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The Effectiveness of Using Video Modeling Techniques to Improve Motor Skills for Preschool Children with Autism Spectrum Disorders

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The Effectiveness of Using Video Modeling Techniques to Improve Motor Skills for Preschool Children with Autism Spectrum Disorders

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by

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Abstract

Beside the main syndromes of socialization and communication for individuals with autism spectrum disorders, they also have impairments in motor skills, such as ball skills (catching and throwing) and postural stability (standing and walking balance). The main objective of this dissertation is to improve motor skills for preschooler children with ASD through use of video-modeling techniques. A secondary objective of this research was to find a correlation between the development and improvement of ball skills and balance tasks. Twenty-six children with ASD from 3-5 years old participated in two groups: one using video-modeling and another using live-demonstrations as early interventions. Four independent variables of motor skills were used in this study, including catching, throwing, standing and walking balance, throughout 10 sessions. Each session included four blocks with which to practice each motor skill in about 60 minutes. The results of this study indicated that there were positive improvements for the video-modeling group in the performance of ball skills (catching and throwing) and balance tasks (standing and walking) with significant correlation between the development of ball skills and balance tasks. The findings of this study contribute to knowledge regarding the development of motor skills for children with ASD, and they provides caregivers who are working with children, such as physical education teachers, therapists, and parents, video modeling as a teaching strategy to enhance the motor skills as an early intervention.

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CHAPTER 1

Introduction

The impairments of motor skills, significantly associated with autism spectrum disorders (ASD), are evident from early stages of infancy, and they cause problems in sequencing movement for crawling and walking. These motor deficits have also been observed in older children with ASD with difficulties developing basic motor skills, including motor control, poor coordination, clumsy gait, slow response, and low tone. Furthermore, the symptoms of ASD have usually afforded significant insight into the developmental problems of brain (Dziuk et al., 2007). Other related abnormalities of socialization and communication for individuals with ASD can negatively impact other daily routines, including in movement or engagement with others. Pan et al., (2009) found that the deficit of social skills in ASD children could also lead to worsening performance in physical activities, motivation, and social skills. As a result, these deficits of social, communication, and motor skills differ from one person to another according to the wide range of symptoms, levels (mild, moderate, and severe), and deficiencies in skills that can happen in the individual with ASD (Graham et al., 2014; Hilton et al., 2007).

Recent work has concentrated on explaining the movement impairments of children with ASD, including postural instability, clumsiness, with poor upper and lower limb coordination. This deficiency of movement may have a direct effect on motor learning processes while trying to acquire new motor skills. For example, motor deficiency could significantly limit opportunities for engagement in sports, games, and essential activities in daily life. As a result, these noticeable impairments of fine and gross motor skills could lead children with ASD to avoid practicing regular sports as their healthy peers do, and can also lead to social isolation, unless they find appropriate care from physical education teachers or clinical therapists who may develop their motor skills (Colebourn el al.,2016)

In fact, there has been a sharp increase in the number of individuals diagnosed with ASD. According to Autism Speaks' *Leading the Way: Autism-Friendly Youth Organization Guide*, it would not be surprising to discover in the near future that ASD has become the most-diagnosed disorder in children, more than other serious diseases such as cancer, AIDS, and diabetes (2013). Furthermore, due to the increasing number of children diagnosed with ASD, apparent deficits of motor skills should be taken into consideration because of their negative impact on other associated issues in ASD, such as socialization and communication impairments frequently caused by a deficiency in basic physical skills. For example, Findlay and Coplan (2008) stated that taking an active approach to engagement in group sports, games, and physical activities for ASD children helps to improve these impairments in socialization and communication. However, more investigation and understanding of motor skill impairments in ASD children will provide a clearer picture of the cause of these impairments and the treatments that may limit their frequency and adverse effects.

ASD is often considered one of the most prevalent disorders of the modern era in the U.S. due to the increase in diagnoses over recent years. Christensen et al., (2016) indicated that approximately one in 68 children has been identified as having ASD. The growing number of children diagnosed with ASD has caused fear in general society because of the many negative effects on health and social and physical skills. One of the most common impairments for children with ASD is successful social interaction. Many deficits in interaction and communication with others are features of the impairments that can affect children's engagement in social games, activities, and relationships with other individuals. As a result, these deficiencies in social skills contribute significantly to psychological issues such as social anxiety, depression, and isolation.

One of the most important health issues that affect children with ASD is being overweight. Being overweight for children with autism may relate to the lack of engagement or involvement in social and physical activities due to their deficiencies in social and motor skills. Phillips et al., (2014) reported that children with autism are twice as likely to be overweight when compared with other healthy peers. Beside the lack of participation in social and physical activities, other contributing factors to weight issues could be medications and selective v eating habits. In consequence, being overweight is just a stepping stone that leads to other health problems such as diabetes, blood pressure, and high cholesterol. However, improving the motor skills of children with autism may help avoid the health risks exacerbated by the lack of participation in physical activities.

In summary, researchers have emphasized that ASD is characterized by having great challenges and difficulties in the performance of motor skills and repetitive behaviors (American Psychiatric Association, 2000; Diagnostic and Statistical Manual of Mental Disorders, 4th ed., text revision). The impairments of motor skills in children with ASD can be observed at an early age and tend to be barriers that naturally limit their physical abilities to practice sports. Children with ASD often have overall impairments in motor skills that include fine and gross motor skills such as tying shoes, writing, riding a bike, or catching a ball. Many studies have indicated that children with ASD struggle to perform motor skills, and they tend to have overall motor impairments according to the nature of ASD symptoms (Ament et al., 2009; Green et al., 2002; Pan et al., 2009). As a result, the association between ASD and overall motor skills impairments can cause significant challenges for children not only in performance of complex tasks but even in basic motor skills.

Furthermore, there are significant motor impairments that negatively affect children with ASD including motor development and postural stability. First, the impairments of motor development have been emphasized through much research about children with ASD and their significant challenges in performing basic motor skills (Ament et al., 2009; Green et al., 2009; Pan et al., 2009). For example, children with ASD are more likely to have motor delays or impairments in the execution of manual dexterity and ball skills (throwing and catching objects such as balls). Poor stability could also cause a delay in the performance of motor skills (Dowell et al., 2009; Dziuk et al., 2007; Graham et al., 2014; Hilton et al., 2007). Postural stability includes dynamic and static balance skills that can affect most motor movements.

A few investigations into the impairments of motor development and postural stability have been conducted on children with ASD. These investigations have concluded that ball and balance skills are the most frequent deficiencies that can be easily observed by individuals who are working with such children, such as physical education teachers or clinical therapists (Dowell et al, 2009; Hilton et al, 2007). The most common dependent variables tested in most of these studies on children with ASD were ball skills and balance. Furthermore, the impairments of motor development and postural stability, particularly in the ball and balance skills such as catch, throw, static and dynamic balance, were the most frequent dependent variables that have been tested to emphasize the degree of this deficit in ASD.

Interestingly, when analyzing the ball skills for children with ASD, the reasons for their impairment in most motor skills such as catching or throwing ability are typically seen as easy to perceive. Children with ASD have abnormalities in their internal model of perception or visualization, which is responsible for adapting movement of motor skills and mirroring others. Also, Whyatt & Craig (2011) emphasized that, due to poor perception skills, individuals with

ASD have problems with motor tasks that require anticipatory control, such as catching oncoming balls. However, the most glaring weakness in spatial and temporal control for individuals with ASD in ball skills in general is in balancing. As balance is considered a critical element in developing ball skills patterns, worse balance means worse ball-skills performance.

Balance is an essential skill for individuals with ASD that should be mastered due to its importance in performing more complex skills. However, children with autism have significant challenges in both static and dynamic balance tasks. For example, Graham et al. (2014) found that when comparing children with ASD to other healthy peers, children with ASD have a greater difficulty in performing single-leg stands, and they tend to lose their balance earlier. Furthermore, Steindl et al. (2006) suggest that to maintain the equilibrium of standing balance, multiple sensory systems such as proprioceptive, visual, and vestibular should be successfully synthesized to enhance balance. Balance is considered a necessary element of ball skills; the improvement of balance may positively enhance the perfection of ball skills and vice versa.

In conclusion, due to the significant impairment of visualization in the brain during the performance of motor skills, children with ASD tend to require more visual supports in processing information through performance of sport skills than external feedback from their surrounding environment. As a result, video modeling may be an element in treatment, enhancing visualization and giving an initial picture of the skills useful for the improvement of ball and balance tasks.

Video modeling as a visual support strategy has been used for individuals with ASD to treat and improve social and communication skills (Charlop & Milstein, 1989; Charlop & Walsh, 1986). Unfortunately, the use of video modeling to improve sports skills and physical activities for children with autism has been limited (Kunzi, 2015). Only one directed study used video-modeling methods to examine fine and gross motor skills for children with ASD in comparison with children who have a moderate intellectual disability. The result showed significant improvements of fine and gross skills for children with ASD after applying video modeling methods. Intervention or programs of video modeling may be an effective strategy for improving individual skills because children with ASD prefer a particular selectivity stimulus better than an over-selectivity stimulus. The active engagement of video modeling is considered a psychologically-beneficial method for children with known disorders because a self-healing process often comes with self-acceptance. In fact, the use of video-modeling techniques is promising in its use in therapy among children with various disorders, including autism.

Purpose of the study

The purpose of the present study was to examine the efficacy of using video-modeling approaches to improve the catching, throwing, standing and walking balance tasks in children with ASD.

Hypotheses

The following are the hypotheses driven by the primary research problems in this study:

1. The use of a video-modeling technique would improve ball skills (catching and throwing) for children with ASD more than children with ASD who are shown a live demonstration.
2. The use of a video-modeling technique would improve balance skills (static and dynamic) for children with ASD more than children with ASD who are shown a live demonstration.
3. There would be a significant correlation between the development of ball skills and balance skills.

Definition of Terms

Balance: The requirement to stay in control of body movement or stay in an upright position. Two types of balance are: static and dynamic.

Catch skill: The ability of the body to control an object like a ball, depending on the individual's ability to follow the ball with the eyes.

Motor skills: The production of movement by a full engagement of complex muscles and nerves. Motor terms include "fine" and "gross" motor skills.

Performance: The execution of an action. For example, it is widely used on the sports field in relation to the completion of basic and complex motor skills.

Physical activities: Bodily actions that require working with muscles, such as running, dancing, and swimming.

Video Modeling: A technique used to teach desired behaviors by having participants first watch a video that demonstrates a target behavior, then imitating the behavior.

Delimitations

1. The study was delimited to preschool children with ASD from 3-5 years old.
2. The independent variables used in this study were ball skills (catching and throwing) and balance tasks (standing and walking balance).
3. If other tasks are used, results may differ.
4. The results were limited to individuals ranging in age from 3 to 5 years old and to high-functioning individuals with ASD.

Assumptions

All children followed the direction of the intervention, understood the instructions, and they gave their best efforts when tested.

Limitations

1. Due to the lack of availability of a large sample of children with ASD, the sample size of the participants was small in this study. As a result, the statistical significance lacked power. Restricted age range, the restricted range in functioning, as well as limited clinical and school samples also served as limitations.

2. Some children were taking medications, which likely affected their participation in practicing physical skills during the study. The researcher had to work around this in order to get the child to exercise. The researcher was required to reschedule the session for another day in the same week.

3. The researcher faced difficulties from the participants with regard to the engagement of standing balance due to greater impairments affecting postural stability, though adaptations and modifications were made to ease standing balance.

4. The results were limited to individuals ranging in age from 3 to 5 years old and to high-functioning individuals with ASD.

Significance of the Study

Advantageous results and significant outcomes resulting from this study will be available to share with the interested parties, special needs clinics, and autism centers. Furthermore, these highlighted outcomes will be accessible to anyone in charge of developing and improving the field of physical education and sport psychology programs for children with ASD. However, this study intends to help caregivers, such as physical education teachers and coaches, clinical therapists, and parents to contribute to reducing the impact of motor skill impairment by using the video-modeling interventions. Children with autism would benefit from interventions or programs to improve their motor skills in order to offset the delay in acquisition of motor skills at an early age. These movement impairments can cause great difficulty for children with autism in negotiating their physical environment, gross and fine motor skills, and social activities. However, these skills do not come naturally for those children with or without autism, but need to be practiced, learned, and reinforced (Gallahue et al., 2012; Logan et al., 2015). Certainly, an effective program to improve motor skills for children with ASD should increase positive performance and engagement of physical activity skills. Due to the lack of studies about improving the impairments of motor skills for children with ASD, an underlying goal of this study was to contribute to the spread of a greater sense of awareness about individuals with ASD in order to create more useful approaches to improving motor skills. Finally, it was hoped that this study helped to create a video modeling technique that stands as a significant method for teaching and improving the motor skills for children with ASD.

CHAPTER II

Literature Review

Autism

The intent of this chapter is to highlight the issues and concerns of the present study, focusing on the development of delayed motor skills of children with ASD. It includes historical definitions of ASD and diagnostic types, children with ASD, fundamental motor skills in typical and atypical children, the motor profile for ASD children, impairments of ball and balance skills, and using video modeling as a psychological method to positively improve a variety of motor skills.

Autism Spectrum Disorder was initially identified by Leo Kanner (1943) and Hans Asperger (1944) as a developmental disorder described as an impairment in socialization, imagination, and communication (Whyatt & Craig, 2013). After the first description by Leo Kanner in 1943, ASD has been known as a failure to develop fundamental social relationships at the beginning of childhood (Vernazza et al., 2005). The symptoms of autism can be noticed as early as 9-15 months while diagnoses of autism usually occur at 3-5 years (Haglund, Karin & Källén, 2010). Ideally, diagnosis occurs via clinical criteria using the Diagnostic and Statistical Manual of Mental Disorders, American Psychiatric Association (DSM IV) or the International Classification of Diseases, 10th edition (ICD-10) (HaglundKarin & Källén, 2010). Various studies emphasized the first definition of ASD by Kanner in 1943: Autism Spectrum Disorder is a common expression for multiple complex symptoms of brain development that causes significant difficulties in the ability of socialization, communication, and behavior (Harris-Taylor, 2015; Jacobs, 2013; Nic Fleming, 2006). However, the initial definition of ASD that first appeared in the mid-20th century in the third edition of (DSM-III), changed in the fourth edition

(DSM-IV), then was combined with the 10th revision of (ICD-10) to become a comprehensive definition of autism. ASD is now defined as a pervasive developmental disorder that is diagnosed in early age with significant impairments in communication, social interaction, and stereotyped, repetitive, restricted behavior involving a child's interests and activities (Lai; Lombardo & Baron; 2014). The most recent revision of DSM-DSM-5 (2013) refers to the definition of ASD without addressing its subtypes. It states that the difficulties of ASD are based on aspects of daily life, such as social interaction and communication, interest, activities, and repetitive and restricted behavior (Lai, Lombardo & Baron-Cohen, 2014).

Some diagnostic types are considered branches of Autism Spectrum Disorder and have previously been identified in many studies. To clarify, besides autism, which is also considered a part of the spectrum disorder, other spectrum disorders, such as Asperger Syndrome (AS), pervasive developmental disorder not otherwise specified (PDD-NOS), and Autistic disorder, are classified under the ASD umbrella (HaglundKarin & Källén, 2010; Harris-Taylor, 2015). Moreover, these diagnostic types of autism involve virtually the same characteristics of symptoms and levels, ranging from mild to severe, while also differing from one to another. For example, researchers can classify the degree of ASD symptoms by using the intelligence quotient (IQ) to separate mild from severe autism (Tsatsanis & Powell, 2014). IQ testing measures the knowledge and ability to plan, reason, think, and solve problems (American Psychiatric Association, 2013). Furthermore, a US study found that nearly half of children with ASD are in the proper range of IQ (average or above average), scoring 80-85 or greater; below 71 is considered severe autism, and is usually characterized as an intellectual disability (Baio, 2014).

Problems

As mentioned previously, the symptoms of ASD can be noticed and diagnosed at an early age. Asperger Spectrum is an exception, however, as it is usually diagnosed in individuals ranging in age from seven to the end of adolescence (HaglundKarin & Källén, 2010). Autism has been reported as one of the fastest growing developmental disabilities, increasing dramatically from 2004 to 2013 (Boat & Wu, 2015). In the US, an estimated one in 68 children has been identified with ASD (Christensen et al., 2016). More than 3.5 million Americans live with ASD (Ostrow, 2014). The growing number of children diagnosed with ASD in the US has brought increased attention to the multiple negative social and physical effects on individuals that require appropriate intervention care by specialists. This care helps to limit the worsening of ASD symptoms in children.

Socially, a child with Autism Spectrum Disorder has a core deficit in social activities that can lessen interaction with the surrounding environment in daily life. Kanner's (1943) definition of ASD: a significant impairment on healthy social relationships starts from early childhood. To illustrate, Bellini and Hopf (2007) emphasize that individuals with ASD face challenges and difficulties in dealing with their impairments, especially in communication and social interaction. These impairments of social skills, which frequently appear in early age, could affect "eventual social anxiety, depression, isolation, and other unfavorable outcomes" (p.80). Furthermore, these impairments could cause children with ASD to struggle with communication skills and their ability to join others in social activity games. Whyatt & Craig (2011) reported that individuals with ASD often have difficulties understanding how to engage or play with other peers in social games. As a result, they may prefer to be alone instead of joining others in social games.

Language and speech deficits are common symptoms commonly considered the causation of most social problems faced by children with ASD. Dwyer and Credo (2010) explain that children with autism have a deficit in language and speech. Noticeably, many children who have language or speech problems are unable to master basic social skills. Some do not speak at all and fail to express their emotions. However, others do demonstrate basic social skills and can name simple actions and objects (Autism and Social Interaction, 2010). These symptoms that cause impairment in social skills and communication vary, according to the condition, from mild to severe ASD. For example, according to the National Institute for Health and Care Excellence (NICE), 70% of children with ASD are diagnosed with at least one physical health problem, while around 50% have a mental disorder (Autism, 2014). As a result, multiple symptoms of autism could limit the child's involvement in essential social skills with others in their surrounding environment; therefore, these deficits could affect the health of children with ASD.

Most children with ASD are prone to health problems that result from a lack of participation in social and motor skills activities. Egan, Dreyer, Odar, Beckwith, and Garrison (2013) indicate that children diagnosed with ASD in their toddler years are more prone to obesity or being overweight when compared to typical children. Furthermore, research has shown that teenagers with ASD in the U.S. are more than twice as likely to be overweight compared to children without a developmental disorder (Phillips et al., 2014). To illustrate, some children with ASD have to take medications such as antipsychotics that might cause weight gain. Another reason may be that some children with autism tend to have highly picky eating habits or eat only particular foods that are high in calories (Curtin, Jojic & Bandini, 2014). The problem of being overweight for children with autism causes other health conditions, such as high blood pressure, high cholesterol, and diabetes (International Meeting for Autism Research, 2014). Obesity is also a common health problem related to ASD because these children and youth are less active than those without developmental disorders (Must et al., 2014). According to the Centers for Disease Control and Prevention, participating in normal physical activities is an important step in maintaining a healthy weight (Kiley, MacDonald & Menear, 2014).

Autism and Motor Development

The development of movement refers to the general term of motor development, defined as the ability to move and is considered a key to individual development. As each physical change occurs, an individual gains new abilities. Motor development is a vital factor in a child's bone and muscle growth that enables overall task performance and movement in manipulating objects in their environment (Boskic, 2010). The development of movement takes place as children develop from birth to adulthood (Boskic, 2010). Motor development can be classified as including fine motor and gross motor skills. The following are definitions of the categories for use in this study.

Fine motor skills, also known as dexterity, refers to the ability to control slight muscle movement. Fine motor skills occur throughout human development stages aiding learning acquisition of such skills as drawing or writing. Movement is involuntary in newborns and later, with growth, a voluntary movement of muscles that controls the movement of such body parts as hands and eyes. Use of fine motor skills can be forgotten or lost due to an extended period of non-use. Small muscle movement can also become impaired by a brain, muscle or spinal cord injury (Fine motor skill, 2017). Gross motor skills refer to the ability to move big muscle groups such as arms and legs to enable standing, walking, and running. These skills require control of posture, such as an infant controlling his/her head to track a moving object. Consistent practice improves gross motor skills.

Over the past two decades, many studies have confirmed that children with autism spectrum disorders have common signs of motor impairments (Green et al., 2009). The Bruininks-Oseretsky Test of motor proficiency (BOT-2) is a brief form of various motor skills tests used to measure fine and gross skills for three groups of 36 children (12 children with Asperger's syndrome, 12 children with autistic disorder, and 12 children with pervasive developmental disorder not otherwise specified). Through such tests, significant motor impairments have been shown mostly in coordination and clumsiness for all participants compared to other groups (Ghaziuddin, Butler & Ghaziuddin, 1998). It is evident that motor delays for children with ASD take place over time from birth to adulthood (Brian et al., 2008). Many children with ASD have been affected by a variety of motor impairments that include impairments in gross motor, fine motor, and motor coordination (Pan, Tsai & Chu, 2009). For example, on the Henderson Test of Motor Impairment, Green et al. (2009) found that about 50% and 67% of children with AS and ASD, respectively, had significant motor deficits. Some of these motor impairments were readily observable; others needed more identification by clinical specialists who emphasized that not all children with ASD have been identified with motor impairments. For more clarification, children with ASD might face considerable difficulties in negotiating their fine motor control such as in writing or tying shoes, and in socializing play such as team sports, ball skills, and bike riding (Jansiewicz et al., 2006). Wing (1981) found that 90% of 34 cases ranging in age from 5 to 35 years in the study who had been diagnosed with ASD have an apparent impairment participating in games that require an involvement of motor skills. Indeed, a strong relationship exists between motor impairments and the levels of ASD. The symptoms of movement deficits could be worse when having severe levels of ASD (Hilton et al., 2007). Motor deficits have great impacts on autistic children in contributing to apparent impairments of basic motor skills that include balance, gait, tone, posture, and coordination (Dowell et al., 2009). Deeper understanding and investigation of these movement deficits would provide a clear picture of the association between motor impairments and Autism Spectrum Disorders.

Overview of selected studies

Information from 13 relevant research studies, will be reviewed in this chapter. Information from these studies was extracted based on the characteristics of participants, research design and methodology, and significant outcomes. The features of the participants of these 13 studies were broken into four categories: age range, gender, characteristics, and diagnosis. The findings are as follows:

Age. The 13 articles included three age range groups of participants. First, 4-6 years was the selected range for one study (Vernazza et al., 2005). The second age range was from 8-14 years and was involved in 10 articles (Ament et al., 2009; Dowell et al., 2009; Dziuk et al., 2007; Green et al., 2009; Green et al., 2002; Hilton et al., 2007; Macneil & Mostofsky, 2012; Molloy, Dietrich, & Bhattacharya, 2003; Pan, Tsai & Chu, 2009; Whyatt & Craig, 2011).

The third study involved the range of child to young adult: age range about 6-17 years (Jansiewiez et al., 2006).

Gender. Participants of both genders were reported in most studies (Ament et al., 2009; Dowell et al., 2009; Dziuk et al., 2007; Graham, Abbott, Nair, Lincoln, Müller & Goble, 2014; Green et al., 2009; Hilton et al., 2007; Macneil & Mostofsky, 2012; Whyatt & Craig, 2011). Furthermore, only three studies used exclusively-male participants (Green et al., 2002; Jansiewiez et al., 2006; Molly et al., 2003). However, two studies did not provide information about the gender of participants (Pan, Tsai & Chu, 2009; Vernazza et al., 2005). In fact, males were involved in most studies because there is substantial evidence of a higher existence of autism disorders in males rather than females throughout the clinical presentation of ASD (Brugha et al., 2011; Kim et al., 2011; Kirkovski et al., 2013). In fact, the average estimated ratio through most studies proposed a proportion of 4:1 as a whole for the spectrum (Fombonne, 2003, 2009).

Seven studies used a comparison between the participants with ASD and a control group of typical members (Dowell et al., 2009; Dziuk et al., 2007; Graham et al., 2014; Green et al., 2009; Molly et al., 2003; Vernazza et al., 2005; Whyatt & Craig, 2011). On the other hand, three studies included ASD participants and an atypical control group, such as participants with Attention-deficit/hyperactivity disorder (Ament et al., 2009; Macneil & Mostofsky, 2012; Pan et al., 2009). Two studies included participants of ASD with atypical groups of children that had Developmental Disorder Motor Function (SDD-MF) and high functioning autism (HFA) (Green et al., 2002; Jansiewiez et al., 2006).

Research Design and Methodology

All 13 articles selected for this literature review included participants with ASD, and the studies used validated diagnostic instruments. Seven articles used the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (Ament et al., 2009; Dziuk et al., 2007; Graham et al., 2014; Macneil & Mostofsky, 2012; Pan et al., 2009; Vernazza et al., 2005; Whyatt & Craig, 2011). Also, the Autism Diagnostic Observation Schedule-Generic (ADOS-G) was reported in two studies (Green et al., 2009 & Molly et al., 2003). Both the Autism Diagnostic Interview-Revised (ADI-R) and (ADOS-G) were included in two articles (Dowell et al., 2009; Jansiewiez et al., 2006). The International Classification of Diseases (ICD) to diagnose ASD was involved in one study (Hilton et al., 2007).

All articles focused on motor impairments or delayed movements to establish the primary focus of research questions. Two kinds of research questions were involved in the 13 articles. First, most of the studies investigated postural stability and gait and tried to determine if there were significant impairments that might cause a delay in motor skills for ASD children (Dowell et al., 2009; Dziuk et al., 2007; Graham et al., 2014; Hilton et al., 2007; Macneil & Mostofsky, 2012; Molly et al., 2003; Vernazza et al., 2005; Whyatt & Craig, 2011). Three studies examined motor development and overall motor skills to find the relationship between ASD and motor dexterity (Ament et al., 2009; Green et al., 2009; Pan et al., 2009). However, only two studies used both research questions of overall motor skills and postural stability to examine the particular impairment of motor skills (Green et al., 2002; Jansiewiez et al., 2006).

For the collected data and instruments used by researchers in these studies, there was a great variety of measurements. However, according to the articles, all the studies had employed validated and reliable instruments. The Movement Assessment Battery for Children: Second Edition (MABC-2) and The Test of Gross Motor Development (TGMD-2) as well (DSM-IV) were used in the assessments of overall motor development skills (Ament et al., 2009; Green et al., 2002; Green et al., 2009; Hilton et al., 2007; Vernazza et al., 2005; Whyatt & Craig, 2011). Additionally, for gait and postural stability, The Physical and Neurological Examination for Subtle Signs (PANESS), and Nintendo Wii Board, and Postural sway measurements were used (Dowell et al., 2009; Dziuk et al., 2007; Graham et al., 2014; Jansiewiez et al., 2006; Macneil & Mostofsky, 2012; Molly et al., 2003; Pan et al., 2009).

Quantitative statistics in an experimental design appeared in 13 studies. For example, the univariate analyses of variance such as ANOVA and ANCOVA comprised the majority of statistical analyses that were used to analyze the outcomes of measurements.

However, some limitations were found or faced within the studies. The major issues reported in some studies included a lack of age range, sample size, instrument, and statistical power that would possibly impact findings (Ament et al., 2009; Dowell et al., 2009; Dziuk et al., 2007;

Graham et al., 2014; Green et al., 2002; Molly et al., 2003). Other limitations included missing equalization of gender and sample size, and standard evaluation of tests (Dowell et al., 2009; Dziuk et al., 2007; Graham et al., 2014; Pan et al., 2009; Whyatt & Craig, 2011). Finally, Green et al. (2009) used the Movement Battery Assessment for Children (M-ABC) to examine manual dexterity, ball skills, and balance, as well as a parental questionnaire.

Summary of Findings

Children with ASD may have multiple motor-skills impairments that can negatively impact maintenance of efficient motor skills. Many strengths and weaknesses have been reported involving motor development and postural stability of autistic children. Researchers have found significant indications of deficiencies in the motor profile in ASD children. For example, children with ASD showed much more motor impairment than typical children with Attention Deficit Hyperactivity Disorders (ADHD). The impairments particularly occurred in manual dexterity, ball skills, and balance (Ament et al., 2009; Hilton et al., 2007; 2009; Green et al., 2002; Green et al., 2009 &Pan et al., 2009). Also, the studies involving weaknesses of postural stability revealed static and dynamic imbalance more than other movement areas. Furthermore, other studies indicated a strong association between the level of severity of ASD and their motor impairments. Therefore, when the level of severity of ASD increases, the probability of the diagnosis of overall motor impairment increases as well (Dziuk et al., 2007; Hilton et al., 2007; Graham et al., 2014; Pan et al., 2009; Whyatt & Craig, 2011). The motor impairments of autistic children may be worse with severe ASD than mild and moderate conditions.

The motor profile of autistic children suggested that some aspects of motor skills may help in contributing to maintaining healthy movement. Some studies revealed no significant difference between the ASD and control groups of children in terms of age (Dowell et al., 2009; Dziuk et al., 2007; Graham et al., 2014; Jansiewiez et al., 2006; Macneil & Mostofsky, 2012). Notably, Pan et al. (2009) emphasized that no relationship had been found between children with mild Asperger spectrum and locomotion skills. Regarding results that have been found for postural stability skills such as balance and gait, no statistical differences were found between either right and left feet in both groups of ASD and healthy children for gait (Vernazza et al., 2005). Furthermore, there was no significant difference in static and dynamic balance in manual dexterity involving securely seated subjects with ASD (Green et al., 2002). Also, Hilton et al. (2007) found no significant difference in motor impairment between typical and both mild and moderate levels of ASD children when using Social Responsiveness Scale (SRS) and the Movement Assessment Battery for Children (MABC). Lastly, Whyatt and Craig (2011) found no significant difference between genders when examining manual dexterity, ball skills, and balance in ASD.

To correct inefficient movement that is noticeable as a deficiency in children with ASD, a coupling of temporal and visual feedback in terms of motor skills is required (Ament et al., 2009). The apparent impairments of movement in ASD that affect the performance of motor skills are elements of dyspraxia, a term for various problems impacting brain ability that causes difficulties in processing information. As a result, the information received in the brain may not be transferred completely to the body while performing movements. Dowell et al. (2009) stated that there is an association between apparent motor impairments and dyspraxia in ASD, represented in the weakness of spatial formation representation while performing motor skills. Additionally, children with ASD tend to depend on their body space while limiting the use of visual feedback from their surrounding environment. This procedure is known as an impairment in the formation of the perceptual-motor action model in the brain when performing gesture skills (Macneil & Mostofsky, 2012). However, dyspraxia in ASD is the main problem that can negatively affect complex movement skills, and is not only limited to the deficit in imitation of complex skilled-gesture performance (Dziuk et al., 2007). Furthermore, Green et al. (2002) indicated that when the complexity of motor tasks increases, the possibility of worsening motor-skill performance also increases. Likewise, the deficit of social skills in ASD children could also lead to worsening performance in physical activities, motivation, and social skills (Pan et al., 2009). Two studies revealed a strong relationship between the impairment of motor skills especially in balancing and the severity level of ASD (Graham et al., 2014; Hilton et al., 2007). The impairments of motor skills, speed, and grip strength may increase with age (Vernazza et al., 2005); Whyatt and Craig (2011) suggested, though, that the deficit of balance is not considered pervasive in ASD children, but could be noticeable. Finally, Jansiewiez et al. (2006) concluded that there is no widely observed correlation between postural skills and language proficiency in AS children.

Ball and balance skills in ASD

As previously mentioned, balance and ball skills were the most frequently used dependent variables that have been tested in research involving ASD. The most tested skills in control balance were static and dynamic forms of balance and gait skills. For example, standing on one or both feet with closed or opened eyes in static or dynamic positions was the skill most used in the studies investigating balance. Children diagnosed with ASD have deficits in motor skills that require balance. However, object control has been considered a significant dependent variable in ASD. For instance, most studies focused on testing ball skills such as throwing and catching. To illustrate, Ament et al. (2009), in his study of 56 children with ASD, maintained that they showed greater difficulties in performing balance and ball skills. As a primary diagnosis, these impairments of balance and ball skills were significantly associated with having ASD. Graham et al. (2014) found that performing the single leg stance is the most affected; in comparison to typical children, ASD participants lost balance earlier than typical children, especially for one-leg tasks. When Green et al. (2002) examined 11 participants with Asperger syndrome, they found a significant correlation between ball skills in general and both performance of balance and manual dexterity (Green et al., 2002). Another study examined dynamic and static balance, and ball skills such as catching and throwing for 101 children with ASD. In this study, the impairment of ball skills in children with ASD was at a significantly higher degree than other balance activities, such as ball/walk (dynamic balance) impairment scores. The participants also showed an apparent weakness in the timed board-balance activities (Green et al., 2009). Likewise, Hilton et al. (2007) elicited the same results in balance and ball skills as Green et al. (2009), though Hilton examined 51 of children who were diagnosed with Asperger Spectrum. Furthermore, Jansiewiez et al. (2006) found that 40 participants with ASD had significant difficulty in performing balance and gait skills and were also slow with timed foot and hand movements.

A study by Pan et al. (2009) focused on object control skills, such as hopping, striking, and catching. In an investigation of 91 children with ASD and a range of 90-120 on the IQ scale, children with ASD showed poorer performance in catching skills in comparison with typical children (Pan et al., 2009). Finally, regarding both ball and balance skills, overall impairments in these skills were found in 18 participants with ASD by using the Movement Assessment Battery to assess manual dexterity, ball skills, and balance (Whyatt & Craig, 2011). As a result, despite the valuable outcomes from previous studies that emphasized the weaknesses of ball and balance tasks in motor skills for ASD children, other impairments are also considered related deficiencies of ASD, such as lack of coordination, clumsy gait, and reduced manual dexterity. These specific impairments are generally observed by parents and clinical therapists (Hilton et al., 2007 & Dowell et al., 2009). Unfortunately, impairment of such motor skills as ball and balance could result in being poor at games that include motor skills for children with ASD (Wing, 1981).

In a case study of Autism and Asperger syndrome, Frith (1991) noted that a boy "stood in the middle of a group of playing children like a frozen giant. He could not possibly catch a ball; however easy one tried to make it" (as cited in Green et al., 2002, p. 664). When thinking about the motor profile impairment of ASD children, especially in ball and balance skills, one is supposed to analyze both patterns of the skills and the association among them that could affect the execution of these skills. For example, Whyatt and Craig (2013) mentioned that a highlighted impairment of catching skills is highly associated with the deficit of spatial-temporal control of movement, and that the first sign may be observed when analyzing the movement patterns of the catching ability for ASD participants (2013). Externally, catching requires an individual to coordinate the movement of the receiving arms, so that the patterns of hand movements tend to be a function of the movement of the oncoming ball (Whyatt & Craig, 2013). Internally, Glazebrook et al. (2006) noticed that children with ASD are sometimes surprised when someone throws a ball at them. They seem to be confused for a moment by thinking about what to do to catch a ball (Rinehart et al. 2006). As a result, this apparent perceptual awareness of catching an oncoming ball is considered an impairment in perception–action coupling in the brain while performing the skill. To illustrate, the catching skill is a complex operation requiring an online internal monitoring and control of the movement, while also taking into consideration the required response to perceptual information in conjunction with suitable timing to initiate the ball-catching action through perspective control. This illustration of an internal process that happens through catching describes the association between spatial and temporal control of the movement represented in the delay between perceiving information and physically responding to the perceived information. Furthermore, spatial and temporal control can play a significant role in differentiating the level of control and performance if there is an additional ball task. As a result, children with ASD may have a problem joining others in social games involving catching skills (Whyatt & Craig, 2011). So, as previously mentioned, catching skill highly depends on the external imposed spatial and temporal constraints while the dynamic of an oncoming ball should direct the control of action (Whyatt & Craig, 2013). Therefore, there is a significant association between action and the sensory feedback already built by the brain to anticipate the sensory outcome of self-generated motor commands (Izawa et al., 2012). This process is called an internal model, and is considered the most important part of an individual's ability to adapt movement and learn from observing other people; therefore, the formation of interior visualization of an action is a necessary step to develop motor skills, as well as social and behavior skills. Certainly, lack of these skills is common when looking at the developmental nature of ASD. This might also support the explanation of the impairments in motor skills by considering the associated deficits in ASD children's ability to deduce other's actions. This critical observation has been derived from previous studies. When children with ASD try to pick up a new activity pattern such as catching or throwing a ball, they depend on their internal body space by using proprioceptive feedback and isolate the use of the external visual by discounting feedback around them. They depend only on their body space in the internal visualization of the brain and limit the use of visual feedback from the surrounding environment (Izawa et al., 2012). In the tasks that involve anticipatory control, such as catching an oncoming ball, most children with autism struggle using perception action strategy in which the action requires being coupled to perception in the brain (Whyatt & Craig, 2011). It is possible to infer from this that the impairment of balance skills negatively impacts involvement in social skills, causing high avoidance of activities that require balance skills, thereby decreasing independence (Martha & David, 2016).

Balance is a necessary skill that should be improved to develop other gross motor skills, such as ball skills. Therefore, the relationship between ball and balance skills in performing temporal and spatial control in catching may be noticeable. For example, catching requires balance and hand-eye coordination, as well as motor planning, depth perception, and visual acuity (Pediatric Physical Therapy at its Best!, n.d.). Balance is also a significant skill required to perform daily activities such as dressing and bathing, and is also necessary for involvement in such recreational activities as riding a bike (Jasmin et al., 2008). Beside improving the main deficiency of balance, improving balance skills may also help in the development of ball skills in children with autism. Balance is considered a required skill of catching, mainly with regard to spatial and temporal control. Furthermore, ball skills, such as catching or throwing, can reflect children's ability to manage and balance their bodies in space (Help Your Child Develop Ball Skills - North Shore, n.d.). To conclude, ball and balance skills are considered the most common abnormalities in motor skills that can negatively impact children with ASD in their participation in physical education classes or in social games that include ball skills both inside and outside the school. However, physical education teachers or therapists should recognize and try various methods to eliminate these deficits in ball and balance skills.

Summary

The information presented in this section largely concludes that ASD causes significant weaknesses in socialization, communication, and restricted behaviors with regard to interests and activities. ASD’s symptoms can be observed at 8 months, and diagnosed at 3 years. Children with ASD have greater impairments of motor skills than typical children. These motor skills impairments can become barriers for children with ASD when engaging in regular daily duties or physical activities. Such motor skills impairments in children with ASD cause problems in the visualization process used during performance of motor skills. Most of the research examined manual dexterity and ball skills, such as throwing and catching. However, in comparing children with ASD with other healthy peers in postural stability such as gait, balance, and skilled gesturing, most of the articles pointed to postural stability as being poorer in balance-control tasks, specialized gestures, gait, and repetitive movements.

Due to the impairments of internal models of perception for children with ASD, notably through the performance of the catching skill as an example, using such visual supports as video modeling techniques may be an optimal approach for enhancing internal visualization in the brain. This method can also provide fundamental knowledge and a clear picture of ball and balance tasks patterned in the brain. According to the American Psychiatric Association (2000), children with ASD revealed significantly greater strength in interpreting and processing visual information than auditory information. Furthermore, Bryan and Gast (2000) suggest that individuals who are working with children with ASD as teachers and caregivers be encouraged to maximize the use of visual support strategies in providing instruction while minimizing the amount of auditory feedback provided.

Visual supports

Tissot and Evan (2003) and Welton et al. (2004) agree that visual stimuli and supports are effective methods to teach children with ASD to learn essential skills. To illustrate, providing children with ASD support that visually presents information regarding a particular skill can help such children to strengthen their attention, ability to select the appropriate stimuli, and help them to positively interact with the provided information (Corbett & Abdullah, 2005; Tissot & Evans, 2003). For example, Bryan and Gast (2000) clarified that various forms of visual support methods, such as videos, pictures, and symbols, could improve apparent impairments in ASD. These strategies of visual supports have been used predominantly for healthy people as an educational approach (Johnson & Cuvo, 1981). Using interventions that include a wide variety of visual tools to support an individual with ASD can begin in very early childhood, immediately after a diagnosis of autism (Hayes et al., 2010).

Also, Hodges et al., (2006) emphasized that the use of visual supports has shown significant benefit in reducing the variety of symptoms related to ASD. These symptoms, associated with communication, social disabilities, and cognition, show the most reduction in impairment for individuals with ASD particularly through use of visual artifacts (Cohen & Sloan, 2007). However, despite the positive results reported in using visual support strategies to teach children with ASD, visual supports are sometimes difficult for parents, teachers, and caregivers to use. They should, though, take into consideration the following steps to overcome such challenges and barriers. First, these tools should be adapted to improve communication and social skills for children with ASD. Second, visual support must be made more flexible to ensure each unique individual with ASD experiences a significant impact as they develop. Finally, using visual tools can help caregivers support children with ASD in their motor-skill development with minimal effort. Caregivers of children with ASD have sometimes struggled creating, using and monitoring the efficacy of their own tools (Hayes et al., 2010). This research aims to create effective visual tools for them.

Regarding to the features of video modeling, this technique synthesizes two of the most effective interventions while teaching motor skills for children with ASD: visual cues and modeling. The strengths such interventions build or establish with students with ASD is a consequence of incorporating visual cues in provided instruction. There is evidence that may indicate this strategy is particularly effective with who are visual learners. Additional components of video modeling can improve the adaptation of the material and can be widely used to meet their needs (Bellini & Akullian, 2007).

A type of visual support method used for children with ASD is picture activity schedules. This approach can play a useful role in reducing contextually disadvantageous behaviors, increasing involvement Time-on-task behaviors, and contributing to the improvement of social interactions (Bryan & Gast, 2000; Dooley et al., 2001; Johnston et al., 2003). Picture activity schedules function to provide a visual illustration of a series of activities that the child with ASD is supposed to perform (Bryan & Gast, 2000). Bryan and Gast (2000) identified picture activity schedules as a visual depiction of skills and behaviors that should be performed in a certain sequence when completing a task.

Beside the benefits of picture activity schedules in improving the psychological and social aspects of children with ASD, evidence suggests it also serves a practical function with regard to motor skills improvement. Numerous studies using such motor skills assessments as the Movement Assessment Battery for Children-Second Edition MABC-2 and the Test of Gross Motor Development-Second Edition TGMD-2 for children with ASD reported a difficulty in understanding how to instruct children to perform some motor skill tasks. As a result, this misunderstanding could negatively impact scores for these assessments (Green et al., 2002; Staples & Reid, 2010). However, using the picture activity schedule method can facilitate the understanding of provided instruction for MABC-2 and TGMD-2 assessments to be performed, while also helping to obtain better performance and motor skills task scores. Liu and Breslin (2013) examined the effectiveness of a picture activity schedule on a performance of the MABC-2 for 25 children with ASD from 3-16 years old. Researchers divided the participants into traditional protocol and picture activity schedule protocol. In the traditional protocol, before a performance of motor skills under MABC-2, children received demonstrations and detailed verbal descriptions for each task. With the picture activity schedule protocol, the researchers minimized the use of verbal instruction to guarantee visual support and presented a picture for a participant before the performance of each task. As a result, the members of the traditional group showed a significant delay in both fine and gross motor skills performance. However, the participants of a picture activities schedule showed better performance and significantly higher scores than traditional protocol. In conclusion, the finding of this study suggested that using picture activity schedules in MABC-2 assessment for children with ASD can improve performance and scores for fine and gross motor skills (Liu & Breslin, 2013). Furthermore, the researchers also recommended that practitioners incorporate a picture activity schedule method into MABC-2 assessments when evaluating motor skills performance for children with ASD (Liu & Breslin, 2013).

Video Modeling as a Strategy for Visual Support

A video modeling procedure can be used as a direct teaching strategy for many reasons. For example, previous researchers in video modeling have shown that video modeling is an effective teaching strategy for children with autism (Charlop-Christy & Daneshvar, 2003; D'Ateno, Mangiapanello, & Taylor, 2003; Nikopoulos & Keenan, 2003). Moreover, video modeling provides an opportunity for children with autism to learn to imitate other children rather than solely replicate adults (Weiss & Harris, 2011). Also, video modeling techniques provided a uniform learning opportunity throughout the interventions for each student in the teaching groups that used video modeling.

Bellini and Akullian (2007) indicated that researchers have been interested in the video modeling technique as an advanced approach to providing visual support in the education of children with ASD for the past 20 years. Furthermore, video modeling is considered an effective method for educating individuals with ASD because such individuals show an over-selective interest toward their preferred stimulus (Reed, 2012). To illustrate, Reed (2012) explained that individuals with ASD mostly tend to spend more effort focusing on one stimulus at the expense of other significant stimuli in the environment. It is similar to the commonly used method of learning through observation; such observation is an important method for learning in children with ASD who share classrooms with typical students, as much the former's learning comes through imitating and watching the latter. (Charlop-Christy, Le & Freeman, 2000).

Bellini and Akullian (2007) defined the function of video modeling as providing a clear demonstration of skills or target behaviors by using video representation as a model. Delano (2007) explained that the function of video modeling interventions is to engage a child regularly in watching videotapes of typical examples of others, such as peers and adults, practicing skills that were previously taught (2007). For example, an edited videotape of a model performing a typical targeted behavior or skill allows a child with ASD to observe an average performance of the skill before attempting its execution. Also, video modeling contributes to the improvement of communication and vocalization skills (Charlop & Walsh, 1986; Charlop & Milstein, 1989), as well as play and social skills (Taylor et al., 1999; D'Ateno et al., 2003).

Communication and Social Skills

Many studies have been done to examine the effectiveness of using video modeling in contributing to the improvement of communication and social skills for children with ASD. Children with ASD are diagnosed with significant impairments in the core areas of communication and socialization (Batshaw, 2002) that can lead to great deficits in their ability to quickly engage others in socialization and utilize social communication skills (Marris, 1999). The physical development of children during play aids in socialization and transforms into verbal interaction and communication. For example, making this transition for children with ASD children in social development and learning new styles of social interaction is especially challenging (Halle et al., 2016). The challenges presented by new social interactions impact a child's ability to quickly adjust to and engage in utilizing social communication and socialization tasks. Kroeger et al. (2006) investigated the effectiveness of socially delivered programs for 25 , children with ASD, ranging in age from 4-6 years old. The children participated in one of two designated groups: a direct teaching group or a play activities group. Also, the children in the direct instruction group were assigned to use a video modeling technique to practice play and social skills. However, children in the play activities group were assigned to have uninstructed play through 15 sessions of the intervention. As a result, the direct teaching group that used video modeling acquired more social skills than the unstructured play activities group. Both groups improved in prosocial behaviors from pre/post-test time. Moreover, reports from parents supported the positive result of using video modeling, having observed advances in social communicative language for their children with ASD (Kroeger et al., 2006). To compare the effectiveness of video modeling techniques, Nikopoulos and Keenan (2007) examined two experiments to teach complex social sequences to children with ASD. The first experimental design of baseline (Condition A) had to watch one of four short videotapes of two individuals participating in a simple series of activities while Condition B had the same procedures with the events in a different sequence. As a result, all children with ASD built a series of social behaviors that significantly enhanced the social initiation skills and facilitated play engagement for children with ASD. In conclusion, use of video modeling for children with ASD leads to an improvement in social and communicative skills, which may affirm the effectiveness of video modeling in improving other necessary areas such as physical performance.

Physical Activity skills

Surprisingly, despite considerable research on video modeling for ASD, children with regard to socialization and communication skills development, use of this technique has been limited in developing sports skills in physical education classes or practice centers. One study by Mechling and Swindle (2012) sought to examine the impact of video modeling on gross and fine motor tasks in ASD children and those with moderate intellectual disabilities. This study included two groups of elementary students: in the first group, three children were diagnosed with a mild intellectual disability; in the second group, three children were diagnosed with ASD. Both groups were assigned to watch video modeling of an adult performing such fine motor tasks as tangling a plastic band and such gross motor functions as jumping and walking. Each trial showed a recorded performance of a skill being performed in its optimal form, then asked the child to perform the task within five seconds of watching the videotape. As a result, significant progress was noticed in the performance of both groups in fine and gross motor tasks, as reflected by an increase in the number of correct trials following the introduction of video modeling. Also, both groups showed more proficiency in the performance of gross motor than fine motor tasks through video modeling. However, the children with moderate intellectual disabilities in the first panel showed more independently correct trials than children with ASD (Mechling & Swindle, 2012).

Another study was conducted on three adolescent children with ADHD, cerebral palsy, and intellectual and developmental disabilities to examine the positive impacts of using video modeling intervention to teach physical activities (Cannella-Malone et al., 2013). All three students took a pre-assessment to evaluate their performance level in physical activities before starting the video modeling intervention. The assessed physical activities included jumping rope, riding a skateboard between cones, ladder drill (i.e. feet going in and out), ladder design (i.e. multiple steps), shuttle run, and disc ride. Furthermore, children had to watch the video modeling and immediately perform the required skill. The same procedures were followed with other activities throughout the intervention. As a result, the participating children made significant progress in learning and improving physical activities. Only one student learned all six physical activities alone without using error corrections. Cannella-Malone et al. (2013) concluded that video modeling as an approach might be considered as a useful tool to teach physical activities to children with significant disabilities. Even though the Cannella-Malone et al. (2013) study did not use children with ASD, video modeling has been shown to be a positive, practical approach to provide the foundation for the improvement of motor skills among various disabilities.. Video modeling might be a successful approach to support motor skills improvement in children with ASD in the future.

On the other hand, demonstration of a task for a learner prior to their attempt to mimic movement is a technique widely used by athletics teachers and coaches as a form of first exposure. They can demonstrate the skill with or without using verbal instruction, and they then encourage their students to reproduce the task. Live demonstration of motor skills is a more effective educational technique for skill acquisition than such others as trial-and-error or verbal instruction. Furthermore, the visual perception perspective of demonstration allows the observer to select the associated motion and establish a reference for the learner that hones the reproduction of the movement in subsequent trial attempts.

Summary

Children with ASD have motor deficiencies that can affect their ability to practice or join in physical activities performed by their healthy peers. The purpose of this study was to determine whether video-modeling techniques are a more effective instructional tool for children with ASD to improve such basic motor skills as catching, overhand throwing, standing and walking balance than their live-demonstration counterparts.

CHAPTER III

Methods

Participants

Twenty-six children from two urban elementary schools and one autism clinic in two cities in eastern Oklahoma, all with autism spectrum disorders and ranging in age from three to five years old, served as participants in this study. After institutional review board approval, permission was obtained from the principals as well as their pre-k autism specialist teachers at the two schools. Permission was also obtained from the clinic administrators. Each child whose data were used submitted a parental consent form. Students in both schools and the clinic (N = 26) participated in 12 sessions of video modeling and live demonstrations that taught and allowed students to practice techniques that improve motor skills. The video modeling and live demonstrating groups each had (N=13) participants.

Equipment

Materials and equipment required for use during the study included:

1. A small soft hand ball for a catching task: the ball is 7 inches in diameter and 120 grams in weight, and features a textured no-slip grip. Small size for small hands, perfect for age group of 3 to 5 years (not recommended for age 6 and up).
2. Hacky sacks for a throwing task: cotton-crocheted multi-color hacky sack, filled with plastic beads.
3. Stopwatch for standing balance tasks: shows hour, minute, second. Size (L x W x H): 8.0 x 6.4 x 2.0 cm.
4. Wide and long duct tape for walking task: the tape is 1-⅞ in. wide. Indoor, silver in color, for general purpose.

5. Targeted signs for a throwing task: a smiley face on the wall.
6. Small balloons for a catching task.
7. Small classroom chair for standing balance task.

Tasks

The motor tasks were chosen according to given deficits in motor skills. This study used four motor tasks to assess the expected improvements in motor-skills performance. These tasks were assigned after respondents observed the video-modeling programs and live demonstration. According to the Movement Assessment Battery for Children Second Edition (MABC-2) and other measurements, ball skills and balance activities are suitable for 3-16-year olds, and are widely used for children with ASD (Brown & Lalor, 2009). However, the motor tasks used during this study have been adapted in their measurements and assessments by the researcher to better fit the participants' ages and abilities.

Catch a Ball. Participants were required to stand on a marked spot about 10 feet away in distance from the ball being thrown the participant had to face the thrown ball with knees and waist slightly bent and feet shoulders-width apart. Before receiving the ball, each participant also had to prepare their hands by making their thumbs face together and slightly above the waist. This catching task required participants to softly catch the incoming ball and bring it toward their chest. The movement was demonstrated by the researcher with another teacher, but no other instruction was given. Two trials in the pre/post tests were given with a short rest of at least 30 seconds in between; the best of the two trials was recorded.

Overhand throw. While standing on a marked spot, participants threw a small hacky sack at a smiley-face target on the wall. To start, the participants were required to pull back their arm while rotating their upper body, leaning it in L-shape while their non-throwing shoulder faced the target. Then, stepping with the opposite foot, participants threw (de-rotating and releasing the ball), then followed through after releasing the ball through use of their arm and upper body. The researcher demonstrated the movement, but no other instruction was given. Again, two trials in the pre/post tests were given with a short rest of at least 30 seconds in between; the best of the two trials was recorded according to the performed elements of the skill.

Standing balance. With shoes on, participants were required to start the task by standing with one foot immediately behind the other foot, with the back foot's toes touching the front foot's heels. While participants did this, they were required to raise their arms up to shoulder-level. Before participants started the trials, the researcher demonstrated the skill with no other given instruction. Two trials were conducted, the second after a short rest of at least 2 min; the longest of the two time trials was recorded in seconds to the hundredths. When participants demonstrated incorrect form, such as incorrect feet placement, the researcher discarded the trial results.

Walking Balance. A long line of tape placed on the floor was used for this task. Participants began the movement by standing with one foot in front of the other. Then, participants stepped forward by placing one foot in line with the other. Participants continued their steps by placing their right foot in front of their left, placing the heel of their foot directly in front of the toe of the other foot as they, walked forward. Participants had to continue walking, step-by-step, for as many steps as they could while maintaining the correct form. Small spaces between steps during the walking balance task were allowed. The researcher demonstrated the walking balance task on the line before the participant performed the task, but no other instruction was given. Participants were given two trials, the best of which was recorded in the highest number correct steps. Walking outside the tape line or leaving long spaces between steps resulted in the researcher discarding the trial results.

Video Model Recordings. The researcher created a video model for each task that represented the performance of the specific skill. These video recordings featured peers who were the same age peers as participants. The researcher recorded his daughter, “Tala,” a 4-year-old enrolled in a pre-k class. McCoy and Hermansen (2007) investigated the relative efficacy of using different types of video modeling, such as peer modeling They concluded that using a peer as a video model proved more effective than other types in video modeling for students with ASD. Furthermore, Bandura, Ross, and Ross (1961) indicated that when the model is very similar to the participant’s age, the participant will be more likely to imitate what he or she sees. Kroeger et al., (2006) used peer video modeling to improve play and social activities for children with ASD. They suggested that using a same-age peer to model would be an appropriate method for modeling play and social skills for children with ASD.

The video models were downloaded from a professional camera, and then downloaded and edited on a laptop. The researcher used a MacBook laptop with a15”screen size to present the individual model for each task during video modeling sessions. The video models ranged from 6 to 25 seconds. The video recording of the catching skill was 3 seconds in length. The overhand throwing also lasted 3 seconds. Standing balance lasted 20 seconds. Finally, the walking balance lasted 9 seconds.

Experimental group. The researcher showed a video recording of the required task before each trial using a laptop screen placed before the participants. The laptop was placed on a high classroom table that was almost as tall as the participants watching the recordings. Then, after watching the video model of the task (catch, overhand throw, standing balance, heel-to-toe walking), the researcher gave a participant about 30 seconds to start the movement. If the participant did not begin to perform the task within 30 seconds, the researcher held the participant's hand and led them to the specific area to start the skill. Cues and help were allowed to be given by the researcher to avoid any difficulties or confusion that might happen with the participants during their performances in all sessions.

Error correction occurred for the experimental group throughout the sessions when the participant continued making mistakes in certain aspects of the skill. The researcher would then show the participant the video recording again, though only for the particular part in which the participant made repeated mistakes.

Live demonstration group. The researcher demonstrated each task (catch, overhand throw, standing balance, heel-to-toe walking) in front of the participant before each trial. A teacher or class specialist helped in demonstrating the catching skill with the researcher before each trial. The participants started the performance of the task after observing the live demonstration of the specific skill. Cues and other support were used during the practice time in all sessions.

With regard to error correction, the researcher immediately provided feedback by demonstrating specific actions in front of the participant. This occurred after each trial, using appropriate cues and support for the participants.

Procedures

The program included 12 sessions. 10 sessions were used for exercising catching, throwing, standing and walking balance tasks. Two sessions were used for the evaluation of the four skills in the pre/posttest for video modeling and live demonstrating groups. In the two schools, the researcher used the participants' classrooms, while in the clinic four classrooms were used for practice areas and were selected based upon the clinic's schedule. Each session lasted approximately 60 minutes twice weekly. The clinic sessions were scheduled for Mondays and Tuesdays. Tuesdays and Wednesdays were used for sessions at the schools.

The sessions were divided into four blocks, with one each for catching, overhand throwing, standing and walking balance. Within both groups, the researcher allowed 15 minutes for participants to practice each task. Every participant received a minimum of four trials in each session for each task in every block during each session.

The researcher used various types of equipment to ease participants' engagement for each skill. Most participants did not follow or respond to the instructions given by the researcher due to the impairment of their social skills. For example, a balloon was used to initiate the practice of the catching skill instead of using the planned ball to make the exercise more enjoyable for the participant. A smiley face target, roughly the size of a plate was hung on the wall for overhand throwing. In the standing balance task, the researcher placed a small chair in front of the participant for support. Participants could hold the top of chair with one or two hands during the practice time. Particularly, during the walking balance task, the researcher guided the participants while walking by placing their hands on the participants' feet to control the space between them and ensure that they walked in a straight line.

Measurements

The researcher created one sheet that included rubrics for all four skills. This rubric, used for both groups, evaluated catching, overhand throwing, standing balance, and walking balance. The sheet included a checklist for catching and throwing, as well as measurement tables for balance skills. These were immediately used after each trial during the pre-test and post-test. To ensure research accuracy during evaluation, some trials were recorded, and the researcher also relied on support from others, including teachers or specialists.

Catching Ball. The researcher used a checklist rubric to measure the performance of catching ball skills by tracking the appropriate movement elements in each trial.

A checklist of the skill's essential elements was used to score and evaluate each participant's performance. This was followed by a brief description of each element, allowing the researcher to check ensure each element was properly performed by participants.

Table 1: *Ball-catching Skill*

Cues	**Trial 1**	**Trial 2**
Face the ball		
Knees bent		
Feet position		
Hands position		
Soft catch toward chest		
Ball toward chest		

Description of the sub-components:

1. Face the Ball: Body faces the incoming throw ball
2. Knees Bent: Bent at knees with slight bend at waist
3. Feet Position: feet shoulder-width apart
4. Hands Position: Thumbs face together for balls above the waist, thumbs face away for balls below the waist
5. Soft Catch: "Soft" hands reach for ball, absorb impact.
6. Toward the Chest: Bring ball toward chest

Overhand throw. A researcher used a checklist assessment rubric to measure the performance of overhand throw.

Table 2: *Overhand Throwing Skill*

Cues	**Trial 1**	**Trial 2**
Turn Side to Target		
Elbow High (L) Shape		
Step in Opposition		
Correct Angle of release		
Follow Through		

A brief description for each element allowed the researcher to pick and check immediately the correct element that was correctly performed by a participant.

Description of the sub-components:

1. Turn Side to Target: Turn side to target while non-throwing shoulder faces the target
2. Elbow High (L) Shape: Pull arm back while rotating the upper body, leaning in an L-shape
3. Step in Opposition: Stepping with the opposite foot
4. Correct Angle of release: Throwing (de-rotating and smoothly releasing a ball),
5. Follow Through: Following through after releasing the ball using arms and upper body

Catching and throwing skills are evaluated cumulatively according to the correct performed element of each skill. These evaluations are used in pre/post-test for both groups.

Standing Balance. Timing was the major measurement of standing balance. Actual time achieved by the participants in each trial was recorded exactly in seconds to the hundredths.

Table 3: *Standing Balance Skill*

Trials	Obtained Time
1st	—-:—-
2nd	—-:—-

Walking Balance. The actual number of steps that the participants successfully walked forward along the line, following the corrected performance of the skill.

Table 4: *Walking Balance Skill*

Trials	Number of Obtained Steps
1st	
2nd	

Treatment of the Data

One of the most common pretest-posttest designs is the two group control group design. This design ensures that an experiment has a strong label of internal validity (Shuttleworth, 2009). In this design, both control and experimental groups are pre-tested and both groups are then post-tested. This design has strong internal validity, because the pretest ensures that both groups are equivalent and a pretest score is used as a covariate variable.

CHAPTER IV

Results

Demographics

Twenty-six participants were recruited for this study and they were randomly divided into two groups with 13 participants in each group. The control group with 13 participants was given live demonstration technique and experimental group with 13 participants were given video modeling technique.

Seven participants (27%) had moderate autism while 19 participants (73%) had severe autism. Eight were female participants and 18 (69%) were male participants. Participants' ages ranged from three to five years, with a mean value of 4.18 and standard deviation 0.57. Complete group-wise demographic data can be found in Appendix A.

Pretest Results

In the catching and throwing skills, pretest scores between two groups (live demonstration and video modeling) were compared to make sure that both groups had the same baseline parameters in order to determine the actual effect of video modeling treatment. Since data are nominal, Chi-Square tests were used to assess the difference in two independent groups of pretest scores. Results confirmed that there was no significance difference between Live Demonstrating and Video Modeling groups on pretest results of skills. Thus, both groups had similar catching and throwing characteristics prior to treatment.

Standing balance was measured by the number of seconds a participant's stood skill, and walking task was measured the number of steps a participant walked. Since these two variables were measured in ratio type scale, independent t-tests were used to assess the difference between two groups in pre-test scores. Pre-test score results revealed that there was no significant difference in standing balance between video modeling and live demonstration group, $t(24) = 1.67$, $p = .11$. Thus, it was determined that both video modeling and live demonstration groups had the same standing balance skill. However, pre-test score results revealed that there was a significant difference in walking balance between video modeling and live demonstration group, $t(24) = 2.48$, $p = .02$. The partial eta squared (effect size) value was .20. The main purpose of comparing the differences between two groups in pretest scores was to make sure that both groups had similar characteristics before giving them a treatment of video modeling. Then in order to assess the effect of video modeling technique, the posttest scores were later compared between experimental group (video modeling) and control group (live demonstration).

Catching Skill

There were four skills tested in this study using video modeling technique: Catching, Throwing, Walking, and Standing. The catching skill was evaluated by six elements (sub-skills) of the skill. Each element of the skill was scored during the performance of the skill. If the participant correctly performed the element of skill, the element was scored (1). If not, it was scored as (0). The six elements of catching skills were:

i. Face the ball

ii. Knee bent

iii. Feet position

iv. Hands position

v. Soft catch

vi. Ball toward the chest

The McNemar test was used to assess the differences on a dichotomous variable between two paired groups (pretest and posttest). It is more appropriate to use McNemar test to analyze the pretest-posttest study designs as well as analyzing the matched pairs studies (Bennet & Underwood, 1970; Siegel & Castellan, 1988). The McNemar test examines the level of change in the binary (dichotomous) variable from pretest to posttest.

Six different McNemar's tests were used to find the significant difference in six elements of catching skill between video modeling group and live demonstration group. Results revealed that there is no significant difference in **face the ball** catching skill between participants who were shown video modeling and participants who were given live demonstration, χ^2 (1) = .033, p = .05. The McNemar's test revealed that the participants from video modeling technique group significantly improved the **knee bent** element of catching skill with compare to participants from live demonstration group, χ^2 (1) = 10, p< .001, ϑ = .88 in post test scores. The phi effect size .88 indicates that there was a large effect of video modeling technique to improve the knee bent catching skill. Another McNemar's test revealed that the participants from video modeling technique group significantly improved the **feet position** catching skill with compare to participants from live demonstration group, χ^2 (1) = 6, p< .001, ϑ = .68. The effect size .68 indicates that there was a large effect of video modeling technique to improve the feet position catching skill. Results also indicated that the participants from video modeling technique group significantly performed better in **hands position** catching skills which compared to participants from live demonstration group, χ^2 (1) = 8, p< .001, ϑ = .68. The effect size .68 indicates that there was a large effect of video modeling technique for improve in the hands position catching skill. Similar results were found for **soft catch** and **ball towards the chest** of catching skills. Results indicated the participants who were in video modeling groups performed significantly better than participants who were in live demonstration group in soft catch skill, χ^2 (1) = 8, p< .001, ϑ = .78 and in ball towards the chest skill, χ^2 (1) = 11, p< .001, ϑ = .92.

Effect sizes of each element of catching skill indicate large effect of video modeling towards the improvement of catching skill. In short, participants who were shown video performed significantly better in catching skill than the participants who were shown the live demonstration for catching skill. Figure 1 to Figure 6 in appendix show the improvement of participants in the catching skills from pretest to posttest.

Overhand Throw Skill

There were five elements to evaluate of throwing skill. Each element of the skill was measured during the performance. If the participant correctly performed the element of skill, the element was scored (1). If not, it was scored as (0). The five elements of overhand throw skills were:

i. Turn Side to Target

ii. Elbow High (L)

iii. Step in Opposition

iv. Correct Angle of release

v. Follow Through

Since these elements of the skill were also measured by dichotomous response, therefore again McNemar test was used to assess the differences on a dichotomous variable between two paired groups (pretest and posttest). It was used to assess the null hypothesis that there was no change in participants who performance the tasks successfully using video modeling techniques. The McNemar's test revealed that the participants from video modeling technique group significantly improved in **turn side to target** element of overhand throwing skill with compare to participants from live demonstration group, χ^2 (1) = 5, p =.032 , ϑ = .62 in post test scores. The phi effect size .62 indicates that there was a large effect of video modeling technique to improve the turn side to target element of throwing skill. Similar results were produced in other elements of throwing skill. Participants who in video modeling groups performed significantly better in **elbow high, step in opposition, correct angle of release,** and **follow through** than participants in live demonstration group with the McNemar's test statistics values, χ^2 (1) = 8, p =.004; χ^2 (1) = 10, p< .001; χ^2 (1) = 6, p =.016; and χ^2 (1) = 11, p< .001 respectively and the effect size were 0.78, 0.88, 0.68 and 0.92 respectively. Results indicated that the treatment of video modeling technique produced significantly better improvement in the throwing skill than live demonstration technique. These trends of results are also shown in appendix from Figure 7 to 11.

Standing Balance

The evaluation depends on the obtained time of standing balance. In this age, this is considered a difficult skill, so it was expected no one would stand for a long time because they were weak in balance skills. So, the standing balance skill was measured by the time duration (minute, seconds, and part of second). Before analyzing data, these values were converted into seconds. A dependent t-test was used to find the significant difference in the standing balance skills of participants before the treatment of video modeling and after the treatment of video modeling. Results revealed that there is significant improvement in the level of standing balance skill using video modeling technique, t(12) = 2.23, 0= .02.

Examination of the raw scores showed that one participant had longest duration balance skill which made it as an outlier case. This participant was subsequently removed from the posttest analysis. When this outlier was removed from the posttest, the result did not change, indicating that the groups were significantly different, t(11) = 3.05, p = .05. The descriptive and inferential results with and without the outlier for standing balance are shown in the following table.

Table 5: *Raw Scores*

	Pretest Standing Balance (in seconds)		Posttest Standing Balance (in seconds)				
	M	SD	M	SD	df	t	Sig
With Outlier	0.96	2.09	4.88	6.90	12	2.23	0.02
Without outlier	1.01	2.17	3.32	4.17	11	3.05	.005

Results with and without the outlier case indicated that participants who were in the video modeling groups stood longer than participants from the live demonstration group (see Figure 12 in the appendix).

Walking Balance

Another dependent t-test was used to assess the significant difference in the walking balance skill of participants before the treatment of video modeling and after the treatment of video modeling. The evaluation counted successful steps on the line. It is also considered as a difficult skill for autistic children in this age because they are generally poor in balance skills. Results revealed that there was significant improvement in the level of walking balance skill using video modeling technique, $t(12) = 6.50$, $p< .001$. Participants who were in video modeling groups performed better in taking steps than participants from the live demonstration group. (see Figure

13). Another way of looking for the effect of treatment is to compare the scores of control and treatment group instead of pretest and posttest scores. Since there was a significance difference in the pretest scores in walking balance skills between video modeling group and live demonstration group, the ANCOVA (Analysis of Covariance) procedure was used to find the significance differences in the post tests results of walking balance skills between live demonstration and video modeling group after partialling out the effect of pretest results. The dependent variable posttest walking skill was compared between two groups (video modeling and live demonstration) controlling the covariate of pretest walking skill. The results indicated that the covariate, pretest walking skill, was not significantly related to posttest walking balance skill, $F(1, 23) = 27.51$, $p = 14$. There was a significant difference in the posttest walking skill between the video modeling and live demonstration group after controlling the effect of the pretest score, $F(1, 23) = 10.60$, $p < .001$, $\eta 2 = .32$. Moreover, walking Balance skill is significantly improved in Video modeling than Live Demonstration. Results also suggested that Walking balance skill is significantly improved by 32% by using video modeling technique after controlling the significance effect of pretest scores (see ANCOVA table in the appendix).

Another hypothesis was to find the relationship among the four skills in video modeling group. There was a significant correlation between walking and standing balance skill, $r = .50$, $p=.04$. There was also a significant correlation between walking balance and overhand throw skills, $r = .59$, $p=.02$, as well as a significant correlation between walking balance and catching skills, $r = .58$, $p=.02$. Results did not show a significant correlation between overhand throw skills and standing balance. Similarity results did not indicate the significant correlation between catching skills and standing balance. In conclusion, results suggests that the overhand throw and catching skills are significantly related to the walking balance skill. The complete correlation matrix is presented in table 2. The researcher did not add all the components of catching and throwing skills rather analyzed it element-wise of both skills for each skill separately. Since the responses from these skills were dichotomous, it does not make sense to calculate the average of six elements of catching skills. That's why analysis of each component of catching and throwing was conducted separately. This way, more insight and specific information about catching and throwing skills can be obtained.

CHAPTER IV

Discussion

Introduction

Autism spectrum disorder is a complex developmental disability that can negatively impact motor skills acquisition or performance. The main purpose of this experiment was to investigate the effectiveness of using video modeling techniques to teach motor skills to preschool-level children with autism spectrum disorders as an alternative to the traditional live-demonstration method. This study hypothesized that the video modeling group would show greater improvement in catching, overhand throwing, and standing and walking balance than the live demonstrating group, and that there would be a correlation between the development of ball skills (catch and overhand throw) and balance skills (stand and walk). Twenty-six children with ASD were randomly assigned to one of two groups, either video modeling or live demonstrating, and they undertook initial testing of their performance in catching, overhand throw, and standing balance and walking balance. After the participants completed 10 sessions, during which they demonstrated these skills, the researcher assessed the children again through a post-test.

Findings

The impact of video modeling, as compared with live demonstration according to this study's findings, closely matched the initial hypotheses. Standing balance's result was not expected, as individuals with autism-spectrum disorder typically demonstrate a greater deficiency in balance-related skills than other skill areas due to their deficit in balance skills. In this study, the video modeling program aimed solely to improve motor skills and to examine the effectiveness of this technique over live demonstration. Unfortunately, because no specific studies were found in the existing literature regarding the effectiveness of video-modeling techniques in the development of catching, throwing, standing and walking balance tasks, and it is difficult to compare the present findings with other studies.

First hypothesis, significant differences were found in catching and throwing tasks in the experimental group. Catching skills were further tested by six elements, and as well as throwing skills were measured by five sub-components. The elements, or sub-components, of each skill represented the completed performance of each task. Catching requires an individuals to depend on their internal body space by using proprioceptive feedback and isolating the use of the external visual by discounting feedback around them. They depend only on their body space in the internal visualization of the brain and limit the use of visual feedback from the surrounding environment (Izawa et al., 2012). Also, according to Whyatt & Craig (2011), tasks that involve anticipatory control, such as catching an oncoming ball, are difficult for children with autism using perception-action strategy in which the action requires coupling to perception in the brain. The author therefore hypothesized that using video-modeling techniques would naturally stimulate those receptors, ultimately resulting in the child's ability to positively maintain and improve catching skill performance. The result revealed that children in the video-modeling technique group showed remarkable improvements in correct performance of all required parts of catching. Most children in the video modeling group became more capable and confident in the correct performance of all of the catching skill elements than the children in the live-demonstrating group. The only related study found in the literature about using video modeling to improve gross and fine motor skills, even though different tasks of gross motor skills were used, found children with ASD who used video modeling showed more proficiency in the performance of gross-motor than fine-motor tasks through video modeling (Mechling & Swindle, 2012).

Mechling and Swindle's (2012) findings are in line with the present findings. Overhand throwing, a gross motor skill, showed greater improvement among children in the video-modeling group than in the control group. The present studies reflected the difficulties in overhand throwing exhibited by individuals with ASD. Colebourn et al., (2016) stated that children with ASD also showed difficulties with generating force and determining the proper orientation and direction of the object when throwing. The video-modeling technique, when used with throwing skills, may have helped to positively stimulate these receptors to enhance an ASD individual's ability to learn to perform this task, and contributed to the differences in throwing-skill scores between the groups.

The control group did not show improvement in catching and throwing skills after using the traditional method of teaching motor skills as live demonstration. The results of both tasks in the control group supported the findings of the literature regarding the existing deficiency of motor skills in individuals with ASD, especially in the performance of catching and throwing skills among children with ASD. Ament et al. (2009) indicated that the impairment of ball skills including catching and throwing are usually associated with individuals having ASD.

In the following hypotheses, Lirgg et al. (2018) stated that balance skills with eyes opened depend on varieties of complex process that require vision and full reliance on sensory input from proprioceptor and vestibular organs. Most literature indicates children with ASD have greater impairment in static and dynamic balance skills in general than in other non-balance tasks. Unfortunately, no studies used a video-modeling technique to improve balance skills. Furthermore, most of the studies evaluated only the ability of children in the performance of balance tasks for the purpose of determining their level of deficiency in these tasks, rather than focusing on the improvement of balance skills. Graham et al. (2014) confirmed that children with

ASD showed weakness in standing on one leg, and they tended to lose balance more quickly than other children. However, during this study's standing-balance tasks, children with ASD in the video-modeling group showed increased improvement in their ability to control their body and stood for more time than children in the control group. This result was surprising as they demonstrated a greater deficiency in standing balance during the pre-test. The development in this task suggested the importance of visual nutrition provided by the video-modeling technique as a natural stimulation for balance receptors. Just six children in the pre-test's experimental group performed the standing skill while the rest of the children did not perform the skill. However, video modeling significantly improved standing balance, with some children standing for longer periods and with less visible difficulty. Only four children in the live-demonstrating group demonstrated improvement, and they appeared to struggle to perform the required tasks in spite of practice. Video modeling may, then, have contributed to the difference in standing balance scores between the groups.

Walking balance skill is considered an activity dependent on one's vision, as well as other sensory inputs. In this activity, the brain must exhibit control over the body, as participants walk along a line as closely as they can. Participants using video-modeling showed better proficiency in the performance of walking balance task. Walking balance improved by 44% with use of a video-modeling technique. Mechling and Swindle's (2012) research also supported the present findings with walking skills as a gross motor skill, though they used different methods and skills. There was significant progress in gross-motor skills in the ASD participants, as reflected by an increase in the number of correct trials following the introduction of video modeling.

The third hypothesis was that there was a relationship between ball skills and balance skills. In general, children with autism have a great deficiency in balance skills, as well as in catching and throwing, but this deficiency is not as pronounced as in balancing. It was hypothesized that significant improvement in catching and overhand throwing skills through video modeling techniques could lead to improvements in standing and walking balance as well. Leary and Hill in (1996) suggested that the impairment of balance skills negatively impacts development of social skills, causing high avoidance of activities that require balance skills, thereby decreasing independence. This suggestion could apply to the practice of other motor skills as well, and the impairment of balance skills could also prompt avoidance in the performance of those motor skills. The present findings showed a significant relationship between the improvement of catching, throwing, and standing with the improvement of walking balance skills, while there seemed to be no association in scores between standing balance and such ball skills as catching and throwing tasks.

Implication for Practice

This study could allow for improvement of motor skills and engagement, as well as increasing the impact of educational and therapeutic methods used in teaching children with ASD. The video-modeling technique helped some children with ASD to acquire new motor skill after program completion. To illustrate, both the video-modeling and live-demonstrating groups in the pretest showed clear difficulties in performing such basic catching skills as facing the ball, bending their knees, and soft catch of the ball toward their chest. Additionally, many lacked the ability to perform most of the elements required in throwing. For example, some children struggled to catch or throw, and after watching a live demonstration of catching or throwing skill by the researcher, they acted as if it had been the first time they had seen the skill performed. However, the participants' performance of catching and throwing improved after using video-modeling techniques to teach both skills. From the third session, the improvement in performance was noticeable through participants' increased ability to closely imitate ball-catching-and-throwing patterns after watching the video modeling.

The live-demonstrating group acquired catching and throwing skills more slowly. Also, those in the live-demonstration group appeared to do worse in their performance of balance tasks, especially in standing skill. Graham et al. (2014) confirmed that children with ASD showed weakness in standing on one leg, and they lost balance earlier in comparison to typical children. However, a few students in the video-modeling group began to imitate the skill after watching a video model of the skill to be performed after the fourth session. They showed progress in acquiring the standing balance which is considered the hardest skill in the study, and this task had the least numbers of participants achieve an acquisition of standing compared to other skills in the study.

The most surprising result of this study occurred in the walking balance task. Only three of the 13 participants in the video-modeling group could walk five or more steps during the pretest. However, after using video modeling the other 10 participants showed improvement in their walking balance with the farthest distance walked during the post-test being 13 steps. In the live-demonstrating group, only five students were able to walk nine steps. Although this difference was a somewhat small number, it was nonetheless significant and supports the effectiveness of the use of video modeling in teaching a new motor skill to preschoolers with ASD.

In addition, to video-modeling's effectiveness in supporting the acquisition of motor skills, the technique also contributed significantly to an increase in performance level for children weak in the four tasks. For instance, some children with ASD can catch and throw, and demonstrate standing and walking balance, with forms that are mostly correct, but there is still room for improvement in some elements or parts of the skill. For example, some children can catch a ball by facing the ball with bent knees, their feet and hands in the appropriate position to prepare to receive the ball, but could not catch the ball by bringing it toward their chest. In throwing tasks, such elements of the skill as turning their side to the target, elbow high, or stepping with the opposite foot during the performance were sometimes absent. In standing balance tasks, the biggest issue was in placing one foot immediately behind the other. Moreover, some children struggled to maintain their steps while demonstrating walking balance along a line by taking longer spaces than allowed between steps, or walking correctly before losing their control by walking out of the line. However, the video-modeling technique was more effective in improving their motor-skills performance than using live-demonstrating techniques. Some students persisted in repeating mistakes in form, such as catching a ball with their arms instead of their hands until the eighth session, but with continued use of video modeling they eventually corrected their performance. To conclude, children with ASD may have received better feedback or drew a clearer picture of whole-motor skills through video modeling than with live communication with a teacher.

Second, social skills in children with ASD improved tangibly during the use of video modeling meant to practice motor skills. As known, ASD can hamper one's ability to interact socially and communicate when compared to their healthy peers. According to Marris (1999) these impairments can lead to great deficits in their ability to quickly engage others in socialization and their ability to utilize social communication skills. Through observation and follow up during this study, it was noted that some children with ASD did not even respond or react to any verbal and physical communication, and acted as not appearing aware of provided instruction or orders to perform a motor task. They appeared less motivated to engage in motor-skill activities. In fact, these impairments were mostly related to the severity of ASD and sometimes to the age of the individual. These impairments can therefore build barriers for individuals with ASD, making it difficult for them to join and interact in physical activities with such personal trainers as parents, teachers, and therapists, and definitely in interacting with methods used in learning or teaching motor skills.

However, results from the study suggest that the video-modeling technique might occupy the missing gap in communication, playing the role of the researcher in teaching motor skills for a majority of the participants in the video-modeling group. The improvement of performance and correction of errors confirmed the ability of individuals with ASD to communicate better and get optimal feedback by perceiving and performing skills through video modeling. Some children with severe ASD and non-verbal symptoms communicated and interacted with the video models by watching and copying a skill's patterns. Some children struggled in performing the standing balance task. Later, during 10 sessions in which participants watched a recording of standing balance models four times, the video was able to attract participants to communicate and perform with the required ask. This positive interaction with video-modeling appears to lead to an improvement in standing balance, either in correct position or for a longer time. Similar improvements in engagement and interaction were found in the other three tasks: catching, throwing, and walking balance. As found in the study for Kroeger et al., (2006) that video-modeling contributed to greater improvement of social-play activities than the uninstructed group in learning the play activities through 15 sessions.

The live-demonstrating group did not show the same improvement in interaction and engagement through practicing and learning motor skills while watching a live demonstration of tasks by the researcher. Children with ASD watched a live demonstration of the required tasks 40 times over 10 sessions, but from observations by the researcher they largely did not show a similar attraction and interaction. Lack of interest and attraction to the live demonstration technique may have affected progression of their motor skill ability. For example, four children in the live-demonstration group did not interact or pay attention to the provided technique during any of the sessions, and they largely appeared to ignore each demonstration provided by the researcher. Bellini and Hopf (2007) indicated that individuals with ASD face challenges and difficulties in dealing with their impairments, especially in communication and social interaction. To conclude, it was apparent that improvement of engagement level that represents the interaction with live-demonstration techniques was much less than the achieved positive engagement reflected in use of the video-modeling technique.

Evidence suggests use of the video-modeling technique in teaching motor skills must be aligned with schools, clinics, and families. Using video modeling to teach motor skills is a supportive technique that requires a physical education teacher, therapist, or parent to provide instruction and required feedback for children with ASD if they are to acquire or improve their motor skills. As previous research mentioned, video modeling is an advanced and effective approach to providing a visual support and instruction for children with ASD (Charlop-Christy & Daneshvar, 2003; D'Ateno, Mangiapanello, & Taylor, 2003; Nikopoulos & Keenan, 2003). To illustrate, during the first two sessions of the first week, most children started to watch a video model with full attention before each task, but they did not respond or perform the required task. During the second week, children started to watch a video model of a task, and go immediately to the specific area for performance, especially those that involved catching, throwing, and walking balance. The performance of these tasks were weak, especially in standing and walking balance. Some students took considerable time to begin performing the task and appeared confused. During the third week, better performance of catching and throwing was observed for some children, who applied most of these skills' sub-components during positive trials of walking balance. Reed (2012) argued that children with ASD spend more effort in focusing on one stimulus at the expense of other important stimuli in the environment; he suggested that video-modeling is a unique learning method for teaching through observation, as a student watches and imitates the video model. The significant progress in engagement convinced the researcher of the effectiveness of video-modeling techniques in teaching motor skills for children with ASD, as opposed to the live-demonstration technique, which did not appear to significantly motivate a child with mild or severe ASD to perform a motor task.

In addition, the video-modeling technique was essential to facilitating steps or sub-components for each motor skill by providing all instruction in one video model instead of providing live feedback by the researcher. Dwyer and Credo (2010) explain that children with autism have a deficit in language and speech. Therefore, due to the impairment of language and speech for children with ASD, communication with a child concerning specific feedback about a sub-component of a skill is difficult. For example, the most difficult task of this study for most children was standing balance; it was difficult to start the task, especially in immediately placing one foot behind the other foot. In the live-demonstration group, even after demonstrating the task in front of participants and correcting errors throughout ten sessions, only three students showed mastery in the performance of the task. However, in the video-modeling group, most participants started placing their feet in the correct position while watching the video model and even before the start of their trials. To conclude, children with ASD were better able to acquire correct task patterns of tasks through watching video models, and there was no need for the researcher help to facilitate the explanation of the whole skill or part of it.

Video modeling appeared to be an enjoyable technique for children with ASD and helped them to establish positive relationships with the researcher in an educational environment suited for teaching motor skills. The results of using the video-modeling technique to instruct children also suggested positive relationships may be established through such strategies. The comparisons between video demonstration and live demonstration results and interactions helped to determine which group was more impacted and engaged. To illustrate, most participants in both groups in the early sessions did not welcome or show signs of positive feeling toward the researcher while teaching motor tasks likely because of their weakness in their social ability to make friends or develop positive relationships. However, the video-modeling technique quickly established relationships between most participants and the researcher. For example, through the pretest and, especially, the first two sessions, most participants tried to avoid contact with the researcher or avoided watching video models of the provided task. Then, the children gradually began to interact with the researcher, largely smiling, and paid more attention to the video models. Some of them expressed their apparent happiness and pleasure through laughter while watching a video of a girl their age modeling a task. The participants with ASD appeared happy, greeting the researcher with such informal phrases as “Hi” or “Bye,” and they sometimes high-fived after each trial. These positive behaviors occurred using the video-modeling technique, and indicated the trust and close relationships between the researcher and with each participant that may result from its use.

On the other hand, children with ASD in the live-demonstration group were also slow to develop relationships with the researcher. Further, though, they neither completed their trials nor reflected any response after watching live demonstrations several times. The researcher tried to make sessions more fun by using such cues and equipment as a balloon for catching and throwing or a smiling face as a target for throwing tasks, but they did not show same positive impacts as the video-modeling group in building relationships with the researcher. Only a few participants appeared to be happy and started to show positive relationships with the researcher, but the rest showed less interest to and happiness toward the trainer. To conclude, using video modeling was an enjoyable technique for children with ASD and helped them to establish positive relationships and behaviors toward the researcher while sharpening specific motor skills.

Limitations

As with any research study, there is a possibility for flaws in design, data, and interpretation. In this study, one consideration that needs to be taken into account is that the study was designed to investigate large number of participants with ASD of different genders and levels of severity in their autism. However, the relatively small number of participants prevented significant gender and autism-level diversity for the purposes of the study. Consequently, the generalizability of the study results with respect to other genders and autism levels are limited.

The class environment in which this study took place limited participants' engagement in watching the video or live models during the first week of sessions. To illustrate, most classes for children with ASD designs have enjoyable and educational equipment such toys, games, puzzles to help children to learn and stay busy. These objects proved to be a barrier to the study, distracting participants from the tasks given to them. Participants sometimes preferred to play with a toy more than watching the video-modeling, or took significant time to respond to each trial. However, from the second session onward, the classroom was adapted to be empty of any external influences that might limit participant in watching both techniques. Also, the transition from one task to another became faster when the classroom did not have any objects that might distract the attention of children with ASD.

For some participants, taking medication on session days appeared to negatively impact motor-skill performance. Isolation and lack of motivation were the most observable signs of difficulties for participants after using medication, which in turn limited their abilities to engage in the practice of motor tasks with their other peers. However, making up the session on another day proved to be an optimal option for those students who took medication on session days.

Using a peer live model in teaching children with ASD motor skills instead of an adult may have made a difference in the improvement of catch, throw, standing balance, and walking balance. However, in real world usually a live model of motor skills will be done by a teacher as an adult.

Recommendations and Future Research

Since the video modeling appeared to improve participants' ability to learn and perform motor-skill tasks, the results of this study were encouraging. Over the course of only 10sessions video-model observation and exercise of motor skills, participants showed an observable progress in their performances after 40 trials for each task. The video-modeling technique appears to have been instrumental in teaching children with autism catching, overhand throwing, standing and walking balance techniques. Further research can be conducted with longer interventions for 2-5-year-old preschool children with ASD, which might indicate greater improvements in the performance of motor skills, especially for such difficult tasks as demonstrating standing balance. Therefore, the length of intervention using video-modeling techniques may allow for instruction of a greater variety of motor skills or allow instructors to teach more complex tasks. The results of this study suggest that employing a physiological test, such as using heart rate monitors while examining moderate-to-vigorous motor skills may be worthy of consideration in future research. In consequence, expanding the video-modeling intervention program over a broader window of time, and with a broader set of skills, may lead to remarkable progress for children with autism in the acquisition and improvement of motor skills.

In addition, using video models of motor tasks during skill instruction reflected an enhanced educational process for children with ASD ranging in age from two to five years. The differences in scores between the video-modeling and live-demonstrating groups suggested the participants responded more favorably toward video-modeling than live demonstrations. This technique helped to facilitate and deliver the essential explanation of a required task with no feedback required from the researcher. Participants in the video-modeling group appeared to be better informed and derive greater enjoyment during motor-task performance. However, future research on the impact video-modeling techniques in teaching complex motor skills for children with autism should focused on providing an action story for participants older than 5 years, instead of showing the regular video models used during this study. Creation of such a video model can include a single skill or several complex motor skills, including more information through advanced cues and sound effects. For example, a video model can include, along with a demonstration of basic motor skills, a story about an excellent student who can catch a ball correctly. This story can also be provided with such cues as sound effects such as music. Future research may also examine the relationship between the improvement of motor skills and academic progression using video-modeling techniques during educational processes.

Finally, it is important that the findings of this study be generalized for use in schools, clinics and homes. Future research can be conducted with a larger sample size from special-education classes in schools and clinics specializing in autism. The research can be expanded to include parents of children with autism to participate in the research, showing their children video models while at home. As smart tablet use among children 3 to 5 years old is becoming more common, using tablets to play video models of motor tasks can be done by physical education teachers, physical therapists, and parents, and can help generalize the positive impacts of this study’s findings. To conclude, the usage of video-modeling techniques to improve motor tasks for children with ASD provides grounds for future research, including the lengthening and broadening of intervention programs, such as use of video-modeling technology in other education sources and for other learning processes, thereby generalizing the method for larger communities of children with autism.

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Appendix

Table 6: *Demographic Information of Participants (N=26)*

		Video Modeling (N = 13)		Live Demonstration (N = 13)		Total (N = 26)	
	Level	N	%age	N	%age	N	%age
Level of Severity	Moderate ASD	5	38.50%	2	15.40%	7	27%
	Severe ASD	8	61.50%	11	84.60%	19	73%
Gender	Female	3	23%	5	38.50%	8	30.80%
	Male	10	77%	8	61.50%	18	69.20%
Age	Ranges	3.2 to 4.90 (M=4.16)		3.10 to 5 (M=4.20)		3.10 to 5 (M=4.18), SD = .57	

Table 7: *ANCVOA Table*

Tests of Between-Subjects Effects

Dependent Variable: Post-Walking Balance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	255.546[a]	2	127.773	11.002	.000	.489
Intercept	393.756	1	393.756	33.905	.000	.596
PreBalnce_OS	27.508	1	27.508	2.369	.137	.093
Group	123.149	1	123.149	10.604	.003	.316
Error	267.108	23	11.613			
Total	1143.000	26				
Corrected Total	522.654	25				

a. R Squared = .489 (Adjusted R Squared = .444)

Table 8*: Correlation Matrix among Four Skills*

Correlations

		Post-Standing Balance	Post-Walking Balance	Overhand Throw	Catching Skills
Post-Standing Balance	Pearson Correlation	1	.499*	.236	.345
	Sig. (1-tailed)		.041	.219	.124
	N	12	13	13	13
Post-Walking Balance	Pearson Correlation	.499*	1	.589*	.584*
	Sig. (1-tailed)	.041		.017	.018
	N	13	13	13	13
Overhand Throw	Pearson Correlation	.236	.589*	1	.952**
	Sig. (1-tailed)	.219	.017		.000
	N	13	13	13	13
Catching Skills	Pearson Correlation	.345	.584*	.952**	1
	Sig. (1-tailed)	.124	.018	.000	
	N	13	13	13	13

*. Correlation is significant at the 0.05 level (1-tailed).

**. Correlation is significant at the 0.01 level (1-tailed).

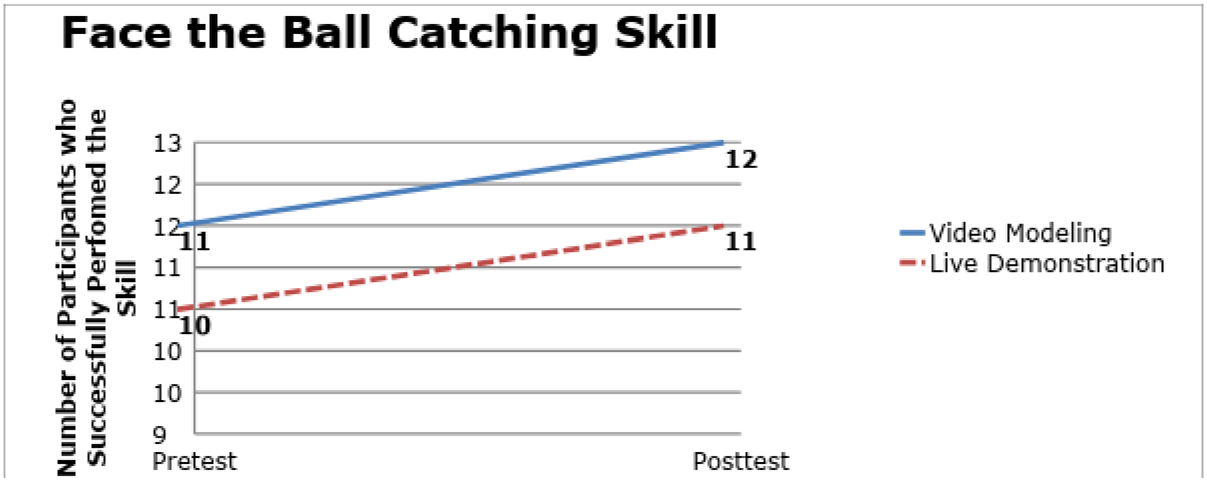

Figure 1

Participants who successfully completed face the ball of catching skill

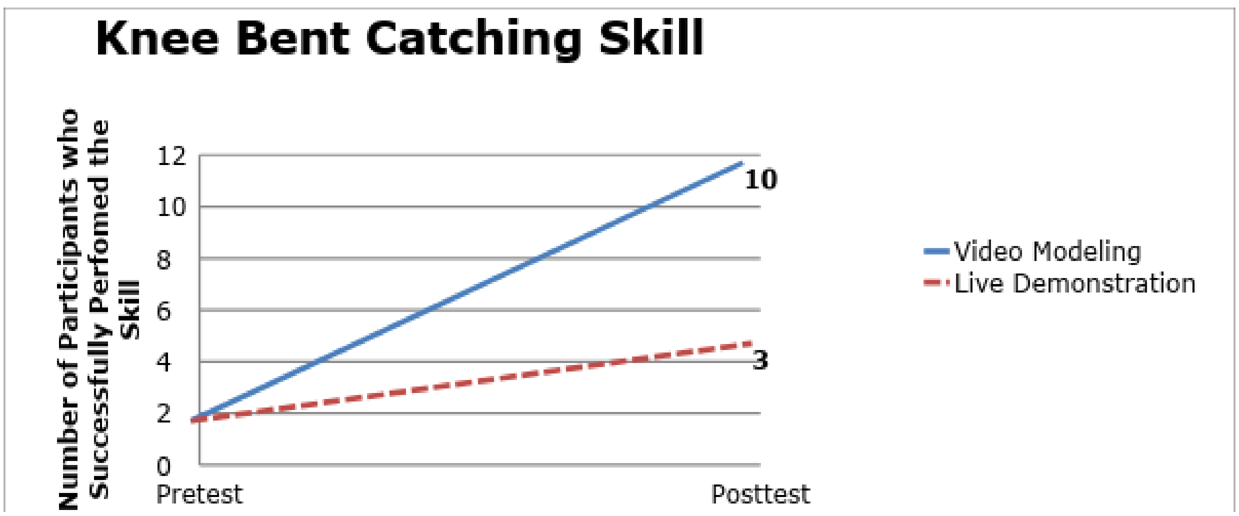

Figure 2

Participants who successfully completed knee bent of catching skill

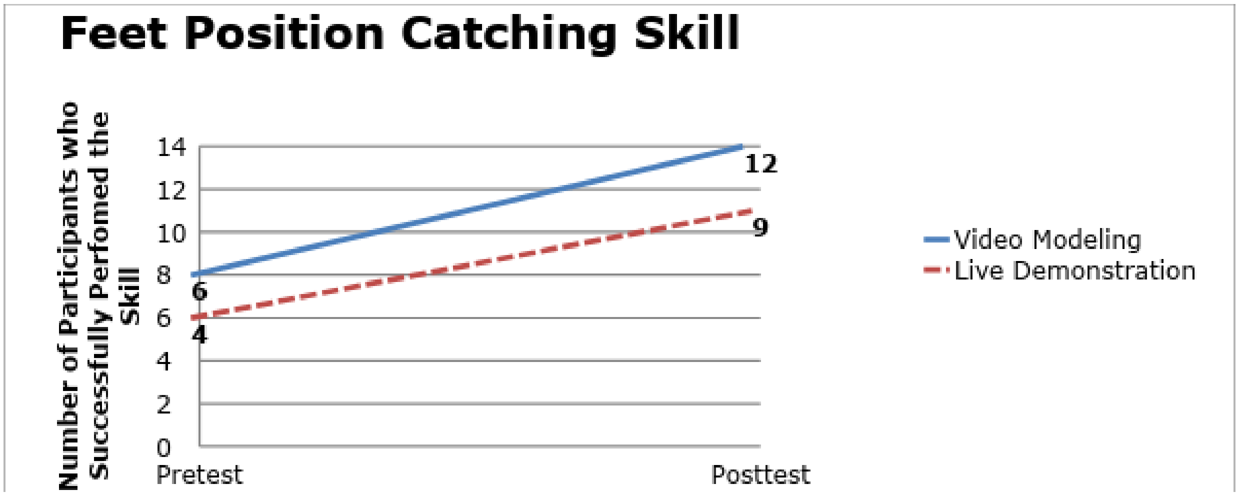

Figure 3

Participants who successfully completed feet position of catching skill

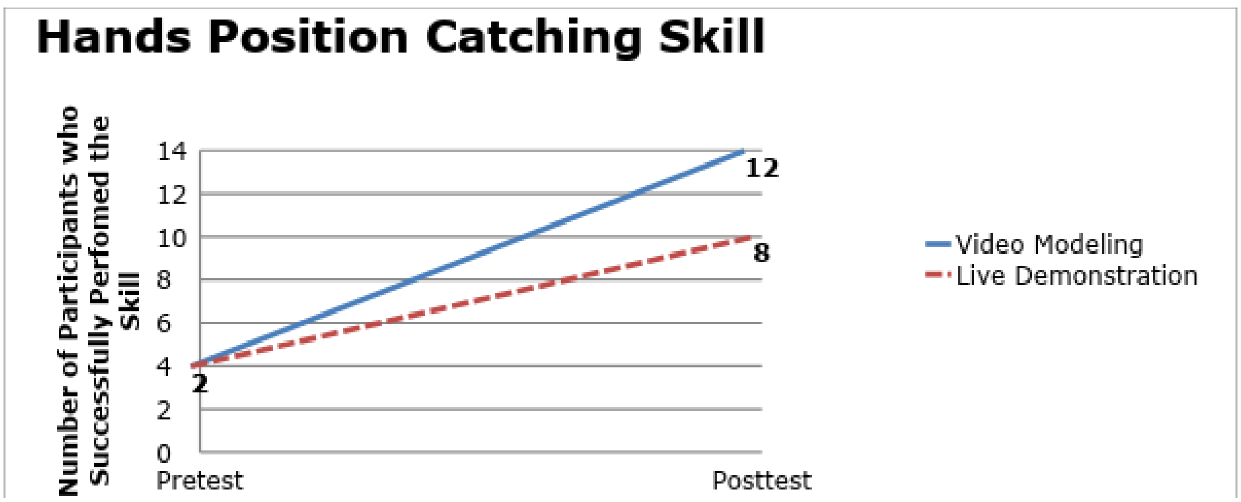

Figure 4

Participants who successfully completed hands position catching skill

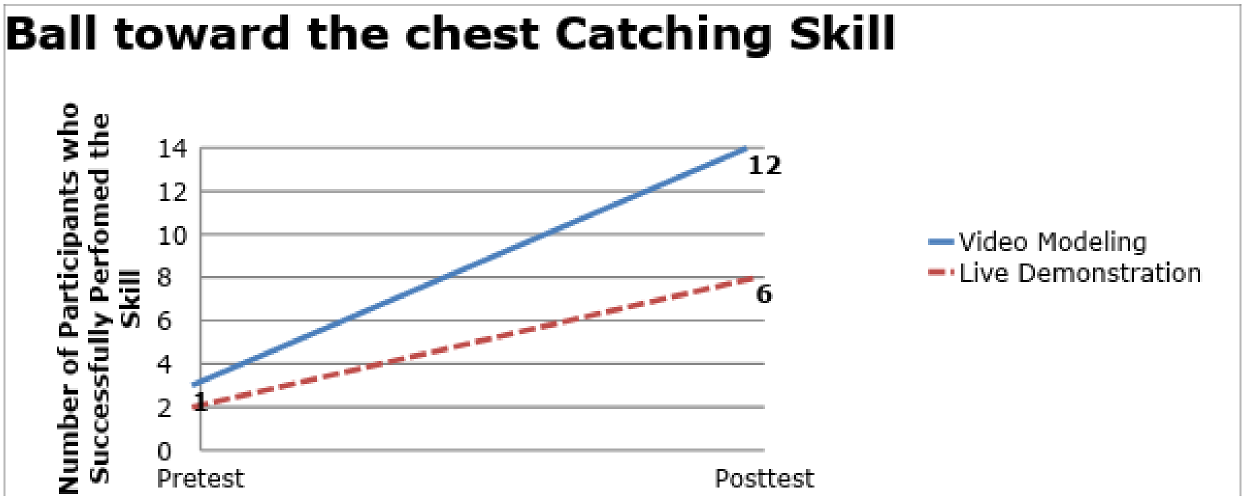

Figure 5

Participants who successfully completed ball towards the chest of catching skill

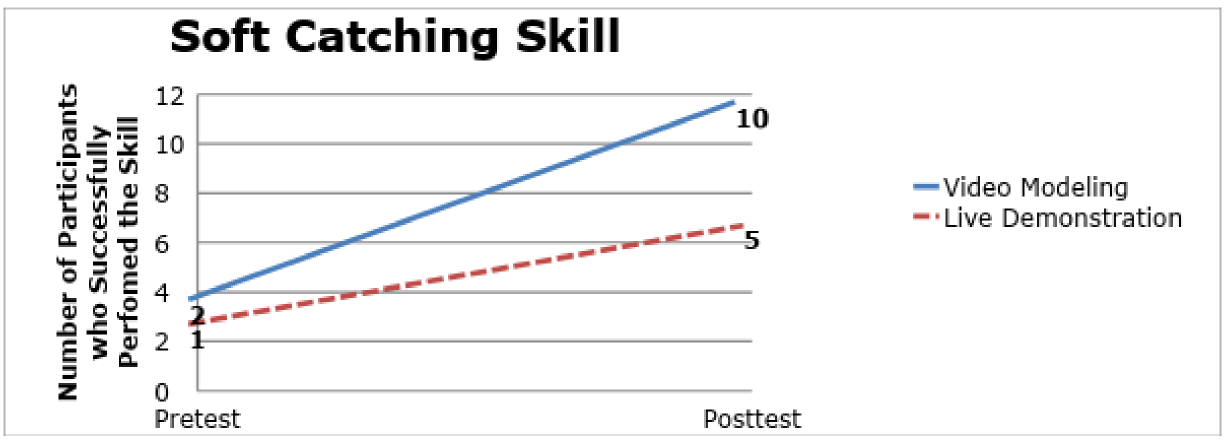

Figure 6

Participants who successfully completed soft catching skill.

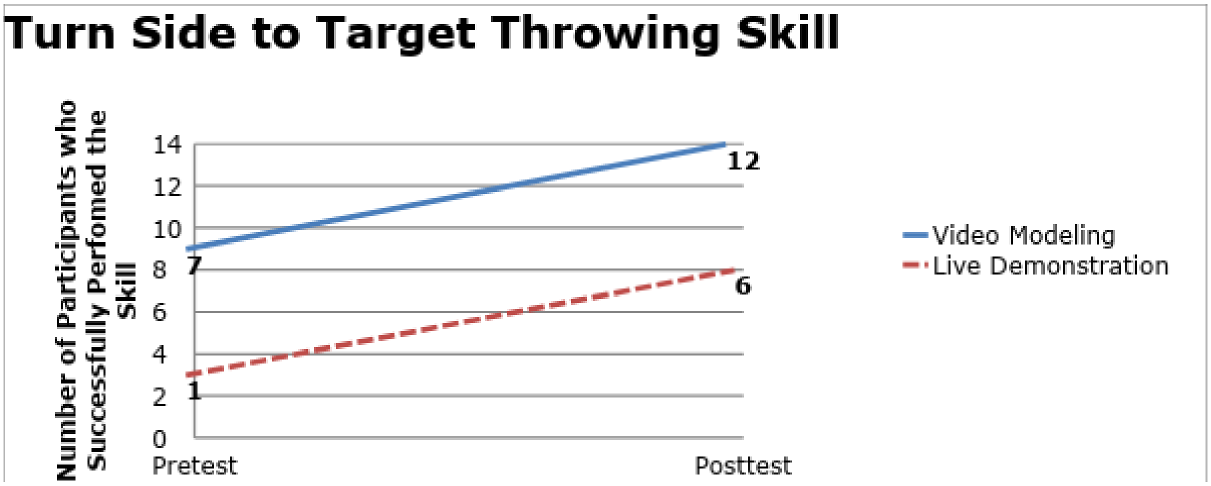

Figure 7

Participants who successfully completed turn side to target of throwing skill

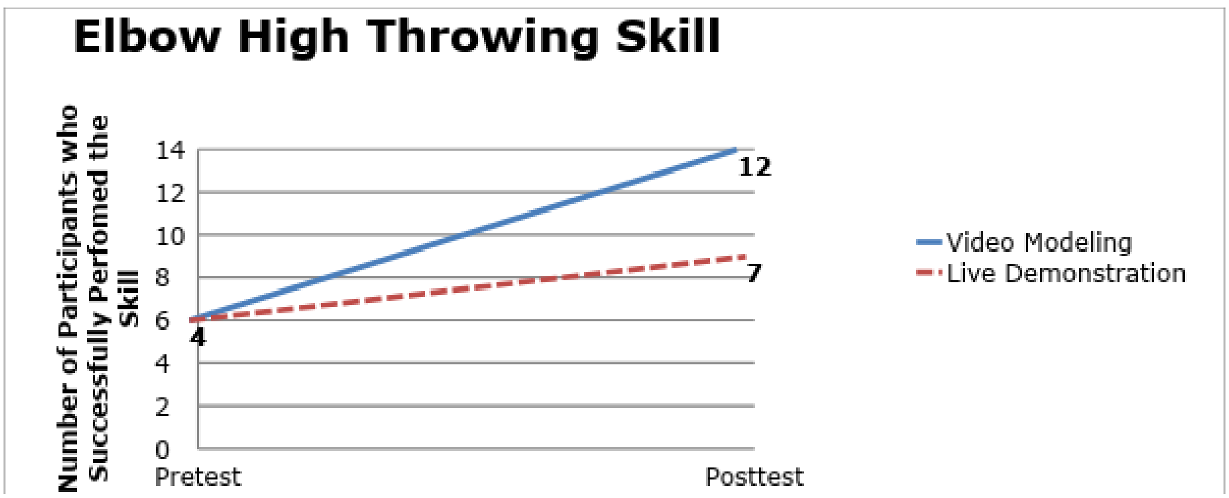

Figure 8

Participants who successfully completed elbow high of throwing skill

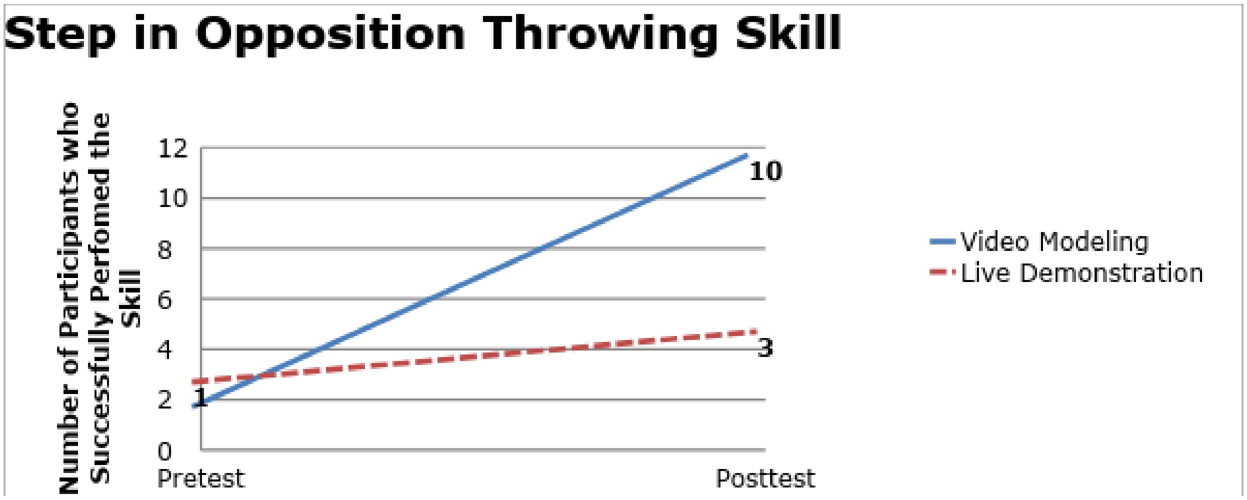

Figure 9

Participants who successfully completed step in opposition of throwing skill

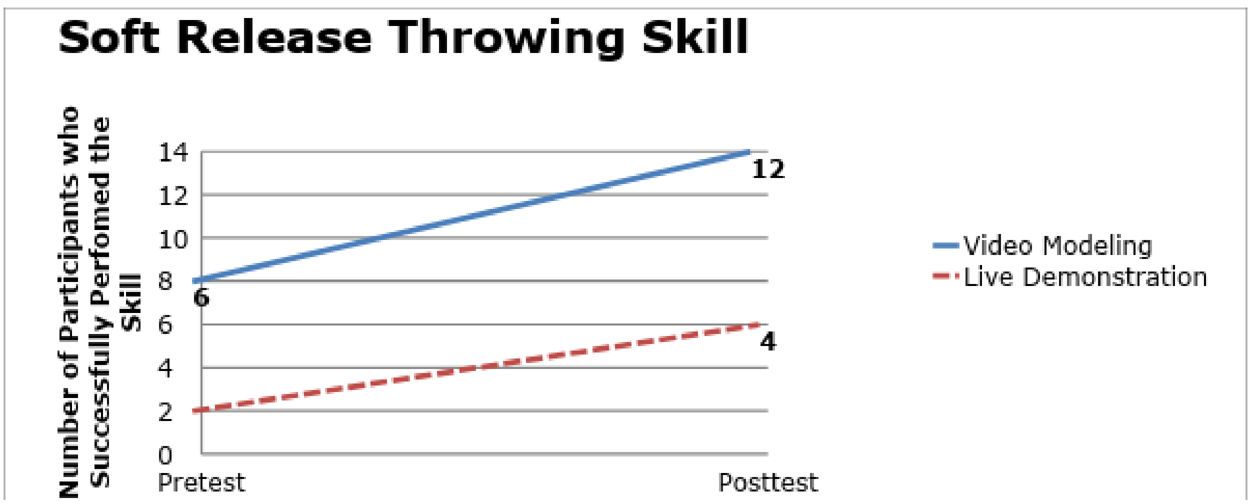

Figure 10

Participants who successfully completed correct angle of release in throwing skill

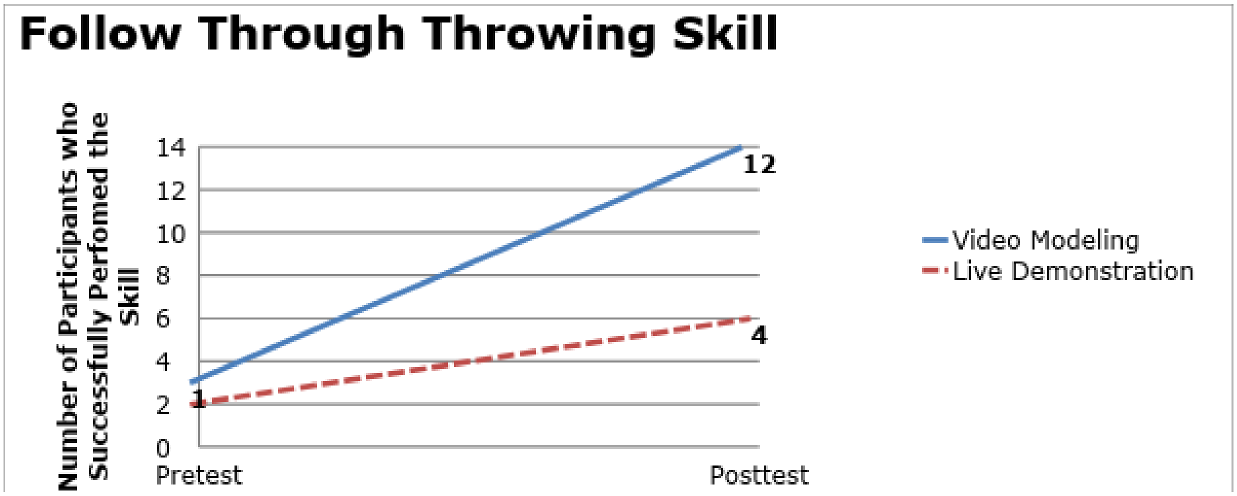

Figure 11

Participants who successfully completed follow through of throwing skill

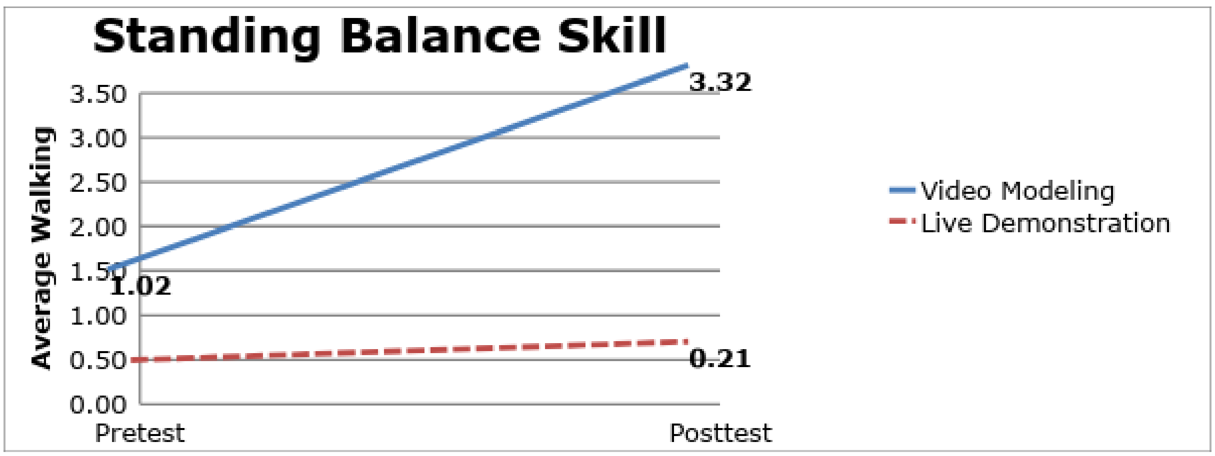

Figure 12

Participants who successfully stood and balanced in the number of seconds (without outlier)

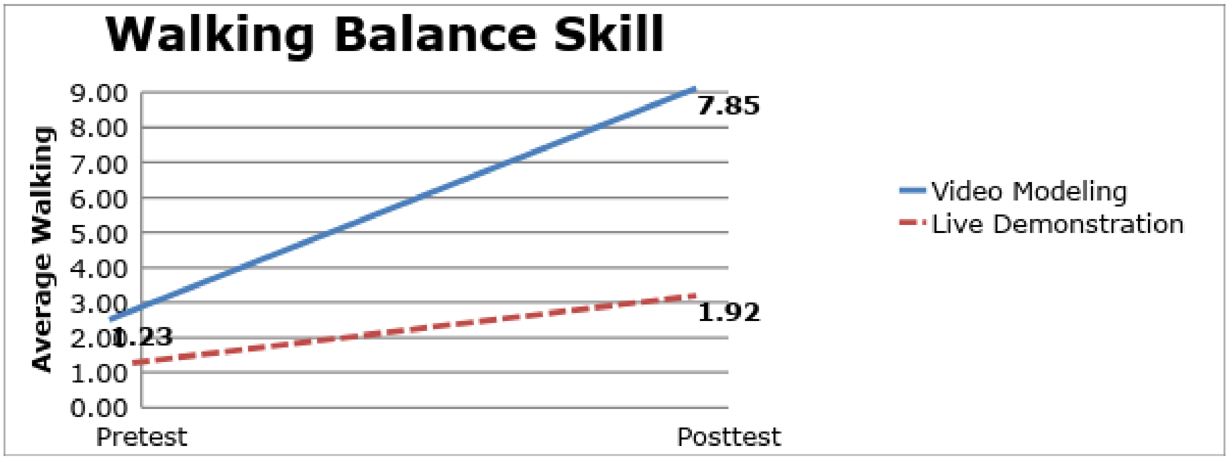

Figure 13

Participants who successfully walked and balance in number of steps

UNIVERSITY OF ARKANSAS

To:	Atyh Abdullah M. Hadadi
From:	Douglas James Adams, Chair IRB Committee
Date:	02/21/2018
Action:	**Expedited Approval**
Action Date:	02/21/2018
Protocol #:	1802101009
Study Title:	The Effectiveness of Using Video Modeling Techniques to Improve Motor Skills for Preschool Children with Autism Spectrum Disorders
Expiration Date:	02/15/2019
Last Approval Date:	

The above-referenced protocol has been approved following expedited review by the IRB Committee that oversees research with human subjects.

If the research involves collaboration with another institution then the research cannot commence until the Committee receives written notification of approval from the collaborating institution's IRB.

It is the Principal Investigator's responsibility to obtain review and continued approval before the expiration date.

Protocols are approved for a maximum period of one year. You may not continue any research activity beyond the expiration date without Committee approval. Please submit continuation requests early enough to allow sufficient time for review. Failure to receive approval for continuation before the expiration date will result in the automatic suspension of the approval of this protocol. Information collected following suspension is unapproved research and cannot be reported or published as research data. If you do not wish continued approval, please notify the Committee of the study closure.

Adverse Events: Any serious or unexpected adverse event must be reported to the IRB Committee within 48 hours. All other adverse events should be reported within 10 working days.

Amendments: If you wish to change any aspect of this study, such as the procedures, the consent forms, study personnel, or number of participants, please submit an amendment to the IRB. All changes must be approved by the IRB Committee before they can be initiated.

You must maintain a research file for at least 3 years after completion of the study. This file should include all correspondence with the IRB Committee, original signed consent forms, and study data.

cc: Cathy D Lirgg, Investigator

TULSA

PUBLIC SCHOOLS

Lanier Elementary School

"Excellence and High Expectations with a Commitment to All"

02/20/2018

To Mr. Atyh Hadadi,

I am the principal of Lanier Elementary. Ms. Jessica Caldwell has agreed to allow you to work toward kinesiology study by working with students in her classroom for students ages 3 – 5 with developmental delays. Specifically, you will be working with students who have a suspected category of autism. I understand that you will obtain signed consent forms from the students' parents prior to working with them in the classroom.

Ms. Caldwell will be happy to cooperate with you to help you achieve your goal within her classroom. You may e-mail her at caldwje@tulsaschools.org. You may also contact me at adamsbe@tulsaschools.org or call Lanier Elementary at 918-833-9380. Thank you.

Sincerely:

Mrs. Betty Adams

Principal of Lanier Elementary / TPS

1727 S. Harvard Ave. | Tulsa, OK 74112 | 918-833-9380 | FAX: 918-833-9393 | www.tulsaschools.org

TULSA PUBLIC SCHOOLS

Exceptional Student Support Department

EQUITY CHARACTER EXCELLENCE TEAM JOY

2/2/18

To Whom It May Concern:

Atyah Hadadi has approached our district about fulfilling the duties of his kinesiology study for his degree with our students in pre-k autism programs. Atyah has visited Hoover Elementary and connected with Ms Kathy Davis, our teacher for developmental delays and autism. Kathy is well-experienced and had a really great exchange with Mr. Hadadi and is more than happy to facilitate him and his project with her students.

We are excited to help Mr. Hadadi with is project and to learn from him as well. Should you have any questions, please do not hesitate to reach out to me via email or phone. jamesgr@tulsaschools.org or 918-746-6708.

Mr. Hadadi has provided us with a written overview of his project, his contact information and parent consents to be signed by participating parties. We request a copy of signed consents prior to his work with our students and appreciate his cooperation in this matter.

Sincerely:

Greg James

Greg James

Executive Director of Exceptional Student Support

DESTINATION EXCELLENCE

www.tulsaschools.org

The Effectiveness of Using Video Modeling Techniques to Improve Motor Skills for Pre-school Children with ASD
Principal Researcher: Atyh Hadadi
Faculty Advisor: Dr. Cathy Lirgg

This is a parental permission form for research participation. It contains important information about this study and what to expect if you permit your child to participate.

Your child's participation is voluntary.

Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision whether or not to permit your child to participate. If you permit your child to participate, you will be asked to sign this form and will receive a copy of the form. We must also have your child's assent to participate in this study.

INVITATION TO PARTICIPATE

Your child is being invited to participate in a research study about improving motor skills by using video model and live demonstration teaching techniques at the Griffin Promise Mission Clinic in Broken Arrow. Your child is being asked to participate in this study because he/she has an autism that could affect basic motor skills such as fine and gross motor skills. Using both technique of video modeling and live demonstration through an intervention program will help to improve motor skills.

WHAT YOU SHOULD KNOW ABOUT THE RESEARCH STUDY

Who is the Principal Researcher?

The principle researcher is Atyh Hadadi
A Ph.D student at the University of Arkansas
College of Education and Health Professions
Phone: 479-966-5689
Email: ahadadi@uark.edu

Who is the Faculty Advisor?

Faculty Advisor is Dr. Cathy Lirgg
Associate Professor
College of Education and Health Professions
(HHPR)-Health, Human Performance, & Recreation
Phone: 479-575-6667
Fax: (479) 575-5778
Email: clirgg@uark.edu

What is the purpose of this research study?

The purpose of this study is to examine the efficacy of using video modeling approaches to improve motor skills for children with Autism Spectrum Disorders.

Who will participate in this study?

16-20 children with Autism Spectrum Disorders is the expected number of preschoolers with ASD from 3-5 years old.

The Effectiveness of Using Video Modeling Techniques to Improve Motor Skills for Preschool Children with ASD

Principal Researcher: Atyh Hadadi

Faculty Advisor: Dr. Cathy Lirgg

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INVITATION TO PARTICIPATE

Your child is being invited to participate in a research study about improving motor skills by us-ing video model and live demonstration teaching techniques at the Hoover elementary school in developmental delays and autism. Your child is being asked to participate in this study because he/she has an autism that could affect basic motor skills such as fine and gross motor skills.

WHAT YOU SHOULD KNOW ABOUT THE RESEARCH STUDY

Who is the Principal Researcher?

The principle researcher is Atyh Hadadi
A Ph.D student at the University of Arkansas
College of Education and Health Professions
Phone: 479-966-5689
Email: ahadadi@uark.edu

Who is the Faculty Advisor?

Faculty Advisor is Dr. Cathy Lirgg
Associate Professor
College of Education and Health Professions
(HHPR)-Health, Human Performance, & Recreation
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The Effectiveness of Using Video Modeling Techniques to Improve Motor Skills for Pre-school Children with ASD
Principal Researcher: Atyh Hadadi
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INVITATION TO PARTICIPATE

Your child is being invited to participate in a research study about improving motor skills by using video model and live demonstration teaching techniques at the Lanier elementary school in developmental delays and autism. Your child is being asked to participate in this study because he/she has an autism that could affect basic motor skills such as fine and gross motor skills.

WHAT YOU SHOULD KNOW ABOUT THE RESEARCH STUDY

Who is the Principal Researcher?
The principle researcher is Atyh Hadadi
A Ph.D student at the University of Arkansas
College of Education and Health Professions
Phone: 479-966-5689
Email: ahadadi@uark.edu

Who is the Faculty Advisor?
Faculty Advisor is Dr. Cathy Lirgg
Associate Professor
College of Education and Health Professions
(HHPR)-Health, Human Performance, & Recreation
Phone: 479-575-6667
Fax: (479) 575-5778
Email: clirgg@uark.edu

What is the purpose of this research study?
The purpose of this study is to examine the efficacy of using video modeling approaches to improve motor skills for children with Autism Spectrum Disorders.
Who will participate in this study?
6 preschooler children with Autism Spectrum Disorders (3-5 years old) is the expected number will participate in this study.

What will your child be asked to do?
Your child's participation will require the following: