this visual learning style; use of pictures, use of in-vivo modeling and use of video modeling. Pictures used frequently for children with autism such as the Pictures Exchange communication System (PECS) and Treatment and Education of Autistic and related Communication handicapped Children (TEACCH), involve visual prompts. These instructional techniques emphasize the need for a structured environment for increasing communication, easing transitions, and increasing attention to task in the classroom environment (Mesibov, Shea & Schopler, 2005). Pictures are used as visual support systems in the creation of schedules, illustrations for social stories or to illustrate specific target skills such as the rules of the classroom (Rao & Gagie, 2006). The structural components capture and increase attention to task using visual images in a predictable and consistent manner.

In vivo modeling refers to the demonstration of a task by a person (a model). The model can be an adult, typically developing peer or sibling. The participant observes the model and imitates the demonstrated skill. Researchers have found that participants can benefit from either adult, peer or siblings models demonstrations indiscriminately (Ihrig &Wolchivk, 1988; Jones & Schawartz, 2004).

In vivo modeling has been used as an effective instructional technique for many years for children with and without disabilities to facilitate the development of new skills. In vivo modeling was initially researched by Bandura, Ross and Ross (1961) with the "bobo" doll study. They determined that in vivo modeling had an immediate imitation effect on typical development children's behavior that included imitation of aggressive behavior. Zetou, Tzetzis, Vernadakis, & Kioumourtzoglou (2002) also reported that in vivo modeling with instructional cues helped typically developing children learn a new motor skill such as volleyball. Music teachers have also used in vivo auditory modeling (Suzuki method) to teach musical skills (Warren, 2007). Children with autism had benefit of Response Imitation Training. This intervention is used to increase spontaneous play in children with autism and utilizes in vivo modeling in order to teach imitation skills (Ingersoll & Gergans, 2007). In vivo modeling of facial gestures has facilitated imitation and engagement in emotional responses such as a smile, frown, anger and surprise in children with autism (Dequinzio, Townsend, Sturmey & Poulson, 2007).

In the area of academic skills, researchers have investigated the use of in vivo modeling on handwriting skills with typically developing children. Lamme (1991) emphasized the importance of educators modeling the correct letter formation when teaching handwriting. According to La Nunziata, Cooper, Hill and Trap (1985), in vivo teacher modeling of letter formation leads to increased production in letter formation accuracy. The Handwriting without Tears program (Olsen, 2001) has also emphasized the importance of in vivo modeling of letter formation. The first step in this handwriting instructional program is based on in vivo modeling; the teacher demonstrates the letter formation. Then the child imitates the teachers. There is no a specific recommended handwriting program for children in the school systems. This important instructional area has been left up to the educators to teach handwriting skills, however, it is expected that a child will write his or her name by kindergarten. There is great uncertainty in how and what is the best method to teach handwriting skills to children.

Video Modeling

Additionally, researchers have tried video modeling to teach children with autism. Video modeling is a visual instructional method that demonstrates a task performed by a person (a model) through video. The model in this case might be the participant, an adult or a peer. The participant observes a video demonstration and then imitates (Melching, 2005). Kinney, Vendora and Stomer (2003) conducted a study using video modeling as instructional method for increasing academic skills such as generative spelling in children with autism. Their research showed positive results and the participant demonstrated gains in generative spelling and consequently increasing writing skills. Delano (2007) investigated the use of video self modeling for adolescents with Asperger Syndrome and found it to be a helpful strategy to develop the writing communication process in an essay by increasing the number of words and functional parts of an essay. Kinney et al (2003) and Delano (2007) used video modeling in order to facilitate writing communication. However, it is important to note that the participants were high functioning children with autism and did not demonstrate difficulties with letter formation.

Other areas of research using video modeling have shown it to be an effective way of reducing disruptive transition behavior. Using video modeling, the child gets acquainted with the new place or activity. (Schreibman, Whalen & Stahmer, 2000). It has been used successfully to model social interactions such as a smile and handshake when introduce to others and to facilitate reciprocal play in pre-school children with autism (Nikopoulos, & Keenan, 2000). Le Blanc et al. (2003) found that video modeling was an effective tool in developing perspective taking skills. Parents and teachers have also found it to be an effective way of teach daily living skills such as toilet training (Keen, Brannigan & Cuskelly, 2007).

In Vivo and Video Modeling

Some researchers have done comparisons between in vivo and video modeling strategies to determine the relative effectiveness of these forms of modeling in children with autism. A comparison was performed by Gena, Couloura, and Kymissis (2005) on the affective behavior of preschoolers with autism. They concluded that the participants benefit from both types of modeling in the facilitation and imitation of appropriate responses to feelings such as sympathy, appreciation and disapproval. Charlop -Christy, Le and Freeman (2000) also compared these strategies using different activities with five different subjects. Activities included play, coloring, greetings, conversations and self help skills such as brushing teeth and washing face. The study concluded that video modeling was more effective than in vivo modeling, furthermore, the children seemed to acquire the skills faster and it promoted generalization.

The research in this area points at two very useful instructional strategies for children with autism. More research is needed on the areas of handwriting development along the spectrum of children with autism. There is a lack of research investigating the effectiveness of in vivo compared to video modeling for teaching handwriting skills in children with autism. This study investigated the effectiveness of in vivo versus video modeling on basic handwriting skills of copying capital letters in children with autism.

CHAPTER III

METHOD

Design

In this study, a single subject multiple-baseline AB design across participants was used to evaluate the effectiveness of in vivo versus video modeling on copying skills. The multiple-baselines across participants design addressed the impact of the treatment (independent variable) on the copying skills of different participants (dependent variable).

Participants

Participants met the following criteria: (a) designation of diagnosis of autism spectrum disorder according to IDEIA (2004); (b) able to copy a vertical and horizontal line and a circle using a writing tool (Olsen, 2004); (c) between 5 and 10 years old; (d) demonstrated a minimum of 15 minutes of attention to computer or television screen with minimal cueing, as reported by special education teacher or parent(s). Institutional Review Board, school district and parental consent was obtained. A total of three participants were selected for this study from public elementary schools from public elementary schools in rural eastern New Mexico. Excluded from this study were participants who had uncorrected vision or any condition which would biomechanically affect the act of handwriting.

Participant A (three sessions baseline) was a kindergarten student in the inclusion setting. He was 5 year, 4 month at the time. His diagnosis and eligibility codes for special education consisted of Disruptive Behavior Disorder, Attention Deficit Disorder and Autism. He was not able to recognize the letters of the alphabet. He had his vision corrected with glasses. He had difficulty initiating and terminating classroom fine motor tasks. In the Kaufman Assessment Battery for Children, an intelligence test for children, he obtained a Nonverbal Index (NIV) standard score of 91 that placed him in the average category. He received a Mental Processing Index (MPI) standard score of 89 that placed him in the average range.

Participant B (five baseline sessions) was a 5 year, 10 month old female student in a special education program for students that needed a review of kindergarten skills. Her eligibility code for special education was Autism. She was a verbal student and was able to identify all letters of the alphabet. However, she was not able to form the letters independently. She obtained a Mental Processing Index (MPI) standard score of 91 on the Kaufman Assessment Battery for Children, Second Edition (KABC-II) that placed her in the average category. She obtained a Nonverbal Index (NIV) standard score of 100 that placed her in the average category. She obtained a Learning Index standard score of 97 that placed her in the average range.

Participant C (seven baseline sessions) was an eight year and four month third grade student in a segregated setting for children with autism. He was not verbal and required prompting to initiate fine or gross motor classroom activities. He was able to match capital letters. He avoided writing and fine motor activities. On the Vineland

Adaptive Behavior Scales (VABS), he scored moderately low in adaptive functioning on all areas such as personal, interpersonal relationships, play leisure, time, and coping skills. He earned an IQ equivalence standard score of 53 on the Developmental Profile II.

Instruments

A scale-based handwriting rubric designed using the Test of Handwriting Skills-revised (Gardner, 1998) and the Print Tool (Olsen & Knapton, 2006) to give a numerical grade of the participant's letter formation skill. This instrument was thoroughly checked for inter-rater reliability between the school teachers and the investigator, prior to commencement of the study. The group of two raters and the investigator was used to establish consensus on the use of the instrument (rubric). A kindergarten special education student was asked to copy the alphabet in a sequential order by the classroom teacher. The classroom teacher made copies of the letter samples and distributed them to two rates and the investigator. Using the handwriting rubric, the two rates and the investigator proceeded to score the letters. Consensus was measured as number of agreements divided by total number of observations. The percent of agreement using the handwriting rubric was 97.

Score of 1 – participant made no attempt to copy

Score of 2– participant made attempt to copy but creates an undecipherable form

Score of 3 – participant created a form that resembles the target letter and contains any of the following, missing parts, added parts, broken lines, unattached curves/lines, reversal or wavy lines.

Score of 4– participant copied the letter without any of the errors listed under the score of 3. Five consecutives scores of 4 or above indicated mastery.

The *Alphamation* video was used for the video modeling. *Alphamation* is a compact disk that demonstrates stroke by stroke each letter as it as being formed. Concurrently the stroke is described, for example, "Uppercase B- Start, pull down straight, stop, lift, start, slide right, curve down, slide left, pause slide right, curve down, slide left, pause, slide right, curve down, slide left, stop" (Wasylyk, 2006).

Procedure

Pre-testing was conducted to determine each participant's pool of learned and unlearned letters. The primary investigator presented one letter to the participant. The investigator asked each participant to copy the letter on a piece of paper. After going through the whole upper case alphabet with each participant in this same sequence, all letters were scored using the scale-based handwriting tool by the primary investigator. Letters scoring 2 or less on the instrument formed a pool of letters for each participant from which the target letter(s) for the study were drawn at random.

Each participant was seated in a small, quiet and familiar room with minimal visual distracters for both conditions. The investigator assured that the desk and table heights were the appropriate height for the participant. This included assuring that the participant's feet were flat on floor and the table height at approximately belly button height. The child was asked if he or she was comfortable and adjustments were made, as needed. The participants were given a choice of writing tools, and the one the participant chose was the same one used throughout the study. In the in-vivo condition, the experimenter was seated to the side of the participant, performing the instruction. In the video condition, a computer was placed in front of the student, on the table top. A piece of paper, with two solid lines and one dashed line in the middle, with left written on the bottom left side and right on the bottom right, was placed in front of the participant, with the child's writing implement. This type of paper was utilized in both conditions and was most similar to the demonstration used in the video. Participants had 3 opportunities to copy the letter in each session. Each session was approximately 10 minutes, maximum of 15 minutes for either condition.

The baseline or A phase was in vivo. The length of the A phase was randomly assigned among participants and varied from 3, 5, 7, sessions. A letter was introduced and data monitored for a flat, variable, or descending trend. If a positive (improvement) trend was discerned within the A phase, a different letter was chosen from the pool and the process was repeated until an A phase of no improvement was established.

The treatment or B condition was video modeling. Video modeling was presented until criterion was established (5 scores of 4 within two consecutive sessions) or to a maximum of 5 sessions. A positive trend initiated within 2 sessions and discerned by 5 sessions across participants and multiple baselines was interpreted as an advantage to video modeling for letter reproduction.

In Vivo Modeling Procedure

1. The primary investigator modeled the letter.
2. The investigator reminded the participant to pay attention to the paper where the letter was being modeled. The investigator then said "Now it is your turn to write the letter___."
3. The participant was given the opportunity to respond each time, for a total of 3 times per session.

Video Modeling Procedure

1. The participant sat in front of computer.
2. The investigator reminded the participant to pay attention to the video. When video model said "Now is your turn to write the letter___.
3. The participant was given the opportunity to respond each time, for a total of 3 times per session.

CHAPTER IV

RESULTS

The pre-testing was conducted to determine participant A, B and C's pool of learned and unlearned letters. Phase A constituted of three, five, or seven sessions that were randomly assigned to the participants.

The celeretion line method was chosen to determine the significance of change on letter accuracy in the participants as related to the treatment (video modeling). The celeration line provided a visual analysis of the data. This test helped the investigator in finding the significance of the treatment on a subject by expanding the trend observed in baseline or phase A into phase B. The responses above the celeration line needed to be at a statistically significant change of .05 confidence level (Gingerich, Wallace & Feyerherm, 1979).

Participant A

The pool of letters for participant A was F, G, H, I, Q, R, W, and Z. Participant A was randomly assigned three sessions. The first letter drawn at random was letter R. Phase A began with in vivo modeling of the letter R.

After three sessions, participant A displayed a flat trend of number 3 scores. Video modeling was introduced for a maximum of five sessions. A celeration line test was performed to determine if there was a significant change in behavior, The means of each of the two quartiles was 3, thus the celeration line is flat. There were not discernable changes in level or trend between in video and video. This was not a significant change according to the procedures outlined by Gingerich et al., (1979).

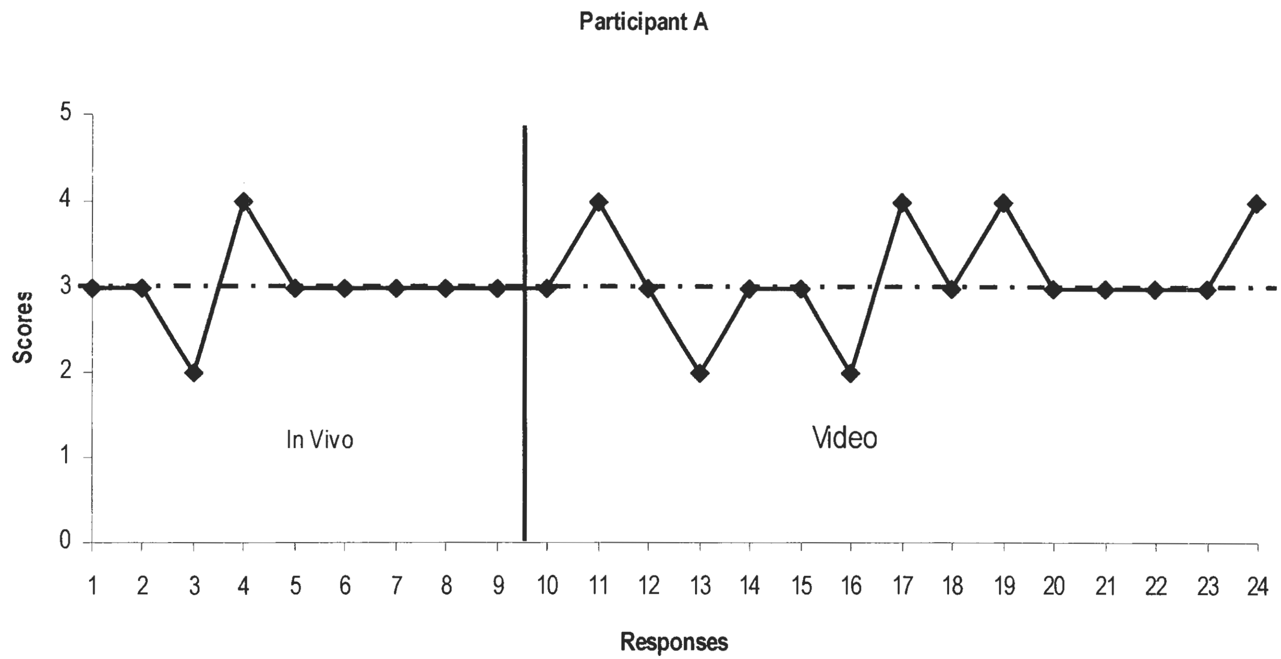

Figure 1. Three baseline sessions.

Participant B

Participant B was randomly assigned five sessions. The pool of letters for participant B was S, K and P. These target letters were drawn at random. The first letter selected at random for participant A was the letter K. Phase A began with in vivo modeling of the letter K. After three sessions participant A obtained five scores of 4, which indicated a positive trend. Another letter form the pool was chosen randomly, the target letter was S. After five sessions of in vivo modeling of letter S, the participant demonstrated a flat trend of number 2 scores.

Video modeling was introduced for five sessions. Participant B demonstrated a variable trend that included three scores of 4 and twelve scores of 2. Participant B (five baseline sessions) demonstrated a positive change in level after the video was introduced however, there were no change in trend. There was not a statistically significant change for video modeling (Gingerich et al., 1979).

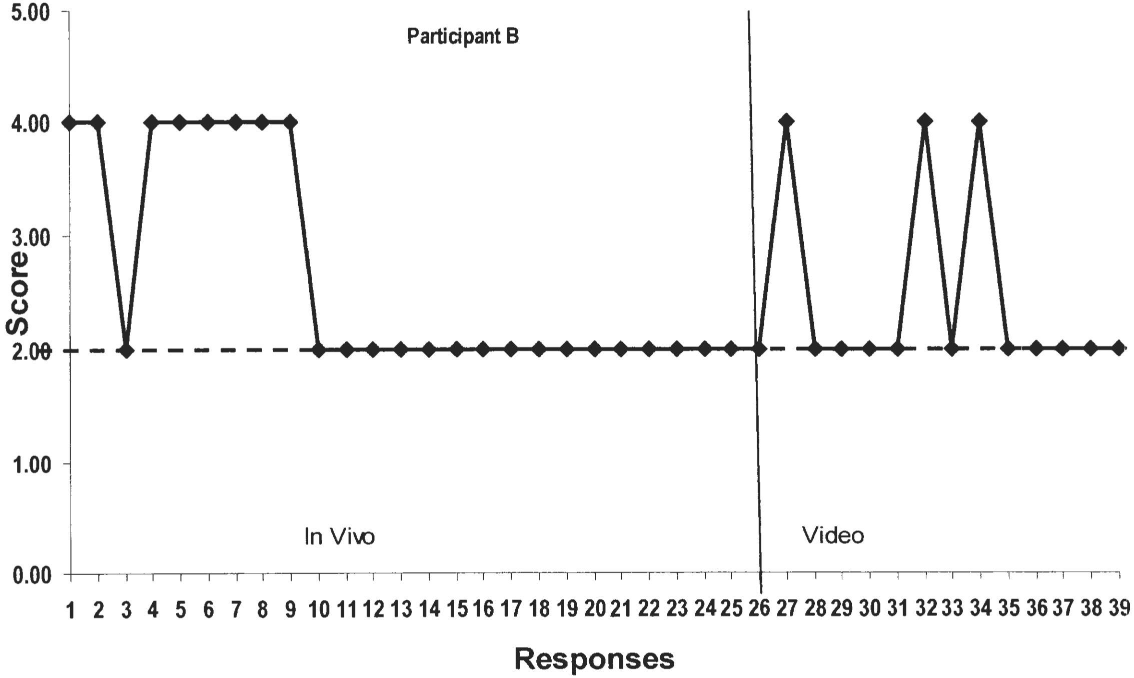

Figure 2. Five baseline sessions.

Participant C

The pool of letters for participant C were E, K, M, P, R, V, W, X and Z. Participant C was randomly assigned seven sessions. The first letter drawn at random was letter K. Phase A began with in vivo modeling of the letter K. After seven sessions, participant B displayed a variable trend that included ten scores of 2, ten scores of 3 and one scores of 4. Treatment or video modeling was introduced for a maximum of five sessions. Participant C demonstrated a variable trend that included three scores of 2, six scores of 3 and six scores of 4.

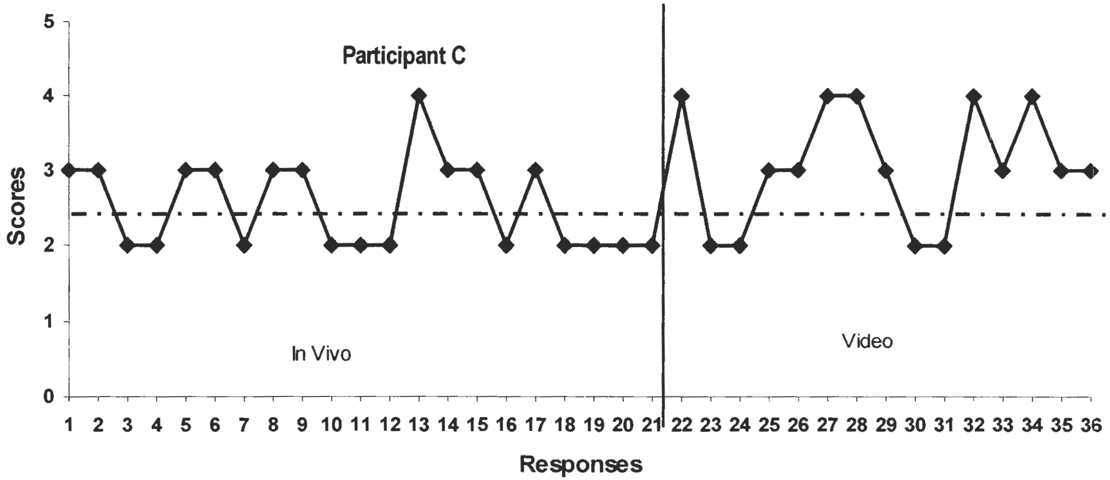

Figure 3.Seven baseline sessions.

CHAPTER V

DISCUSSION

The effects of video modeling within participants showed a similar outcome. There was not a significant change on letter imitation skills. Participant A and B were of average cognitive skills, 89 and 97 respectively. Participant C had low cognitive skills as per IQ equivalency of 53. Participant C showed the closest number of points needed to determine a significant change in letter imitation. He needed 12 points above the celeration line; however, he obtained 11 points above the celeration line. Participant C's individual difference in cognitive skills from the other two participants and the interpretation of participant C responses position him as the closest performance to significant change. This observation might indicate a positive relation between video modeling and the facilitation of letter imitation in children with autism with low cognitive skills. Perhaps video modeling might be a beneficial tool for teaching letters in children with autism with below average and low cognitive skills.

The effects of video modeling across participants showed that video modeling did not significantly change the copying skills in children with autism. However, there is no evidence that video modeling hinders the development of letter imitation skills. Video modeling did not showed negative change in copying skills. Hence, it does not negate the value of video modeling as an alternative and complementary method for teaching handwriting skills. Occupational therapists and teachers might use video modeling in conjunction with in vivo modeling as part of a multisensory approach for teaching handwriting skills.

The participants appeared to enjoy watching the letter videos and seemed motivated to participate in the imitation of letters when using video modeling. They stayed on task and attended video. There was not a distinctive pattern of positive responses needed to draw a firm conclusion about the advantage of video modeling. More research is needed in this area in order to explore video modeling potential to develop handwriting skills in students with and without disabilities. A study on visual attention and attention to task when learning letter formation using in vivo modeling versus video modeling might be beneficial in order to clarify observations mention above. In addition, a study exploring the possible beneficial relationship between the development of handwriting skills using video modeling in children with autism and low cognitive skills may prove beneficial as well.

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APPENDIX

Alphamation Letter Scripts

Alphamation Letter Scripts

Uppercase A-Start, slant left, stop, lift, start slant right, stop, lift, start, slide right, stop.

Uppercase B- Start, pull down straight, stop, lift, start, slide right, curve down, slide left, pause, slide right, curve down, slide left, and stop.

Uppercase C- Start, circle left, stop.

Uppercase D- Start, pull down straight, stop, lift, start, slide right, curve down, slide left, and stop.

Uppercase E- Start, pull down straight, pause, slide right, stop, lift, start, slide right, stop, lift, start, slide right, stop.

Uppercase F-Start, pull down straight, stop, lift, start, slide right, stop, lift, start, slide right, stop.

Uppercase G- Start, circle left, pause, slide left, and stop.

Uppercase H- Start, pull down straight, stop, lift, start, pull down straight, stop, lift, start, slide right, stop.

Uppercase I- Start, slide right, stop, lift, start, pull down straight, stop, lift, start, slide right, stop.

Uppercase J- Start, pull down straight, curve left, curve up, and stop.

Uppercase K- Start, pull down straight, stop, lift, start, slant left, pause, slant right, and stop.

Uppercase L- Start, pull down straight, pause, slide right, stop.

Uppercase M- Start, pull down straight, stop, lift, start, pull down straight, stop, lift, start, slant right, stop, lift, start, slant left, stop.

Uppercase N- Start, pull down straight, stop, lift, start, pull down straight, stop, lift, start slant right, stop.

Uppercase O-Start, circle left, stop.

Uppercase P- Start, pull down straight, stop, lift, start, curve right, stop.

Uppercase Q- Start, circle left, stop, lift, start, slant right, stop.

Uppercase R- Start, pull down straight, stop, lift, start, circle right, pause, slant right, stop.

Uppercase S- Start, curve left, curve right, curve left, and stop.

Uppercase T- Start, pull down straight, stop, lift, start, slide right, stop.

Uppercase U- Start; pull down straight, curve right, push up straight, stop.

Uppercase V- Start, slant right, stop, lift, start, slant left, stop.

Uppercase W-Start, slant right, stop, lift, start, slant left , stop, lift, start, slant right, stop, lift, start, slant left, stop.

Uppercase X- Start, slant right, stop, lift, start, slant left, stop.

Uppercase Y- Start, slant right, stop, lift, start, slant left, pause, pull down straight, stop.

Uppercase Z- Start, slide right, pause, slant left, pause, slide right, and stop.