AN ABSTRACT OF THE THESIS OF

Layne Case for the degree of Master of Science in Exercise and Sport Science presented on June 9, 2015.

Title: The Effects of Video Modeling on Test of Gross Motor Development-3 Performance among Children with Autism Spectrum Disorder.

Abstract approved: ______________________________________________________

Joonkoo Yun

Children with autism spectrum disorder (ASD) have been reported to have motor skill delays and deficits. However, there have been challenges to these findings on whether these deficits are due to lack of movement skills or inaccurate assessment methods. Due to relative strengths in processing visual stimuli as opposed to verbal stimuli within this population, instructional and assessment strategies that incorporate visual presentations are recommended. One visual support approach that has found to be successful among children with ASD is video modeling. Video modeling has been shown in the research to improve and maintain behaviors such as social and communicative skills, play skills, and self-help skills, but use is limited in physical activity and motor assessment settings. It is hypothesized that video modeling strategies may also improve motor performance by enhancing accuracy of motor skill assessments. Therefore, the purpose of this study was to examine the effects of video modeling on the assessment of motor skills among children with ASD. The Test of Gross Motor Development-3 (TGMD-3) was administered to measure motor skills of children in this study. Thirteen children with ASD (ages 11-16) and fifteen children without ASD (ages 3-11) participated in this
study. Participants performed the TGMD-3 under two separate protocols (traditional condition and video modeling condition) in a counterbalanced order. The video modeling condition involved video demonstrations of the selected TGMD-3 skills made by the primary investigator and shown on an Apple iPad Air. The two testing conditions were completed on two distinct days within approximately 7 days of each other. Two repeated-measures one-way ANOVAs were used to examine the differences in gross motor scores between the testing conditions. Although gross motor scores of the video modeling condition among children with ASD increased by approximately 2 points, differences were not found to be statistically significant. Scores of children without ASD decreased by approximately 2 points following the video modeling condition, though differences were also not statistically significant. Two separate one-way repeated measures ANOVAs investigating the effectiveness of video modeling on total assessment duration revealed significant increases in assessment time using the video modeling condition, suggesting that the video modeling condition takes longer than the traditional condition.

Lastly, two 2x3 (condition by preference) repeated measures ANOVAs revealed that both children with and without ASD perform better using the preferred condition (traditional versus video modeling) of the TGMD-3 though these differences were not significant. Future research is needed in order to further explore the effectiveness of video modeling strategies among children with ASD. Additionally, it is recommended that effective video modeling designs and procedures within motor assessment environments are provided in the literature.
The Effects of Video Modeling on Test of Gross Motor Development-3 Performance among Children with Autism Spectrum Disorder

by
Layne Case

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APPROVED:

Major Professor, representing Exercise and Sport Science

Director of the School of Biological and Population Health Sciences

Dean of the Graduate School

I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Layne Case, Author
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Chapter I. Introduction

Approximately 1 in every 68 children are diagnosed with autism spectrum disorder (ASD) (Centers for Disease Control and Prevention (CDC), 2014). The American Psychological Association (2013) indicates that ASD is characterized by behaviors in limited development in communication, social deficits and restrictive, repetitive patterns of behaviors, interests or activities. Research has also shown that many children with ASD exhibit significant delays in motor skill development (Berkeley, Zittel, Pitney, & Nichols, 2001; Pan, Tsai, & Chu, 2009; Provost, Lopez, & Heimerl, 2007; Staples & Reid, 2010). In addition, children with ASD possess relative strengths in processing visual, as opposed to verbal, information and instruction (Tissot & Evans, 2003). Consequently, when considering combinations of these behaviors, students with ASD may have more difficulty in physical education settings where verbal instructions are the primary modes of communication. Thus, motor skill development and performance may be negatively influenced as a result.

Appropriate assessment strategies are necessary in order to encourage positive physical activity experiences for children with ASD. Because the assessment of a child’s motor skills largely dictates physical activity goals and instructional plans, an accurate representation of the child’s motor skills is vital to create appropriate skill progression. This matter is especially important considering the inconsistencies in the research regarding the motor skill development of children with ASD. Research claims that children with ASD demonstrate motor skill deficits and delays (Berkeley et al., 2001;
Lloyd, MacDonald, & Lord, 2011; Pan et al., 2009; Provost et al., 2007; Staples & Reid, 2010), though some studies suggest the possibility that certain assessment protocols may not be appropriate or accurate for this population (Berkeley et al., 2001; Breslin & Rudisill, 2011; Liu & Breslin, 2013; Staples & Reid, 2010). The Test of Gross Motor Development (TGMD) and TGMD-2 (Ulrich, 1985; 2000) are standardized motor skill assessment tools that have been widely used across children with and without ASD. Despite this popularity, however, Berkeley et al. (2001) and Staples and Reid (2010) raised concern with the use of the TGMD and TGMD-2 to assess motor skills of children with ASD. Consistent with other claims (e.g. Lloyd, MacDonald, & Lord, 2011; Pan et al., 2009; Provost et al., 2007), Berkeley et al. (2001) found that children with ASD have difficulties with motor skills; however, they also noted that many of the participants did not appear to understand or interpret the task correctly. For example, instead of performing galloping, running, or skipping as three different tasks, the participants would interpret the skills as simply a function of moving across the room (Berkeley et al., 2001). Therefore, the participants would walk or run across the room, even though they were asked to do a separate task. Additionally, one participant walked a ball to touch a target on the wall, instead of throwing the ball at the target. Staples and Reid (2010) found similar challenges. Participants did not appear to understand the TGMD-2 motor skills correctly. As a result, some participants were given individualized instructions and/or hand-over-hand guidance. Regardless of the additional instruction, however, results still indicated that participants with ASD exhibited delays in motor skill performance.

Although previous studies suggested motor skill delays and deficits among children with ASD even after additional guidance (Berkeley et al., 2001; Staples & Reid,
2010), other studies have shown positive findings with the inclusion of other supports with motor assessments (Breslin & Rudisill, 2011; Liu & Breslin, 2013). These studies investigated the assessment of motor skill performance using various picture-based visual supports. Breslin and Rudisill (2011) found that incorporating picture task cards into the administration of the TGMD-2 elicited significantly higher motor skill performance scores compared to the traditional method, which relied on verbal descriptions and physical demonstrations of the skills. Furthermore, Liu and Breslin (2013) found that children with ASD scored higher on the Movement Assessment Battery for Children-2 when provided with a picture activity schedule as opposed to the traditional assessment method.

The effectiveness of visual supports used in motor skill assessments speaks to other findings that children with ASD have relative strengths in processing visual information, as opposed to verbal information (Tissot & Evans, 2003; Welton, Vakil, & Carasea, 2004). While picture-based supports such as picture activity schedules and picture task cards have been commonly used in physical activity settings among this population (Breslin & Rudisill, 2011, 2013; Fittipaldi-Wert & Mowling, 2009; Liu & Breslin, 2013; Silla & Burba, 2008), video approaches are currently gaining attention. One video approach that has recently received popularity as an evidence-based practice in ASD research is known as video modeling (Bellini & Akullian, 2007; Wong et al., 2014). Although video-modeling publications to date are limited in the fields of PE and physical activity among children with ASD, there is evidence to speculate that video modeling interventions can be effective in these settings (Cannella-Malone, Mizrachi, Sabelny, & Jimenez, 2013; Dowrick, 1991). For example, studies have indicated that video modeling
has fostered improvements such as increased conversational skills and behaviors (Charlop-Christy, Le, & Freeman, 2000), improved social interactions and play skills (Nikopoulos & Keenan, 2003, 2007), self-help skills (Charlop-Christy et al., 2000; Keen, Brannigan, & Cuskelley, 2007; Shipley-Benamou, Lutzker, & Taubman, 2002), as well as maintenance and generalization overtime of learned or improved skills and behaviors (Bellini & Akullian, 2007). Because video modeling presents information in the preferred way, as well as capitalizes on many other characteristics of ASD, children may be able to interpret the instructions more clearly (Corbett & Abdullah, 2005; Tissot & Evans, 2003). This in turn prompts clearer understanding and allows for a better evaluation of their true abilities and skill levels. Thus, video modeling may also result in higher motor skill performance scores by enhancing the accuracy and appropriateness of the motor skill assessment.

Video modeling may also be an attractive tool to children with ASD in assessment settings. For example, previous research has shown that children with ASD prefer video and television viewing (Nally, Houlton, & Ralph, 2000; Shane & Albert, 2008). Teachers and other professionals may also prefer to incorporate video modeling into assessments with this population. According to Bellini and Akullian (2007), video modeling interventions and other visual strategies are relatively brief interventions, which is an important characteristic to professionals with limited time. Additionally, video modeling has been found to be overall more time and cost efficient than in vivo (live) modeling in regards to training and implementing video modeling and employing models for interventions (Charlop-Christy et al., 2000). Flores et al. (2012) also found that instructors indicated a preference for iPads and video strategies over non-electronic
picture-based systems due to reasons such as ease of use, less preparation time, and increased speed in communication among the students.

Overall, traditional motor skill assessment protocols rely strongly on verbal communication and social interactions—two areas that children with ASD have weaknesses in. However, with more appropriate methods of assessing motor skill development of children, it is possible that these children will have more positive experiences in PE and physical activity due to more accurate evaluations of their true abilities. If professionals have an accurate understanding of the child’s motor skills, they may subsequently be able to develop better quality instruction, allowing them to learn more physical activity skills and increase activity engagement. Research involving the ability of a motor skill development assessment to accurately evaluate the motor abilities of children with ASD has recently been investigated using various visual supports (Breslin & Rudisill, 2011; Liu & Breslin, 2013), but no literature to date has explored the use of video modeling in these areas. Thus, the present study aimed to answer questions regarding the effectiveness of video modeling on motor skill assessment performance.

The primary purpose of this study was to examine the effects of video modeling on the assessment of motor skill performance among children with and without ASD. The secondary purpose of this study was to explore the effects of condition preference (traditional versus video modeling) on motor skill performance. In order to explore these purposes, three specific aims were examined.

Specific Aim 1: To compare motor skill performance scores following a video modeling condition versus the traditional administration of the Test of Gross Motor
Development-3 (TGMD-3) for children with and without ASD. Our first hypothesis was that results would indicate that the video modeling condition would produce significantly higher total gross motor test scores on the TGMD-3 than the traditional protocol among children with ASD. Our second hypothesis was that the video modeling condition would also produce significantly higher total gross motor test scores than the traditional protocol among children without ASD.

Specific Aim 2: To compare total TGMD-3 assessment time of the traditional protocol to the video modeling condition for children with and without ASD. It was hypothesized that the video modeling condition would result in a shorter duration of time than the traditional protocol of the TGMD-3 between both children with and without ASD, based on previous studies that have indicated the overall increased time efficiency of video modeling strategies (Bellini & Akullian, 2007; Charlop-Christy et al., 2000).

Specific Aim 3: To examine TGMD-3 condition preferences (traditional versus video modeling) among children with and without ASD. Our first hypothesis was that results would indicate that children with and without ASD preferred the video modeling condition to the traditional protocol of the TGMD-3.

Assumptions and Delimitations

In this study, the following was assumed:

- The Test of Gross Motor Development-3 is sensitive enough to detect small changes in performance across test conditions.
• Parent and/or guardian confirmation of child ASD diagnosis by a physician, psychologist, social worker or school professional is accurate.

• The primary investigator is an appropriate video model for all of the participants in the study.

This study was delimited to:

• Participants from Corvallis, Oregon and other surrounding communities.

• Video modeling demonstrated via iPads, as opposed to other methods of technology.

Limitations:

• Only boys and young male participants were included in the ASD participant group. Future research will benefit with the exploration of video modeling effects and outcomes among girls and young women with ASD.

• Participants with ASD were all between the ages of 11-16, despite our intended study age range of 3-17. Therefore, our study did not allow for the exploration of video modeling effectiveness for young children. Furthermore, because the TGMD-3 skills are designed for children between the ages of 3-10, the effects of video modeling may not have been seen in their full capacity among the older participants like they may have been among younger children. Future studies may benefit from the inclusion of younger participants.

Operational Definitions:

The following list includes operational definitions of terms used in this study:

• *Autism Spectrum Disorder (ASD)*
• A parental or guardian confirmation of the child’s diagnosis of ASD by a clinician.

• *Video Modeling*
  
  o The demonstration of target skills by an individual through video representation on an iPad.
Chapter II. Literature Review

The purpose of this literature review is to provide the readers with background information on video modeling strategies in the research among children with autism spectrum disorders (ASD). Video modeling has shown to improve multiple skills and behaviors within this population. However, there is a gap in the research involving the use of video modeling strategies in physical education and physical activity settings. This literature will present multiple studies in which video modeling has produced positive benefits, as well as describe how this area of research can be explored further. The following material will present the rationale for this study.

Autism Spectrum Disorders (ASD)

One in every 68 children are diagnosed with ASD (Centers for Disease Control and Prevention (CDC), 2014). ASD is characterized by behaviors in communication deficits, social deficits and restrictive, repetitive patterns of behaviors, interests or activities (American Psychological Association (APA), 2013). Many children with ASD also have difficulty understanding verbal stimuli and instructions (Tissot & Evans, 2003), which is the primary mode of communication in most learning environments. This can provoke further challenges when working with this population due to the lack of understanding of the assigned task. This lack of understanding could also lead to inaccurate assessment of a child’s abilities, which can be harmful to the child’s progress in educational settings.

The high prevalence of ASD in school-aged children suggests the importance of finding appropriate, alternative strategies to verbal instruction that may be more
understandable. Children with ASD have been shown to present relative strengths in processing and associating meaning to visual information that is seen rather than heard (Tissot & Evans, 2003; Welton et al., 2004). Due to these strengths in visual processing, one popular approach to alternative instructional strategies in the research is the use of visual supports.

**Visual Supports for Children with ASD**

Children with ASD often learn best with visual stimuli and supports (Tissot & Evans, 2003; Welton et al., 2004). Visual supports are used in order to enhance the understanding of an idea, and can take various forms such as pictures, drawing, symbols, and/or videos (Case & Yun, In press). Presenting information to children with ASD in a format that capitalizes their strengths in and preferences for visual processing can help focus their attention on the appropriate stimuli, and allow them to make more sense of the information (Corbett & Abdullah, 2005; Tissot & Evans, 2003).

Common visual supports used with children with ASD include picture activity schedules and picture task cards (Fittipaldi-Wert & Mowling, 2009). A picture activity schedule is a visual illustration of a sequence of behaviors or activities that the child is expected to engage in (Bryan & Gast, 2000). Picture activity schedules are aimed at increasing time spent on-task and engaged in the desired behavior by providing order and predictability to the child in a preferred means of communication (Welton et al., 2004). Many behaviors and skills, such as classroom transitions and behavior (Dooley, Wilczenski, & Torem, 2001), on-task and on-schedule behaviors, and motor skill performance scores (Liu & Breslin, 2013), have improved as a result of these schedules.
In fact, Liu and Breslin (2013) reported that children with ASD scored higher on the Movement Assessment Battery for Children-2 (MABC-2) when provided a picture activity schedule as opposed to the traditional approach that utilizes live, physical demonstrations and verbal directions.

A picture task card is a visual representation of an action or skill (Breslin & Rudisill, 2011; Bryan & Gast, 2000). While picture task cards are similar to activity schedules in that they visually present information to the child, picture task cards do not incorporate an order or sequence of events. Like activity schedules, picture task cards have been found to increase time spent on-task and decrease time spent in off-task behaviors in classroom and assessment settings (Breslin & Rudisill, 2013; Dooley et al., 2001), as well as increase motor performance scores (Breslin & Rudisill, 2011). Specifically, results from a study by Breslin and Rudisill (2011) indicated that a picture task card condition as opposed to the traditional approach of the Test of Gross Motor Development-2 (TGMD-2) elicited higher gross motor scores among children with ASD. Furthermore, the picture task condition also produced higher gross motor scores than the picture activity schedule condition, which may have been attributed to the larger amount of information and longer duration of the picture activity schedule condition (Breslin & Rudisill, 2011). These above findings suggest that both picture activity schedules and picture task cards have been beneficial among children with ASD, and can be an effective way to improve motor skill assessment performance.
Video Modeling as a Recent Trend in Visual Support Research

Video modeling is a popular approach used in the literature involving interventions with children with ASD. Video modeling is a visual support strategy that includes the demonstration of target behaviors or skills through video representation (Bellini & Akullian, 2007). This approach involves a model (e.g. peer, familiar or unfamiliar adult, sibling, self, etc.) who is videotaped while engaging in the appropriate behavior or skill. The video is then edited to present the relevant information, and shown to the child before his or her own performance. Allowing the student to observe the correct performance of the target behavior immediately prior to attempting the behaviors enhances the probability of successful performance (Shukla-Mehta, Miller, & Callahan, 2010). In fact, there have been many positive, successful results of video modeling interventions with children with ASD.

Social and Play Skills

One area of video modeling research focuses on the improvement of social skills and play behaviors through video modeling (Ayres & Langone, 2005; Bellini & Akullian, 2007; Shukla-Mehta et al., 2010). For example, one study examined the effectiveness of video modeling in teaching social initiations and play behaviors to children with ASD (Nikopoulos & Keenan, 2003). It was found that social initiations and appropriate toy play were increased in 4 out of 7 children, and these new skills were maintained at 1 and 2 months follow-up. A similar study that aimed to teach children with ASD complex social sequences through video modeling found that all four children in the study were able to build a complex sequence of social behaviors following a video modeling intervention (Nikopoulos & Keenan, 2007). Both of these studies suggest that video
modeling can be an effective tool to improve social skills in this population. Similar to Nikopoulos and Keenan (2003), another study examined the effectiveness of a video modeling intervention to teach play behaviors to a preschool child with autism (D’Ateno, Mangiapanello, & Taylor, 2003). In this study, the child viewed a video of an adult model playing with and verbally engaging with various toy items (e.g. doll, tea party set, cooking set, etc.), and was then observed playing with the toys herself. D’Ateno and colleagues (2003) found that video modeling in this scenario led to an increase in the frequency of both verbal and motor play responses with the toys, and can be an effective medium for promoting long play sequences for children with autism.

Communicative Skills

Some studies have also examined the effects of video modeling interventions on communication skills among children with ASD (Bellini & Akullian, 2007). One study looked at the efficacy of video modeling versus in-vivo, or live, modeling in teaching multiple communication behaviors such as spontaneous greetings and conversational speech (Charlop-Christy et al., 2000). Results suggest that video modeling was an effective strategy for increasing these behaviors in four of the five children. For example, one participant provided the desired spontaneous greeting once out of 8 trials during baseline. Similarly, he did not give any correct responses regarding conversational speech during baseline. However, his performance in both areas reached criterion—100% on two consecutive sessions—after only two video modeling presentations. Charlop-Christy and colleagues (2000) also noted that generalization of the behaviors of interest only occurred for the tasks taught through video modeling, and not in-vivo modeling. As a result, this study indicates that video modeling may be effective not only in increasing
communication skills and behaviors, but in promoting the ability to maintain these behaviors in other settings as well.

*Self-Help Skills and Activities of Daily Living*

Video modeling interventions have also been targeted at improving life skills and behaviors that are necessary in order to function independently (Ayres & Langone, 2005; Bellini & Akullian, 2007). Two separate studies examined the effectiveness of video modeling instruction from a first-person perspective to teach various self-help skills to children with ASD (Shipley-Benamou, Lutzker, & Taubman, 2002; Norman, 2001). Shipley-Benamou and colleagues (2002) found that video modeling promoted acquisition and maintenance of self-help skills, including mailing a letter, table setting, pet care, and making orange juice, in all three participants. Similarly, results from a study by Norman et al. (2001) suggest that video modeling instruction can effectively improve functional skills, such as putting on sunglasses, of a child with ASD. Both of these studies also noted that the skills and behaviors were maintained at follow-up. Research has also indicated that video modeling can aid in activities of daily-living such as toilet training (Keen et al., 2007). In fact, Keen et al. (2007) found that children with ASD who watched a toileting video had a greater frequency of in-toilet urinations than controls. Findings such as these are positive and suggest that video modeling may be an essential tool in improving functional skills in children with ASD.

*Physical Activity Skills*

Video modeling research in the field of physical activity is minimal. Only one study has examined the effectiveness of video modeling on teaching fine and gross motor skills to children with ASD and other disabilities as well (Mechling & Swindle, 2012).
Mechling and Swindle (2012) examined the effects of video modeling on the acquisition of fine and gross motor tasks, and the differences across disability groups (students with ASD and students with moderate intellectual disabilities). Three elementary-age students from each disability group participated in the study (n=6). Each child watched videos of an adult demonstrating fine (e.g. tangling a plastic band) and gross (e.g. stepping over a jump rope) motor skills, and was recorded as engaging in a correct response if he or she imitated the skill within 5 seconds of watching the video. Results indicated that while students with moderate intellectual disability performed better on fine and gross motor tasks than students with ASD, all students demonstrated improvements in completing fine and gross motor tasks during video modeling sessions when compared to baseline measures without video modeling. These findings suggest that video modeling can be used as an effective intervention to increase the number of engagements in various physical activity skills.

Though study findings may not directly relate to children with ASD, this area has also been explored among individuals with other disabilities (Cannella-Malone, Mizrachi, Sabielny, & Jimenez, 2013). Cannella-Malone et al. (2013) conducted a study in which video modeling was used to teach physical activities to three children with significant disabilities, including cerebral palsy, ADHD, and intellectual and developmental disabilities. Each student was taught to perform activities such as jump rope, shuttle run, and a ladder drill using video modeling demonstrated on an Apple iPod Touch. Results indicated that each of the three participants made progress learning the physical activities as a result of video modeling, though only one student learned all three activities with video modeling alone and no supplementary support (Cannella-Malone et al., 2013).
These findings also suggest that video modeling may be more effective for some children with disabilities when paired with additional supports and/or teaching strategies. Although participants of this study did not have ASD, these findings provide a foundation for video modeling to be successfully used in physical activity settings among children with disabilities, and may support the use of video modeling in these settings among children with ASD for future research.

**Assessing Motor Skills**

The majority of video modeling research among children with ASD has been performed in fields other than physical education and physical activity (Bellini & Akullian, 2007). However, video modeling may be an effective tool to include in the assessment of motor skills. Past research has examined the effects of various picture-based visual supports on the assessment of motor skill development and performance, indicating that visual supports elicit higher gross motor scores than traditional approaches of motor assessment (Breslin & Rudisill, 2011; Liu & Breslin, 2013). Due to the similar visual characteristics of video modeling to these visual supports, it is speculated that video modeling will also produce higher gross motor scores on motor skill assessments than the traditional protocols.

The Test of Gross Motor Development (TGMD) and the Test of Gross Motor Development-2 (TGMD-2) are widely used process-based assessments designed to measure motor performance of typically-developing children (Ulrich, 1985, 2000). The newest edition of the TGMD, the Test of Gross Motor Development-3 (TGMD-3; Ulrich, In press), was used in this study to examine the effects of video modeling on the
assessment of motor performance among children with ASD. The results of this study can be vital in determining whether or not motor abilities among children with ASD are properly evaluated.

**Conclusion**

Video modeling strategies have been successful when working with children with ASD. These strategies have indicated that behaviors and skills in this population can be improved and increased with the appropriate supports. Video modeling also suggests that children with ASD do not necessarily lack the ability to acquire certain behaviors and skills, despite claims of deficits and/or delays in those areas. Instead, they may lack the ability to understand instructions as they are commonly presented. Misinterpreted or misunderstood verbal instructions can result in an inaccurate evaluation of the child’s current abilities. For example, if the child with ASD does not associate meaning to the action of skipping across the room, and instead walks or runs across the room, that child will be assessed as having poor motor abilities. However, the child may not lack the ability to complete the motor skill, but the ability to understand the assessment instructions. This calls for a need to accurately assess the motor skills and abilities of children with ASD by presenting the assessment in a preferred, visual modality such as video modeling.
Chapter III. Methods

Participants

Participants were recruited from advertisements (please see Appendix A) through local elementary, middle and high schools, personal contacts of the investigators, and campus-based community physical activity programs in the Pacific Northwest region of the United States. Children with ASD were included in this study if they were a) diagnosed with ASD as reported and confirmed by parents, b) able to hold and view videos on an Apple iPad, c) between the ages of 3 and 17, and d) physically able to perform the selected skills of the motor assessment. Children without disabilities were included in this study if they a) had not been diagnosed with a disability according to parental report, b) able to hold and view videos on an Apple iPad, c) between the ages of 3 and 17, and d) physically able to perform the selected skills of the motor assessment. In order to confirm whether the child met the necessary inclusion criteria, the parent/guardian completed a brief demographic questionnaire (please see Appendix B) regarding the child’s diagnosis and abilities. Prior to each participant’s inclusion in the study, informed consent and assent (please see Appendix C) were collected for the parents and child, respectively. All study protocols, methods and materials were approved by the OSU institutional review board (please see Appendix D).

A total of 30 children (20 boys and 10 girls) ages 3-16 participated in this study. Two children (1 with ASD and 1 without disabilities) who did not meet the inclusion criteria or did not successfully complete participation were excluded from the study, resulting in a total sample of 28 participants (13 participants with ASD and 15 children without disabilities). Among the thirteen children with ASD (age range = 11 years – 16
years), seven were diagnosed with autism and 6 were diagnosed with Asperger’s disorder as reported by parents or guardians. Table 1 provides a descriptive summary of all participants.

**Table 1. Descriptive Summary of Participants**

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Boy</th>
<th>Girl</th>
<th>Mean Age</th>
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<tbody>
<tr>
<td>ASD</td>
<td>13</td>
<td>13</td>
<td>0</td>
<td>13.69</td>
</tr>
<tr>
<td>Control</td>
<td>15</td>
<td>6</td>
<td>9</td>
<td>7.67</td>
</tr>
<tr>
<td>Total (Overall)</td>
<td>28</td>
<td>19</td>
<td>9</td>
<td>10.46</td>
</tr>
</tbody>
</table>

*Note. ASD = Autism Spectrum Disorder; Control = Children without disabilities*

**Instrument**

The Test of Gross Motor Development-3 (TGMD-3) was administered in this study. The TGMD-3 is a standardized assessment tool used to collect normative data on the gross motor development of children between the ages of 3 and 10 years (Ulrich, In press). Evidence of the TGMD’s and TGMD-2’s validity and reliability is reported in the respective testing manuals (Ulrich, 1985, 2000). Past research has also reported test-retest reliability and internal consistency coefficients for locomotor skills of .88 and .85 and for object control skills of .93 and .88, respectively (Staples & Reid, 2010). Normative information regarding reliability for the TGMD-3 has not yet been reported in the literature, but the estimation of the internal consistency for locomotor and ball skills from this study were \( \alpha = .93 \) and \( \alpha = .95 \), respectively.

The assessment involves performance of six locomotor skills and seven ball skills. The locomotor skills include running, galloping, hopping, skipping, horizontal jumping, and sliding. Ball skills include a two-handed strike of a stationary ball, forehand strike of a self-bounced ball, one-hand stationary dribble, two-hand catch, kicking a stationary ball, overhand throw, and underhand throw or toss. The TGMD-3 consists of two trials
for each skill included in the assessment. As stated as scoring notes in the TGMD-3 Examiner Record Form (Ulrich, in press), each motor skill is scored according to specified performance criteria on a dichotomous scale of 1 or 0. If the child performs the skill according to the criterion, the skill receives a 1, whereas if the child does not perform the skill according to the criterion, the skill receives a 0. The sums of the scores of the two trials for each skill are used to generate locomotor and ball subtest scores, which are then combined to determine an overall gross motor test score. Because standardized gross motor test percentile scores were not yet available at the end of this study, the raw total gross motor scores were used to provide a representation of overall motor ability. Additionally, the age range of the present study’s participants (3-17) was extended from the original TGMD-3 intended age range (3-10) due to the absence of norms and focus on video modeling effectiveness.

**Experimental Condition Materials**

For the video-modeling condition of the TGMD-3, all video footage was taped by a digital video camera (JVC GZ-HM300 HD Everio Camcorder) and edited with iMovie (Apple, Inc.). Each skill included in the TGMD-3 was recorded from the perspective of a child watching the skill being performed. The primary investigator acted as the video model for all videos made. The selection of the primary investigator as the only adult model is based on literature that suggests models of all types have produced positive results (McCoy & Hermarisen, 2007; Shukla-Mehta, Miller, & Callahan, 2010), as well as feasibility and the investigator’s ability to successfully demonstrate the tasks. Two experts on TGMD-3 motor skill development performance criteria observed the primary investigator’s modeled performance and agreed the demonstrated skills were appropriate.
The resulting videotapes were then edited and compiled into quality, concise video demonstrations of each skill included in the TGMD-3. The videos consisted of 4 parts including (a) an appearance of the word(s) of the selected TGMD-3 skill, (b) a brief clip of the investigator stating the name and short description of the skill she was about to perform, (c) the video representation of the skill by the investigator, and (d) an appearance and voice overlay of the statement “Now you try!” Figure 1 demonstrates an example of one TGMD-3 skill and provides still photos of the four video components. The total duration of each video recording was approximately 17 seconds (mean = 17.08 seconds, range = 15 seconds – 22 seconds). An Apple iPad Air was used to deliver the video modeling presentations to the participants.

![Figure 1](image-url)

*Figure 1*—The above video stills represent the order (left to right) of video components presented to participants for each TGMD-3 skill.

**Procedure**

The TGMD-3 was administered twice—once using the traditional protocol and once using the video modeling protocol—to each participant. Depending on how each participant was recruited, the assessments took place at the child’s school or a location on the university campus (e.g. gym setting). All participants recruited from their schools completed the assessments at their school during or immediately after school hours. The two assessments were administered on separate days within approximately 7 days.
(median = 7 days, range = 5 days – 14 days, mean = 8.07 days, standard deviation = 2.61) of each other at similar times of the day. The order of the tests was counterbalanced for each participant in order to reduce potential testing effects. All of the TGMD-3 assessments were videotaped in order for TGMD-3 performance and total assessment time to be coded later on.

During the traditional TGMD-3 protocol condition, the test was presented to the participant using standardized assessment procedures described in the TGMD-3 Examiner Record Form (Ulrich, in press). The primary investigator gave verbal instructions and a physical demonstration of each skill. A second demonstration of the skill was given only if the child did not appear to understand the task or indicated that he or she needed to see the skill again. The same TGMD-3 assessment protocol was used for the video modeling condition, although video demonstrations were provided on the iPad as opposed to live demonstrations. The appropriate, corresponding video was shown to the participant via the iPad before he or she performed each skill. The same video was shown a second time only if the participant did not appear to understand the task or indicated that he or she needed to see the video again. Immediately after the second assessment, the child was asked which condition (live or video modeling) he or she preferred over the other and why.

Data Reduction

Two research assistants were trained to evaluate the test criteria by watching videotaped TGMD-3 performances of adults and children with and without disabilities. After each research assistant completed training with 12 practice videos over the span of 5 weeks, interrater reliability was tested. Raters who were in agreement greater than 80%
agreement were used in this study. Interrater reliability was periodically tested throughout the study in order to minimize any drift. Interrater reliability ranged from 84% to 92% during the study.

Raters were blind to the condition of the TGMD-3 performances they observed in order to prevent rater bias. Upon completion of each child’s participation in the study, the investigator edited each child’s two videotaped performances in a way that prevented raters from determining which condition was displayed. For example, each video clip started immediately before and ended directly after the skill was performed, and the investigator and iPad were never present in the videos. Because the video performances of each condition were edited to appear the same way, the research assistants did not have expectations as to which condition they were observing to prevent bias towards one particular video. In addition, each participant’s two videotaped performances were presented to the raters in a randomized order.

Data Analysis

Two separate one-way repeated-measures ANOVAs were performed for gross motor scores under the traditional and video modeling protocol conditions for both children with and without ASD. Total testing duration of the traditional and video modeling conditions was also examined among children with and without ASD using two one-way repeated-measures ANOVAs. In order to investigate the effects of condition preference on gross motor scores for both groups, two separate 2x3 (condition by preference) repeated measures ANOVAs were also conducted. Effects of the testing conditions were tested at a significance level of 0.05.
Chapter IV. Results

The TGMD-3 total gross motor scores for the traditional (live) and video modeling conditions among children with ASD were 70.46 ± 18.81 and 72.00 ± 17.68, respectively. Although the video modeling condition produced scores approximately 2 points higher than the live condition, the results of inferential statistics indicated no significant differences of total gross motor scores between the two conditions, $F(1, 12) = .90, \eta^2 = .07, p > .05$. It was also hypothesized that video modeling would produce higher gross motor scores than the traditional protocol for children without disabilities. However, a repeated measures ANOVA revealed no statistical differences of scores between conditions among children without ASD, $F(1, 14) = 2.9, \eta^2 = .17, p > .05$. The total gross motor scores for traditional and video modeling conditions among children without disabilities were respectively 72.33 ± 18.19 and 70.27 ± 17.52. These findings suggest that although scores decreased approximately 2 points with video modeling conditions, video modeling did not produce significant differences in TGMD-3 gross total motor scores. Table 2 provides the total gross motor score means and standard deviations across TGMD-3 conditions for both groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>TGMD-3 Condition</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Live</td>
<td>Mean</td>
<td>SD</td>
<td>Video Modeling</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>ASD</td>
<td>70.46</td>
<td>18.81</td>
<td>72.00</td>
<td>17.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>72.33</td>
<td>18.19</td>
<td>70.27</td>
<td>17.52</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Mean = average gross motor scores; SD = standard deviation

Total assessment duration between TGMD-3 conditions for both groups was also analyzed. Among children with ASD, total assessment time in minutes for the traditional
and video modeling conditions were respectively 15.89 ± 4.04 and 18.92 ± 5.13. A repeated measures ANOVA revealed significant differences among children with ASD, $F(1, 12) = 15.87, \eta^2 = .57, p < .01$. For children without ASD, total assessment time in minutes for live and video modeling conditions were 12.60 ± 2.22 and 14.71 ± 2.63, respectively. A repeated measures ANOVA revealed significant differences on total time between conditions among children without disabilities as well, $F(1, 14) = 22.86, \eta^2 = .62, p < .001$. These findings suggest that it takes significantly longer time to complete the video modeling condition of the TGMD-3 than the traditional protocol for both children with and without ASD. Tables 3 and 4 depict the means, standard deviations and ANOVA results for the differences in total assessment time across conditions for children with and without ASD, respectively.

### Table 3. Repeated Measures ANOVA for Total Assessment Time by Condition for Children with ASD

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>df</th>
<th>$F$</th>
<th>$\eta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASD-Live</td>
<td>15.89*</td>
<td>4.04</td>
<td>1</td>
<td>15.87</td>
<td>.569</td>
</tr>
<tr>
<td>ASD-VM</td>
<td>18.92*</td>
<td>5.13</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. Live = Traditional protocol; VM = Video modeling; * Significance of p<.01

### Table 4. Repeated Measures ANOVA for Total Assessment Time by Condition for Children without Disabilities

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>df</th>
<th>$F$</th>
<th>$\eta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control-Live</td>
<td>12.59**</td>
<td>2.22</td>
<td>1</td>
<td>22.85</td>
<td>.620</td>
</tr>
<tr>
<td>Control-VM</td>
<td>14.71**</td>
<td>2.63</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. Live = Traditional protocol; VM = Video modeling; ** Significance of p<.001

Analyses were also conducted examining the effects of condition preferences on gross motor scores. Descriptive statistics of responses indicated an equal amount of participants with ASD (5) preferred one condition to the other, and three participants had
no preference or did not respond. A 2 x 3 (condition by preference) repeated measures ANOVA indicated there was no statistically significant interaction on TGMD-3 scores between condition and preference among children with ASD, $F(2, 10) = 1.81, \eta^2 = .27, p > .05$, although small differences in mean scores by preference were seen. Additionally, main effects for condition [$F(1, 10) = 2.02, \eta^2 = .17, p > .05$] and preference [$F(2, 10) = 1.78, \eta^2 = .26, p > .05$] on gross motor scores were not statistically significant. Among participants with ASD who preferred the live condition, total gross motor scores for the live and video modeling conditions were 80.40 ± 6.39 and 79.60 ± 9.21, respectively. For those who preferred video modeling, total gross motor scores for live and video modeling conditions were 70.80 ± 7.53 and 71.60 ± 11.37, respectively. Among children who had an alternative preference (e.g. no preference or not able to respond), total gross motor scores for live and video modeling conditions were 53.33 ± 35.22 and 60.00 ± 32.97, respectively, with video modeling producing higher scores. Among children without ASD, descriptive statistics showed that 10 children preferred live over video modeling, 2 children preferred video modeling over live, and 3 children felt mutual toward the assessment condition. A 2 x 3 (condition by preference) repeated measures ANOVA was conducted examining the differences in means of TGMD-3 scores given condition preference among children without ASD and found no significant differences, $F(2, 12) = .70, \eta^2 = .11, p > .05$. Additionally, main effects for condition [$F(1, 12) = .43, \eta^2 = .04, p > .05$] and preference [$F(2, 12) = 1.24, \eta^2 = .17, p > .05$] were not found to be statistically significant. Total gross motor scores for live and video modeling conditions were 71.50 ± 18.90 and 68.60 ± 18.11, respectively, among children without ASD who preferred the live condition. Among those who preferred the video modeling condition, total gross
motor scores for live and video modeling conditions were $58.50 \pm 21.92$ and $60.00 \pm 24.04$, respectively. For the three participants who had a mutual preference for conditions, total gross motor scores for live and video modeling conditions respectively were $84.33 \pm 7.64$ and $82.67 \pm 5.86$. Although TGMD-3 mean scores were higher during the preferred condition for both children with and without ASD, these findings indicate that condition preference does not produce significant differences in total gross motor scores between conditions. Table 5 summarizes the differences in mean gross motor scores given condition preference by group.

| Table 5. Differences in Gross Motor Scores given Condition Preference by Group |
|----------------------------------|-----------------|-----------------|-----------------|-----------------|
|                                  | TGMD-3 Scores by Condition |                 |
|                                  | Live     | SD     | Video Modeling | SD     |
| Group                            | Preference | Mean   |              | Mean   | SD     |
| ASD                              | Live      | 80.40  | 6.39          | 79.60  | 9.21   |
|                                  | VM        | 70.80  | 7.53          | 71.60  | 11.37  |
|                                  | Other     | 53.33  | 35.22         | 60.00  | 32.97  |
| Control                          | Live      | 71.50  | 18.90         | 68.60  | 18.11  |
|                                  | VM        | 58.50  | 21.92         | 60.00  | 24.04  |
|                                  | Other     | 72.33  | 18.19         | 70.27  | 17.52  |

Note. Preference = Protocol condition preferred by participants of each group; VM = Video Modeling
Chapter V. Discussion

The main purpose of this study was to examine the effectiveness of video modeling on TGMD-3 performance for both children with and without ASD. The first hypothesis was that the video modeling condition of the TGMD-3 would produce higher total gross motor scores than the traditional protocol. Although slight changes were observed, the differences in TGMD-3 scores for children with ASD were not statistically significant. Therefore, the increase in total gross motor scores following the video modeling condition cannot be generalized to the ASD population.

The video modeling condition could have produced nonsignificant results for a number of reasons. First, it is possible that the present study’s specific video modeling strategies were not effective and/or did not provide participants with ASD with enough information. Although recommendations for creating video modeling interventions from past studies were used in the making of the present study’s videos (Bellini & Akullian, 2007; Ganz, Earles-Vollrath, & Cook, 2011; McCoy & Hermarisen, 2007; Shukla-Mehta, Miller, & Callahan, 2010; Wilson, 2013), small differences within the research fields, duration of videos, or overall presentation may have caused interventions to be less effective within motor assessment settings. For example, previous studies have suggested video clip lengths of 3-5 minutes and multiple viewings and/or sessions for social, behavioral, communicative and play skills (Bellini & Akullian, 2007; Shukla-Mehta et al., 2010), with effective interventions using videos as short as 30 seconds (Bellini & Akullian, 2007). However, the present study’s videos were 17.08 seconds on average, and were shown to the participants a maximum of two times as specified in the TGMD-3 Examiner Record Form (Ulrich, In press). Past research (e.g. Cardon & Azuma, 2012)
that has indicated children with ASD visually attend to video presentations significantly longer than live presentations used videos 107 seconds in length—approximately 90 seconds longer than the present study’s videos—suggesting short videos may not be long enough to interest children with ASD and/or provide them with adequate information. It is also possible that video modeling was not appropriate for the specific participants within this sample. Previous literature has indicated that evaluating visual processing and comprehension skills may be necessary in order to determine the type of content included in video modeling strategies (Shukla-Mehta et al., 2010), and that individual assessment may be helpful when considering the effectiveness of interventions with particular students (Dowrick, 1991).

To the best of the author’s knowledge, this study is the first study in which both raters were blind to the conditions utilized for each motor performance. Two research assistants were blind to the condition of each TGMD-3 performance and therefore had no bias towards one condition while coding performances. Previous studies involving video modeling and/or other visual supports within physical activity or motor development settings have not included blind coders (Breslin & Rudisill, 2011; Cannella-Malone, Mizrachi, Sabelny, & Jimenez, 2013; Liu & Breslin, 2013), and therefore were not able to fully eliminate bias towards video modeling procedures or protocols using other visual supports. The differences in total gross motor scores found between the live and video modeling conditions were not found to be statistically significant. However, based on the present study’s results, the researchers are not certain whether video modeling is not significantly effective due to the specific video modeling procedures used in this study, previous studies’ potential bias towards video modeling and visual support conditions, or
other variables (e.g. personal characteristics, exposure to video modeling, ASD severity, etc.) that need to be explored. Future research utilizing video modeling within motor assessments should consider blinding raters to the present condition used with each motor performance in order to obtain accurate, unbiased representations of the effectiveness of video modeling. It is vital that video modeling is portrayed accurately within motor assessment literature, whether effective or ineffective, so that children with and without disabilities and involved professionals are able to make informed decisions about video modeling (e.g. time, cost, potential advantages) and benefit as much as possible from these strategies.

This study also aimed to examine the effectiveness of video modeling on total TGMD-3 assessment time compared to the traditional protocol. Contrary to our hypothesis, the video modeling condition of the TGMD-3 lasted significantly longer (2-3 minutes) than the traditional protocol for both groups. These findings contradict past recommendations in support of video modeling strategies as a result of increased time-efficiency (Bellini & Akullian, 2007; Charlop-Christy, Le, & Freeman, 2000).

The location of the iPad and technological nature of video modeling could explain the time differences between the two conditions. In order to maintain rater blindness to the performance condition, the investigator occasionally had to ask the participant to wait to attempt the skill until she was able to quickly move out of the video frame or perform the skill one more time if she was blocking the view of the performance. Additionally, the process of picking up and accessing the iPad, finding and clicking the correct video file, and handing the iPad back to the investigator at the end of the video could have added time to the overall assessment duration. Oppositely, during the traditional
condition, participants were able to stand and observe the demonstration at the same location they were to begin the skill performance, and were permitted to start immediately after the live demonstration. Regardless, based on these findings, teachers and professionals working with children with ASD may be more inclined to use the traditional TGMD-3 condition given video-modeling conditions prolonged the assessment time as well as did not produce statistically significant improvements in test scores. However, a 2-3 minute difference in assessment time is not a large amount of time and its importance may be relative to each professional’s availability and/or child’s individual characteristics and preference. Furthermore, these findings offer support for those working with children without ASD to use traditional protocols instead of video modeling due to increased assessment duration and decreased total gross motor scores (even though not found to be significant).

The second purpose of this study was to examine the effects of condition preferences on total gross motor scores for children with and without ASD. Conditions were equally preferred (live = 5, video modeling = 5) among children with ASD, whereas the traditional protocol was more often preferred than video modeling among children without ASD (live = 10, video modeling = 2). Although differences in total motor scores between conditions according to preference were not found to be statistically significant, participants performed better on the condition they preferred. For example, mean scores indicate that those that preferred the traditional protocol performed better without the iPad and those who preferred the video modeling condition performed better with use of the iPad. Children without ASD who preferred the live condition to video modeling provided reasons related to increased clarity, less confusion and understanding the skill
better when able to see the skill in person. Some children made comments about their association of iPads with fun and video games as opposed to physical activity.

Participants with ASD gave a larger variety of reasoning for preference. Reasons given by participants with ASD as to why they preferred live demonstrations to video modeling included “I love technology and iPads, but I would rather do this without the iPad,” and “I liked it better because it was quicker.” One older student even explained that he knew he understood information better when presented through technology but “the skills were too easy” and he “already knew how to do them.” He noted that if the skills were harder and new to him, he would have preferred to learn them from the iPad. Participants who preferred the video modeling condition to the traditional protocol provided reasons such as love for and interest in technology and increased clarity due to the “visual” given from the iPad. One participant also explained that he preferred working with the iPad because he did not have to “bother” anyone else to use the iPad and was able to avoid others by working independently (Corbett & Abdullah, 2005). These results were not found to be statistically significant and therefore cannot be extended to all children with ASD. However, the evident changes in total gross motor scores according to preference may offer insight to future studies assessing condition preference as well as support the notion that the effectiveness of video modeling strategies may be individual (Dowrick, 1991; Shukla-Mehta et al., 2010) and based on other variables such as participant characteristics, functioning, and preference.

**Limitations**

In regards to the nonsignificant findings, certain limitations must be addressed. ASD severity, communication and visual processing skills were not assessed in this
study. It is possible that video modeling may be more effective for children with different levels of functioning than others (Dowrick, 1991; Shukla-Mehta et al., 2010). Due to the wide range of individuals in this sample, this information could have been useful to compare outcomes across different severities and levels of functioning. Additionally, this study’s sample of children with ASD was small (n = 13), all male, and did not include young children (ages 3-10). Future research within video modeling and motor skill performance should aim to include a larger, more diverse sample size as well as collect data regarding the specific functioning of participants in order to gain more insight on the effectiveness of video modeling among multiple populations.

**Future Research**

Although there is a variety of literature that provides recommendations for creating video modeling interventions in general, academic, social and behavioral fields of research (Ayres & Langone, 2005; Bellini & Akullian, 2007; Dowrick, 1991; Ganz et al., 2011; Shukla-Mehta et al., 2010; Wilson, 2013), there are currently no guidelines to creating effective, evidence-based video modeling strategies specifically in motor skill assessment settings. Because motor skill assessments are different than instructional and other behavioral assessment environments, differences in video modeling designs and protocols may be necessary. It is the recommendation of these authors that present and future studies examining video modeling within motor assessment and physical activity are thoroughly reviewed and offered in the literature. With research in this area rising, it may be useful for researchers to be aware of video modeling designs and procedures of other studies in order to compare and use for reference.
Additionally, based on one previous study indicating the effectiveness of video modeling on teaching physical activity skills to students with significant disabilities (Cannella-Malone et al., 2013) and anecdotal observations made by the primary investigator in this study, it is recommended that video modeling be further explored within instructional and teaching settings for motor skill performance, as opposed to standardized assessment protocols. Many comments made by participants with ASD suggested that using video modeling to promote learning new skills could be effective for them. For example, as stated previously, one participant who noted he had past experience and success with video modeling in the classroom indicated he would like to have learned how to do skills that were more challenging than the skills selected for this study. Another participant paid extra attention to how the skill was specifically carried out, such as imagining specific degrees of hip and knee flexion while running, and became frustrated when he was not able to complete the skill according to the way he visually imagined it. After he was shown the first skill on the iPad, he even asked, “Am I supposed to do it how I do it, or like that,” indicating that he knew he performed the skill differently than what was shown on the video and could differentiate between the two performances. In instructional settings where goals reflect learning and achieving the intended outcome, students may be able to better utilize their strengths in processing visual information to replicate the target skill with limitless views of videos and additional feedback from the instructor. On the other hand, standardized assessment protocols are less flexible and do not provide time to teach the correct skill criteria. The use of other supports such as error correction, prompts or verbal feedback could also replicate teaching environments by providing children feedback supplemental to video
modeling (Bellini & Akullian, 2007; Dowrick, 1991; Ganz et al., 2011; Keen, Brannigan, & Cuskelly, 2007; Shukla-Mehta et al., 2010).
Chapter VI. Conclusion

In summary, the specific effectiveness of video modeling on motor skill performance for children with and without ASD is inconclusive. Findings indicate that video modeling conditions result in significantly prolonged assessment time compared to the traditional TGMD-3 protocol. Based on the present study’s results, it is not clear whether video modeling is ineffective on motor skill performance among children with and without ASD, or if the specific strategies used were not appropriate. With video modeling research efforts increasing, especially within motor skill assessment and performance settings, there is a strong need for further exploration of the accurate effectiveness of video modeling strategies. Clear descriptions and reviews of effective video modeling designs, procedures and interventions should be provided in the literature.
Bibliography


Shukla-Mehta, S., Miller, T., & Callahan, K. J. (2010). Evaluating the effectiveness of video instruction on social and communication skills training for children with...


APPENDICES
Appendix A: Study Advertisement
Research Participants Needed!

Please contact Laynie Case at casela@onid.oregonstate.edu if interested in participating in this research study.

**Group 1:** Children aged 3-17 with autism spectrum disorder  
**Group 2:** Children aged 3-17 without a disability

**Purpose:** We want to examine the effects of video modeling via an iPad on motor performance scores among children with and without autism spectrum disorders.

**Procedure:** This study will require two meetings with an investigator. One meeting will involve the child engaging in various motor skills after a live, physical demonstration, and the other meeting will involve engaging in motor skills after viewing video demonstrations on an iPad.

Study Title: The Effects of Video Modeling on Test of Gross Motor Development-3  
Performance among Children with Developmental Disabilities  
Principal Investigator: Joonkoo Yun
Appendix B: Demographic Questionnaire
Demographic Questionnaire for Parents

Thank you for your interest in this project.

Your Name: _______________________
Your child’s name: ______________ Sex of child: _________________________
Age of child: _____________________ Child Birthdate: _____________________

Please complete the following questions to the best of your ability:

1. Has your child been officially diagnosed with an autism spectrum disorder (ASD)?
   - Yes
   - No

   If yes, by whom was he/she diagnosed? Please check the box or boxes that best describe who diagnosed your child with ASD?
   - Family Physician
   - School Professional (Psychologist, Social Worker, etc.)
   - Other: __________________

   What specific disorder was your child diagnosed with?
   - Autism
   - Asperger’s Syndrome
   - Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS)
   - Other: __________________

2. Is your child physically able to attempt motor skills (e.g. running, throwing a ball, etc.)?
   - Yes
   - No

3. Is your child physically able to view videos on an iPad?
   - Yes
   - No

4. Has your child ever used an iPad before?
   - Yes
   - No

   If yes, what activities does he or she use an iPad for? Please list below.
5. Is your child verbal?
   - Yes
   - No

6. Does your child have any diagnosed disabilities other than ASD?
   - Yes
   - No

   *If yes, what other disability or disabilities has your child been diagnosed with? Please list below.*

7. How did you and your child hear about this research study?
   - OSU IMPACT
   - OSU Kid Spirit
   - Your child’s school
   - Personal contacts
   - Other: _____________________
Appendix C: Consent and Assent Forms
CONSENT FORM FOR PARENTS

Project Title: The Effects of Video Modeling on Test of Gross Motor Development-3 Performance among Children with Autism Spectrum Disorders
Principal Investigator: Joonkoo Yun
Student Researcher(s): Layne Case, William Eason
Co-Investigator(s): N/A
Sponsor: Internal Funding
Version Date: November 20, 2014

1. WHAT IS THE PURPOSE OF THIS FORM?

This form contains information you will need to help you decide whether to be in this research study or not. Please read the form carefully and ask the study team member(s) questions about anything that is not clear.

2. WHY IS THIS RESEARCH STUDY BEING DONE?

The purpose of this research study is to examine the effects of video modeling on the assessment of motor performance among children with and without autism spectrum disorder. Specifically, we aim to compare gross motor development quotients following a video modeling condition versus the traditional protocol of the Test of Gross Motor Development-3 (TGMD-3) for children. It is hypothesized that results will indicate that a video modeling condition will produce significantly higher gross motor quotient scores on the TGMD-3 than the traditional protocol. The results of the study are intended for degree completion of the student researcher, presentation at a professional meeting, and publication in a research journal. Up to 50 children may be invited to take part in this study.

3. WHY IS MY CHILD BEING INVITED TO TAKE PART IN THIS STUDY?

Your child is being invited to take part in this study because he or she is between the ages of 3 and 17.

4. WHAT WILL HAPPEN IF MY CHILD TAKES PART IN THIS RESEARCH STUDY?

Your child will ask to perform various motor skills such as running, skipping, hopping, throwing, catching, and kicking a ball on two separate occasions in order to examine in the two different conditions (traditional and video modeling). The traditional TGMD-3 protocol condition will include a live demonstration of each skill by a researcher. The video modeling condition will
include physical demonstrations of each skill shown by video on an Apple iPad. A researcher will assess the motor performance of each child.

Each test will take approximately 30 minutes. During the first scheduled meeting, your child will engage in the first condition of the TGMD-3. Approximately one week later, your child will ask to perform the same motor skills for the second condition. The testing will take place at Oregon State University, your child’s school, or a mutually agreed upon location.

**Video Recordings:** your child motor performance will be videotaped. Videotapes will later be used in order for the investigator to evaluate the motor development of each child. If you or your child is not comfortable with being videotaped, you may not enroll your child in the study.

**Storage and Future use of data:** Videotapes and data will be stored indefinitely in the research lab in the chance they will be beneficial for future research. All data will be securely stored in file cabinets or password-protected data files in the lab. Because it is not possible for us to know what studies may be a part of our future work, we ask that you give permission now for us to use your personal information without being contacted about each future study. These future studies will be about children with autism spectrum disorder, video modeling and/or motor skills. If you agree now to future use of your personal information, but decide in the future that you would like to have your personal information removed from the research database, please contact Joonkoo Yun at jk.yun@oregonstate.edu.

______ You may store my information for use in future studies.
*Initials*

______ You may not store my information for use in future studies.
*Initials*

We may contact you in the future for another similar study. You may ask us to stop contacting you at any time. Study results regarding the effectiveness of video modeling will be shared upon request with subjects and parents/guardians by email.

5. **WHAT ARE THE RISKS AND POSSIBLE DISCOMFORTS OF THIS STUDY?**

No more than minimal risk is expected. It is possible for participants to injure themselves (scratches, bruises, etc.) while engaging in the selected motor tasks involved in the TGMD-3 assessments. For example, a child may become injured if he/she trips and falls while demonstrated his/her ability to run. In order to minimize risk of injury, we will make sure the testing area is clean and there are no physical obstacles in the way of your child. If necessary, participants will be given breaks during study activities. In the chance that a participant is injured, the injury will be documented and first aid care will be provided if necessary. There will be no additional risks to pregnant women and/or fetuses.

6. **WHAT HAPPENS IF MY CHILD IS INJURED?**
Oregon State University has no program to pay for research-related injuries. If you think that your child has been injured as a result of being in this study, please directly contact the study personnel.

7. WHAT ARE THE BENEFITS OF THIS STUDY?

This study is not designed to benefit your child directly. However, positive findings and knowledge resulting from this study will potentially more accurate motor development assessment of children with and without autism spectrum disorder. For parents that perceive the study results as benefits, their child’s results will be provided upon request.

8. WILL MY CHILD BE PAID FOR BEING IN THIS STUDY?

You or your child will not be paid for being in this research study; however your child will get to select a small gift for participating. If you are visiting OSU campus for testing session, parking permits will be provided upon arrival to the university.

9. WHO IS PAYING FOR THIS STUDY?

The School of Biological and Population Health Sciences at Oregon State University will be partially funding this research.

10. WHO WILL SEE THE INFORMATION MY CHILD GIVES?

The information you provide during this research study will be kept confidential to the extent permitted by law. Research records will be stored securely and only researchers will have access to the records. Federal regulatory agencies and the Oregon State University Institutional Review Board (a committee that reviews and approves research studies) may inspect and copy records pertaining to this research. Some of these records could contain information that personally identifies you.

If the results of this project are published your child’s identity will not be made public.

Only the student researchers and primary investigator will have access to the videotapes of each participant’s TGMD-3 performance. They will only be viewed to evaluate motor performance.

In order to ensure confidentiality, we will de-identify participant names by using identification code numbers on data forms instead of names, secure videotapes inside filing cabinets and use password-protected computer data files.
Under Oregon law, researchers are required to report to the appropriate authorities any information concerning child abuse or neglect. The researchers may also report threats of harm to self or to others.

11. WHAT OTHER CHOICES DOES MY CHILD HAVE IF MY CHILD DOES NOT TAKE PART IN THIS STUDY?

Participation in this study is voluntary. If you decide to participate, you are free to withdraw at any time without penalty. Your child will not be treated differently if you decide to stop taking part in the study. If you choose to withdraw from this project before it ends, the researchers may keep information collected about you and this information may be included in study reports.

If your child participates in IMPACT or Kid Spirit, participating or declining to participate in this study will in no way impact the child’s involvement in those programs.

**Participation terminated by investigator:** Subject participation may be terminated by the investigators without regard to the subject’s consent if a) the subject is absent during any of the two study visits and/or is unwilling to reschedule, b) the subject does not follow instructions for study activities, or c) the subject engages in disruptive behaviors that does not allow him or her to complete participation.

12. WHO DO I CONTACT IF MY CHILD OR I HAVE QUESTIONS?

If you have any questions about this research project, please contact: Dr. Joonkoo Yun at (541) 737-8584 or by email at jk.yun@oregonstate.edu.

If you have questions about your rights or welfare as a participant, please contact the Oregon State University Institutional Review Board (IRB) Office, at (541) 737-8008 or by email at IRB@oregonstate.edu

13. ASSENT STATEMENT

This research study has been explained to my child in my presence in language my child can understand. He/she has been encouraged to ask questions about the study now and at any time in the future.

14. WHAT DOES MY SIGNATURE ON THIS CONSENT FORM MEAN?

Your signature indicates that this study has been explained to you, that your questions have been answered, that your child agrees to take part in this study, and that you are willing to provide the name of the child participant. You will receive a copy of this form.

**Do not sign after the expiration date:** 11/19/2015

| OSLI IRB | Study # 6450 | Expiration Date: 11/19/2015 |
Participant’s Name (printed): ______________________________________________________

Parent’s Name (printed): ______________________________________________________

(Parent/Guardian/ Legally Authorized Representative) ____________________________________________ (Date) ____________

(Signature of Person Obtaining Consent) ____________________________________________ (Date) ____________
ORAL ASSENT FORM

Project Title: The Effects of Video Modeling on Test of Gross Motor Development-3 Performance among Children with Developmental Disabilities
Principal Investigator: Joonkoo Yun
Student Researcher(s): Layne Case, Billy Eason, Emmalee Cron
Co-Investigator(s): N/A
Sponsor: Internal funding

“Hello, my name is Layne.
What is your name?”
<wait for response> If the child is not able to respond, we assume the child does not understand and we will stop.

“I am a graduate student at Oregon State University and I am doing a study to learn how watching videos of activities will help children like you perform those activities.
If you decide to help me with my study, you would do things like watch an iPad, run, skip, and throw a ball.
If you say yes but then decide that you don’t want to do this, you can tell me that you want to stop at any time. You won’t get in any trouble for stopping.
“Do you have any questions?”
<Wait for responses>

Would you like to help me?”
<Wait for responses>
<If no, we will not collect data>
<If yes, the following will be completed>

Participant’s Name (printed): ____________________________________________________________
Name of Witness ___________________________ (Name) (Date)
Witness Signature ___________________________ (Date)
(Signature of Person Obtaining Assent) ___________________________ (Date)
We are asking you whether you want to be in a research study. Research is a way to test new ideas and learn new things. You do not have to be in the study if you do not want to. You can say Yes or No. If you say yes now, you can change your mind later.

Ask questions if there is something that you do not understand. After all of your questions have been answered, you can decide if you want to be in this study or not.

This study is about using video modeling with motor assessments with children like you. Video modeling means watching videos of someone else on an iPad.

We are asking you if you want to be in this study because you are between the ages of 3 and 17.

If you take part in this study, we will ask you to come to this lab two different times to participate in physical activity with us. You will be asked to participate in skills such as running, skipping, jumping, throwing a ball, and kicking a ball. During one of the days, you will get to watch the activities on an iPad, and then try to copy what the videos show you.

Something that might happen to you if you are in this study is you may fall down while running or jumping.

Some good things that might happen to you if you are in this study is that you will have higher motor scores after watching skills on an iPad. This might mean that you will be successful after watching other skills on an iPad. We are not sure that these things will happen. We might also find out things that will help other children some day.

We will write a report when the study is over, but we will not use your name in the report.

If you want to be in the study, sign your name on the line below.

Participant’s Name (printed): ____________________________________________

(Signature of Participant) ___________________________ (Date) ___________________________

(Signature of Person Obtaining Assent) ___________________________

OSU IRB Study # 6450 Expiration Date: 11/19/2015
Appendix D: IRB Notice of Approval
<table>
<thead>
<tr>
<th>Date of Notification</th>
<th>04/06/2015</th>
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<tr>
<td>Study ID</td>
<td>6450</td>
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<tr>
<td>Study Title</td>
<td>The Effects of Video Modeling on TGMD-3 Performance among Children with Developmental Disabilities</td>
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<tr>
<td>Principal Investigator</td>
<td>Joonkoo Yun</td>
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<td>Study Team Members</td>
<td>Layne Caswe, Emmalee Cron, Billy Eason, Zoanne McAllister, Karlee Nordstrom</td>
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The above referenced study was reviewed and approved by the OSU Institutional Review Board (IRB).

**EXPIRATION DATE:** 11/19/2015

Annual continuing review applications are due at least 30 days prior to expiration date

Documents included in this review:

- Protocol
- Consent forms
- Assent forms
- Alternative consent
- Letters of support
- Recruiting tools
- Test instruments
- External IRB approvals
- Translated documents
- Attachment A: Radiation
- Attachment B: Human materials
- Other: Grant/contract

Comments: Recruitment sites added and changes to the study team. Assent forms revised to reflect current study team.

Principal Investigator responsibilities for fulfilling the requirements of approval:

- All study team members should be kept informed of the status of the research.
- Any changes to the research must be submitted to the IRB for review and approval prior to the activation of the changes. **This includes, but is not limited to, increasing the number of subjects to be enrolled.**
- Reports of unanticipated problems involving risks to participants or others must be submitted to the IRB within three calendar days.
- Only consent forms with a valid approval stamp may be presented to participants.
- Submit a continuing review application or final report to the IRB for review at least four weeks prior to the expiration date. Failure to submit a continuing review application prior to the expiration date will result in termination of the research, discontinuation of enrolled participants, and the submission of a new application to the IRB.