# IMPROVING THE OVERHAND THROWING PERFORMANCE OF CHILDREN WITH AUTISM SPECTRUM DISORDER

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BY

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# DEDICATION

Winston Churchill once said, “Success is not final; failure is not fatal; it is courage to continue that counts.” I am dedicating this dissertation to my wife Mindy Adams and my son Luc David George Adams. For my wife Mindy, you are the best decision I have ever made, and I am so happy for the family we are building. For my son Luc, you are the greatest gift your mom and I could have ever received. You are a constant motivation for me to better myself and provide you with every opportunity in life.

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ABSTRACT

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The purpose of this investigation was to compare the influence of three instructional conditions: (a) Direct Instruction only, (b) Direct Instruction plus Video Prompting, and (c) Direct Instruction plus Verbal Prompting on the performance of the overhand throw in children with autism spectrum disorder (ASD). Researchers have reported that children with ASD have consistently demonstrated delays in gross motor skill performance when compared to their typically developing peers (Berkeley, Zittel, Pitney, & Nichols, 2001). Therefore, there is a need to develop interventions specifically aimed at improving the gross motor skill performance of children with ASD. A total of six students with ASD, aged 8 to 13 years attending a private school in Texas, were recruited for this investigation. Results from this investigation expand on previous reports which have demonstrated video prompting to be an effective instructional condition to influence the performances of children with ASD.

*Keywords*: Autism spectrum disorder, video-based instruction, gross motor skill performance, video prompting, verbal prompting

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# CHAPTER I

# INTRODUCTION

Social and communication delays have long been recognized as core attributes of children with autism spectrum disorder (ASD; Centers for Disease Control and Prevention [CDC], 2016). The current mandates of the Individuals with Disabilities Improvement Act calls for the development of early intervention programs for infants, toddlers, and families, including programs for individuals with ASD (US Department of Education, 2004). Researchers have reported that children with ASD consistently demonstrate delays in the performance of gross motor skills when compared to their typically developing peers (Berkeley et al., 2001). These delays directly impact the daily lives of children with ASD by decreasing levels of participation in physical education and community-based physical activities (Mache & Todd, 2016).

## Autism Spectrum Disorder

Autism spectrum disorder is defined by the American Psychiatric Association (APA) as a group of developmental disabilities causing persistent difficulties in social use of verbal and nonverbal communication, social communication and social interaction, as well as, restrictive repetitive patterns of behavior, interests, or activities (APA, 2013). An individual diagnosis of ASD is categorized into three levels based on the support needed:

Level 1, requiring support; Level 2, requiring substantial support; and Level 3, requiring extreme support at all times (APA, 2013).

It is now estimated that 1 out of 68 children living in the United States have a diagnosis of ASD (CDC, 2016). ASD can be accurately diagnosed in young children 18 to 24 months of age through direct observation of behavior by a multidisciplinary team (e.g., psychologist, behavior analyst, speech language pathologist; Johnson & Myers, 2007; Mandell, Novak, & Zubritsky, 2005; Turner & Stone, 2007), although most children are being diagnosed after the age of 4 years (CDC, 2016). While there is no known cure for ASD, researchers have reported that early intervention programs that incorporate as evidence-based practices (EBPs), can significantly improve the performance outcomes in several different areas including the performance of gross motor skills (Liu & Breslin, 2013) and social skills (Hagopian, Kuhn, Strother, & Houten, 2009; Reichow & Volkmar, 2010).

## Performance of Gross Motor Skills

Improving the performance of gross motor skills contributes to successful participation in various types of activities and has been shown to increase the total amount of physical activity (Stodden et al., 2008). Children who have delays in the performance of gross motor skills are at a disadvantage when participating in a variety of physical activities, including individual and team sports, which can lead to a sedentary lifestyle (Barnett, Morgan, Van Beurden, Ball, & Lubans, 2011). For this reason, children, including those with ASD, need various opportunities with sufficient practice to

improve the performance of gross motor skills (Clark, 2007; Goodway & Branta, 2003). Further, researchers have reported that children with ASD have difficulty performing object control skills (i.e., overhand throw; Berkeley et al., 2001). For this investigation, the researcher focused on improving the overhand throwing performance of children with ASD who have an identified delay. Improving the overhand throw for children with ASD may be critical for successful participation in physical education classes, childhood games, and sports. Furthermore, the ability to consistently perform the overhand throw increases the likelihood that children with ASD will develop important functional motor skills (e.g., eye-hand coordination, weight shift, follow-through) leading to more skilled participation during active play, games, and sports (Society of Health and Physical Educators, 2015). For this reason, individuals working with children with ASD should implement EBPs that have shown efficacy over time (e.g., video prompting, verbal prompting).

## Use of Evidence-Based Practices

The Individuals with Disability Education Improvement Act (IDEIA, 2004) and Every Student Succeeds Act (2015) mandate that local education agencies use EBPs when teaching students with disabilities, including those with ASD. Several organizations, such as the National Professional Development Center on Autism Spectrum Disorder (NPDC, 2015), the National Autism Center (NAC, 2015), and the Council for Exceptional Children (CEC, 2018), have defined and reported on the development and implementation of EBPs. Additionally, the NAC, NPDC, and CEC

have designed evaluation criteria for practitioners, parents, policymakers, and researchers to use in identifying EBPs.

The application of EBPs in the physical education setting for children and youth diagnosed with ASD have led to improvements in: (a) opportunities for physical and social engagement with peers, teachers, support personnel, and others (NPDC, 2015); (b) life skill(s) development (Banda, Dogoe, & Matuszny, 2011); (c) activity levels (Sowa & Meulenbroek, 2012); and (d) observational learning (Odom, Collet-Klingenberg, Rogers, & Hatton, 2010). For the current investigation, direct instruction plus two EBPs (i.e., video prompting, verbal prompting) will be implemented and the effectiveness of each condition will be evaluated, specific to each participant's ability to perform the essential elements within the overhand throw. Researchers have reported that applications (apps), such as the app used in this investigation (i.e., Coach's Eye; Techsmith Corporation, 2018) can enhance teaching and support learning for children with ASD (Krause & Taliaferro, 2015).

## Application of Video-Based Instruction

Video-based instruction (e.g., video modeling, video self-modeling, video prompting) has been used to provide visual and auditory cues, including assistance in the performance of many functional skills (e.g., play skills) for children with ASD (MacDonald, Clark, Garrigan, & Vangala, 2005). Researchers who have implemented video-based instruction as an instructional strategy have reported behavior changes across multiple dependent variables, as exemplified by word recognition and punctuation

(Morlock, Reynolds, Fisher, & Comer, 2015), cooking skills (Graves, Collins, & Shuster, 2005), and social skills (Simpson, Langone, & Ayres, 2004). Bellini, Akullian, and Hopf (2007) reviewed numerous investigations where video-based instruction was implemented to improve multiple behaviors (e.g., social reciprocity, play behaviors, functional skills) for children with ASD. For these reasons, the primary researcher was interested in comparing the influence of direct instruction plus video prompting on the performance of the overhand throw for children with ASD.

Video prompting is a type of video-based instruction that has been identified by the NPDC as an effective instructional strategy to improve performance (e.g., time-on-task) of children diagnosed with ASD (Cardon, 2016; NPDC, 2015). When directly compared to other video-based instruction, such as video modeling, video prompting tends to be more effective for performance as video prompting enhances the learner's understanding of a movement through step-by-step instruction (e.g., What do you do first? What do you do next?; Cannella-Malone et al., 2006; Cihak, Alberto, Taber-Doughty, & Gama, 2006). Researchers have reported that video prompting is an effective instructional strategy for skills, such as shoe tying (Grab & Belfiore, 2016), daily living skills (Van Laarhoven, Kraus, Karpman, Nizzi, & Valentino, 2010), and aquatic skills for children with ASD (Yanardag, Akmanoglu, & Yilmaz, 2013).

For *practitioners*, video prompting allows for a sequential teaching and planning strategy (Cannella-Malone et al., 2006). Video prompting also provides practitioners the opportunity to focus on four stages of learning: (a) the acquisition of the skill, (b) the

fluency of the movement, (c) the maintenance of the performance, and (d) the generalization of the skill being performed (Bandura, 1976; Gies & Porretta, 2015). For example, video prompting can be used to present a sequential task analysis of a skill (e.g., overhand throw) to the learner through short video clips that can be followed by immediate practice and contingent feedback from the researcher (Cannella-Malone et al., 2006).

For the *learner,* video prompting provides: (a) a sequential learning sequence, (b) a highlighting of the key components of a skill, and (c) an immediate opportunity for reinforcement and feedback (Mechling, 2005). Video prompting also allows practitioners and learners the opportunity to continue skill practice through repetition until both feel confident that the components of the skill(s) have been met. The decision to implement video prompting in this investigation was based on the research cited above, as well as, the relative ease and efficiency with which the instructional strategy can be applied for the learner.

## Application of Verbal Prompting

Verbal prompting is a verbal cue provided by the instructor to assist in the performance of a desired behavior (Lavay, French, & Henderson, 2016). Given that children with ASD may struggle with receptive and expressive language (Sundberg & Michael, 2001), practitioners should use verbal prompts that incorporate the operational definition of each element of the target behavior. Verbal prompting provides practitioners with the opportunity to focus on a given skill or sequence of skills with the learner, while

reducing the number of errors (National Research Council, 2001). When used correctly, practitioners can apply verbal prompting to improve a variety of skills, such as play skills and social skills to learners with ASD (NPDC, 2015). Using verbal prompting, also allows the practitioner the opportunity to avoid negative feedback such as “no” or “not good enough” and instead focus on providing descriptive clues (e.g., point towards the target) needed for the learner to progress in the given task. Consistent verbal prompts should allow learners with ASD to form a clear understanding of the desired behavior (NPDC, 2015).

In summary, for the learner, verbal prompting provides a systematic strategy of identifying verbal cues that provide opportunities for improvement in an identified behavior (Sundberg & Michael, 2001). The goal of verbal prompting is for the learner to look at the instructor, respond appropriately to the verbal prompt, and complete the task at a higher rate of performance than what was previously performed (Sundberg & Michael, 2001). The ability of the learner with ASD to attend to a visual and auditory prompt is critical for improving the performance of motor skills (e.g., overhand throw).

## Framework of Study: Social Learning Theory

The primary researcher of this investigation focused on teaching a child with ASD a desired skill though the use of visual and/or auditory prompts. Social learning theory posits that cognitive and behavioral changes occur as a result of the learner identifying important components of an observed skill (i.e., visual, auditory) and differentiating between effective and ineffective movements (Bandura, 1976). Based on social learning

theory, the learner heightens his or her understanding of a specific behavior through the auditory and visual feedback within the observation of another individual modeling the desired behavior (Bandura, 1976). Therefore, the reenactment of a previously observed behavior performed by another individual should strengthen the behavior of the observer (Bandura, 1976).

According to social learning theory, the learner will go through four stages of learning based on his or her observation of a behavior: (a) attention, (b) retention, (c) motor reproduction, and (d) motivation (Bandura, 1976). The first stage, attention, allows the learner the opportunity to understand a complex motor behavior (e.g., overhand throw) and make positive identifications of the essential elements within that behavior (Bandura, 1976). The practitioner's responsibility is to: (a) instruct the learner on movements to which he or she should direct his or her attention, (b) provide the learner with multiple examples, and (c) repeat the presentation when complex behaviors are being observed.

The second stage of social learning theory is the ability of the learner to retain information (e.g., throw, follow through). This retention is accomplished through: (a) coding, (b) classifying, and (c) re-organizing information into familiar schemes (Bandura, 1976). Bandura (1976) explained coding as the process of the learner taking in an abstract view of a movement and then re-coding that movement into a higher coding, which increases generalization and future results. Classifying is the ability to weigh and integrate information from different sources based on the performance being observed

and verbally requested (Wood, Bandura, & Bailey, 1990). Reorganizing information into familiar schemes is the process of gathering information through the senses in a dynamic process where the individual builds on the current environment (Huitt, 2003). Within this second stage of social learning theory the learner begins grouping complex skills into patterns and translating action sequences into larger integrated units (Bandura, 1976). Once the learner understands the appropriate strategies to recreate a modeled behavior, he or she builds on earlier known movements and begins constructing a more complex arrangement of behaviors (Bandura, 1976). This arrangement of complex behaviors will reinforce the learner as he or she observes auditory and/or visually effective and ineffective modeled behavior; therefore completing the cycle of learning (Bandura, 1976).

In the third stage of social learning theory, motor reproduction begins the process of the learner reproducing the movements viewed (Huitt, 2003). The fourth and final stage of social learning theory focuses on intrinsic and extrinsic motivation gained from the reproduction of the movement. In this fourth stage, the environment delivers a consequence to the learner that changes the probability that the same behavior will be emitted again (Huitt, 2003). In this investigation, the process of the learner progressing to a mature overhand throw was based on the four stages of the social learning theory.

## Purpose

The purpose of this investigation was to compare the impact of three instructional conditions: (a) Direct Instruction only, (b) Direct Instruction plus Video Prompting, and

(c) Direct Instruction plus Verbal Prompting on the performance of the overhand throw for children with ASD.

## Definition of Terms

The following terms and definitions are essential to understanding this investigation:

*Autism spectrum disorder* (ASD) is defined by the APA as developmental disorder causing persistent difficulties in social use of verbal and nonverbal communication, social communication and social interaction, and restrictive, repetitive, patterns of behavior, interests, or activities (APA, 2013) .

*Behavior* is defined as an observable action performed by an individual which allows for systematic observation by another person (Richards, Taylor, & Ramasamy, 2014).

*Discrete movements* are movements that have a known beginning and end (e.g., kicking, throwing; Schmidt & Lee, 2005).

*Direct instruction* has been defined as instruction where the role of the learner is to reproduce a predicted performance response on cue (Mosston & Ashworth, 2008).

*Everyone Can* is an achievement-based curriculum (ABC) model for increasing physical performances, motor development, and physical activity opportunities (Kelly, Wessel, Dummer, & Sampson, 2010). The model is comprised of five essential components (i.e., Program Planning, Assessment, Implementation Planning, Teaching, Evaluation). *Everyone Can* is designed as an instructional strategy to assist the practitioner in the school system with establishing a plan for programming with goals and

objectives, assessing each student individually or in groups, beginning the implementation process, implementing a teaching style, and evaluating the progress of the student (Kelly et al., 2010). The essential elements within the *Everyone Can* overhand throw were specifically used in this study (Kelly et al., 2010).

*Instructional conditions* are the patterns of interaction between the teacher and student and are defined as the nature of decision making, which determines the teacher and/or student control during the instruction (Metzler, 2017).

*Motor development* is the change in motor behavior over a lifespan and the processes that underlie those changes (Clark, 2007).

*Motor performance* is an observable attempt made by an individual to produce a voluntary action and can be affected by temporary factors such as motivation, fatigue, physical conditioning, and arousal (Schmidt & Lee, 2005).

*Motor skills* are coordinated patterns of movements that include gross motor skills (e.g., running, jumping, throwing, catching, kicking), and fine motor skills (e.g., movement of fingers, toes; Schmidt & Lee, 2005). The focus in this investigation is to improve throwing performance.

*Verbal prompting* (i.e., auditory) is a verbal cue from the instructor to assist in the performance of a desired behavior (Lavay et al., 2016).

*Video prompting* (i.e., visual) is a type of video-based instruction which allows the practitioner the opportunity to break down a desired behavior (e.g., overhand throw) into sequential steps (i.e., side-orientation, T-position, hand above shoulder, stepping

with opposition, shoulder and hip rotation, follow through) for the learner to view (Banda et al., 2011).

*Wash out period* is defined as a period of time within a research investigation when a participant is taken off medication or intervention to eliminate effects of treatment (Roberts, Dusetzina, & Farley, 2015).

## Research Question

One research question guided this study:

Does the instructional condition of direct instruction plus video prompting have a greater impact on the performance of the essential elements of the overhand throw than direct instruction only or direct instruction plus verbal prompting?

## Limitations

This study is subject to the following limitations:

1. Generalizability of results is weakened by a small population size ($n$ = 6).
2. Length of study and number of times each instructional condition was implemented within this investigation could contribute to overhand throw performance.
3. Visual analysis to interpret the data may not generalize to whole population.
4. Participant's degree of effort during all performances was not measured.

## Delimitations

1. All phases of this investigation occurred in the same setting for each participant.
2. All phases throughout this study were video recorded.

3. Interobserver agreement was used to determine the percentage of essential elements performed for each overhand throwing trial.
4. Only one gross motor skill was analyzed (i.e., overhand throw) throughout the entire investigation.
5. Programming and assessment throughout this investigation was individually provided.

# CHAPTER II

# LITERATURE REVIEW

*Keywords*: Autism spectrum disorder, video-based instruction, gross motor skill performance, video prompting, verbal prompting

The purpose of this review was to examine relevant literature and evaluate the level of evidence and/or recommendation using the *Adapted Physical Activity Taxonomy* (*APAT*; Carano, 2014). The literature examined in the current review includes: (a) literature related to the delays in the performance of gross motor skills for children with ASD; (b) literature related to how motor learning delays impact the performance of gross motor skills for children with ASD; (c) literature specific to the evidence-based practices of video-based instruction (i.e., video modeling, video self-modeling, video prompting) and prompting (i.e., verbal prompting) implemented for children with ASD; and (d) literature on the application of social learning theory (Bandura, 1976) in predicting gross motor performance for children with ASD. Based on the purpose of this investigation being for children with ASD, this chapter specifically focused on the following topics:

1. Adapted Physical Activity Taxonomy
2. Performance of Gross Motor Skills
3. Motor Learning Delays Impact Performance
4. Video-Based Instruction
    A. Efficacy of Video Modeling

B. Efficacy of Self-Modeling

C. Efficacy of Video Prompting

4. Verbal Prompting

5. Social Learning Theory Predicts Performances

6. Summary of Findings

## Adapted Physical Activity Taxonomy

The design of the *APAT* assists adapted physical educators and scholars in evaluating and determining the level of evidence (LOE) and/or level of recommendation (LOR) for each piece of literature reviewed (Carano, 2014). For each relevant study reviewed, the LOE was determined based on the research design and findings. There were three possible LOE outcomes, which could be applied to each reviewed individual study. Level 1 indicated a strong study, Level 2 indicated a moderate study, and Level 3 indicated a weak study. The LOE was determined through rigorous evaluation of each section (i.e., introduction, method, results, discussion, other) of each piece of relevant literature. The levels of evidence (L) and table number (T) of each individual study are identified throughout this literature review and an abstract of each are provided in Appendix A. For example, the article by Pan, 2009 would be presented as follows: (Pan, 2009) [L2; T8].

Similarly, the LOR allows for three levels (i.e., A, B, C) for each individual evaluation of the literature based on *APAT* criteria (Carano, 2014). Determining a LOR of A was given when: (a) the overall outcome of the study resulted in significant value, and

could be applied to the educational, recreational, or adapted sport setting; (b) the consistent findings from two randomized-control trials, or meta-analysis were determined; or (c) the intervention had been validated and relevant to the disability population. A LOR of B was given when one of the above requirements was not met. A LOR of C was given: (a) when the recommendation from the study was not relevant to adapted physical activity; (b) when the recommendation was not based on improving physical activity, decreasing obesity, or improving quality of life; or (c) when the recommendation was based on opinion or field-based experience (Carano, 2014). The LOR for each reviewed study is provided within each table in Appendix A.

## Performance of Gross Motor Skills

Jasmin et al. (2009) [L2; T1] reported that gross motor skills are essential for the execution of daily living skills. Further, Sutera et al. (2007) reported that young individuals with ASD who had typical motor development for their age experienced decreased levels of severity in adulthood compared to those children who had delays in motor development. Motor abnormalities, including gross motor skills have been reported during infancy childhood, and adulthood for individuals with ASD (Brian et al., 2008; Fournier, Hass, Naik, Lodha, & Cauraugh, 2010). The numerous researchers reporting on gross motor skill delays for children with ASD demonstrate motor abnormalities are a potential attribute within a diagnosis and should be used to determine level of severity (Gowen & Hamilton, 2013). Developing gross motor skills has been reported by researchers to correlate with the improvement of several skills, including communication

(Gernsbacher, Sauer, Geye, Schweigert, & Goldsmith, 2008), playing and interacting with others (Clearfield, 2011). Therefore, delays in gross motor skills impact key areas of development for individuals with ASD (Leary & Hill, 1996).

Two sub-categories of gross motor skills are locomotor skills and object control skills (Ozonoff et al., 2008; Ulrich, 2000). Locomotor skills are defined as the ability to move oneself through space, while object control skills are the ability to manipulate and project objects (Haywood & Getchell, 2014); both have been identified as the foundation for more advanced motor skills (Staples & Reid, 2010) [L3; T2].

Berkeley et al., (2001) [L2; T3], reported that children with ASD performed gross motor skills in the poor to very poor category when assessed using the *Test of Gross Motor Development-2* (*TGMD-2;* Ulrich, 2000). Similar reports have been confirmed by multiple researchers (e.g., Ament et al., 2015 [L1; T4]; Emck, Bosscher, Beek, & Doreleijers, 2009 [L3; T5]; Green et al., 2002 [L2; T6]; Jansiewicz et al., 2006 [L2; T7]; Pan, 2009 [L2, T8]; Staples & Reid, 2010). These results may be attributed to the general belief that children with ASD exhibit robotic tendencies, demonstrate difficulties with motor planning, and have shown a deficit in retaining motor movements (i.e., motor learning) when executing movements requiring both sides of the body moving concurrently (e.g., overhand throw; Alexander & Schwager, 2012; Roth, Zittel, Pyfer, & Auxter, 2016). These results may also be attributed to evidence that individuals with ASD demonstrate atypical visual processing, which could have a direct relationship

with the child's ability to detect coherent motion and integrate sensory signals (Bertone, Mottron, Jelenic, & Faubert, 2003; Cook, Saygin, Swain, & Blackemore, 2009; Pellicano & Gibson, 2008).

## Motor Delays Impact Performance

Although not identified within the diagnosis of ASD, sensory motor processing delays have been reported by multiple researchers, and directly impact the quality of life for children with ASD (Fournier et al., 2010; Gowen & Hamilton, 2013; Haswell et al., 2009). One area of sensory motor processing where children with ASD have been reported as demonstrating delays when compared to their typically developing peers is motor planning (Glazebrook, Elliott, & Szatmari, 2008). Motor planning is the ability of the child to process the current state (e.g., ball at side) and the desired state (e.g., throw ball at target) of being into a sequence of motor movements (e.g., hand above head, weight shift, release ball towards target); motor planning is often determined before the movement is initiated (Gowen & Hamilton, 2013). Motor planning delays are generally assessed by recording reaction time, which is the time required to plan a task after receiving instruction (Glazebrook et al., 2008; Mari, Castiello, Marks, Marraffa, & Prior, 2003). Motor planning delays in ASD could be attributed to the individual attributes, as well as, the level of support needed within a diagnosis (i.e., Level 1, 2, 3) for children with ASD (Dillon, Adams, Goudy, McNamara, & Bittner, 2016).

For children, imitation is particularly important in learning a new skill and is a central component in motor planning. Researchers have specifically reported children

with ASD demonstrating delays in motor planning related to reach-to-grasp exercises (Mari et al., 2003) [L2; T9], aiming tasks (Glazebrook et al., 2008) [L3; T10], and object control skills (Gowen & Hamilton, 2013). Delays in the development of object control skills may be linked to the child with ASD not understanding the entire movement sequence (Gowen & Hamilton, 2013). Therefore, the child with ASD needs to build an action plan before beginning the movement. Hughes and Leekam (2004) noted that children with ASD are not aware of the consequences of his or her own movements as they pertain to the development of an action plan. Results reported by researchers have been used to better understand the difficulties children with ASD experience in understanding discrete movements (i.e., beginning, middle, ending) consequences when the task is action-based and consists of overlapping movements (e.g., overhand throw; Staples & Reid, 2010).

Determining the necessary steps to achieve a goal-directed action is generally considered a hierarchical process where the child breaks down the essential elements of a movement **(**Gentilucci et al., 2000; Gowen & Hamilton, 2013). Delays in hierarchical thinking may impact the child's ability to: (a) engage in discrete movements, (b) make in-the-moment adjustments, and (c) sustain the needed mastery of a skill to participate (Scharoun & Bryden, 2016) [L2; T10]. Despite these reports, results have varied for children with ASD in relation to motor planning, as several researchers have reported that children with ASD perform at the same level of performance as their typical developing peers (Gowen & Hamilton, 20013).

Motor adaptation is essential for children with ASD to complete daily tasks (e.g., gross motor skills; Gown & Hamilton, 2013). For children with ASD to successfully perform a variety of gross motor skills, the child must be able to adapt to external properties. External properties of the environment could include the weight and location of the object to be manipulated, as well as, short-term and long-term changes in the body (Shadmehr & Krakauer, 2008). Mostofsky, Bunoski, Morton, Goldberg, and Bastian (2004) reported that children with ASD were capable of making adaptations to their environment and completing a task (e.g., catching). Similar results have been confirmed by multiple researchers (Gidley et al., 2008; [L3; T11]; Haswell et al., 2009; Mostofsky, et al., 2004) [L3; T12], for children with ASD. Thus, much the same as their typically developing peers, children with ASD are capable of motor learning and can decrease the variability in motor abnormalities with increased practice and repetition (Gowen & Hamilton, 2013).

## Video-Based Instruction

Researchers have reported children with ASD have specific difficulties in making-sense of auditory instruction (Tissot & Evans, 2003). While children with ASD may have difficulties understanding auditory instruction, there has been evidence supporting video-based instruction (i.e., visual instruction) for this population (Tissot & Evans, 2003). In 2015, the NPDC recognized video-based instruction as an EBP for children with ASD. Subsets of video-based instruction include video modeling, video self-modeling, and video prompting (Hitchcock, Dorwick, & Prater, 2003; NPDC, 2015).

This NPDC recognition was given after the NPDC completed a review of literature where eight single case studies were identified which provided evidence for video-based instruction meeting the NPDCs performance criteria (NPDC, 2015). Within all eight studies, video-based instruction was implemented to improve a variety of skills, such as self-management (Apple, Billingsley, & Schwartz, 2005), complex play skills (D'Ateno, Mangialpanello, & Taylor, 2003; Taylor, Levin, & Jasper, 1999), and social skills (Kroeger, Schultz, & Newsom, 2007). While none of the research presented in this section focused on video-based instruction to improve gross motor skill performance, based on the review of literature video-based instruction, video prompting may enhance the learning of children with ASD and be applied successfully to increase the performance of gross motor skills.

**Efficacy of Video Modeling**

Children with ASD have demonstrated strengths in visual processing. Researchers has reported the use of video modeling to improve social skills (e.g., Charlop-Christy, Le, & Freeman, 2000; Charlop & Milstein, 1989; Simpson et al., 2004; Wert & Neisworth, 2003) functional skills (e.g., Norman, Collins, & Schuster, 2001; Shipley-Benamou, Lutzler, & Taubman, 2002) and play skills (e.g., Besler & Kurt, 2016; Ozen, Batu, & Birkan, 2012). Video modeling is a mode of instruction that uses video recordings through different devices (e.g., computer, laptop, iPad) to demonstrate a desired behavior or target skill (Franzone & Collet-Klingenberg, 2008). The structure of video modeling encompasses video recording an individual (not the learner) performing a skill correctly;

the video is then shown to the learner at a later time (Dowrick, 1999). Bandura (1976) reported that typically developing children can learn at a high rate through modeling.

Despite the literature supporting video modeling, there has been limited research examining video modeling as a way to improve the performance of gross motor skills. In one study, Mechling and Swindle (2013) [L2; T13] reported improved performance of gross motor skills (e.g., walking, jumping, kicking) for each participant ($n$ = 3). This lack of research indicates a need for more research related to the effectiveness of video modeling as an instructional strategy for children with ASD to improve their performance of gross motor skills.

**Efficacy of Self-Modeling**

Video self-modeling is a specific type of video-based instruction where the observer views targeted behaviors performed by himself or herself (Dowrick, 1999). Video self-modeling has been recognized as an EBP (National Autism Center, 2015). Results from a meta-analysis indicated that video self-modeling is an effective instructional strategy that can produce rapid changes in performances for children with ASD in both verbal and cognitive ability (Bellini et al., 2007). Video self-modeling has also been implemented as an instructional strategy to improve a variety of skills including: (a) social and communication skills (Buggey, 2005; Sherer et al., 2001) and (b) off-task behaviors (Coyle & Cole, 2004). Bandura (1976) reported that children learn a number of skills through observing the behaviors of others.

Implementation of video self-modeling for children with ASD should include exemplar performances of the targeted behavior performed by the child or youth with ASD. Thus, when the child or youth with ASD views the modeled behavior, he or she should observe an errorless behavior with all other extraneous footage deleted (Dowrick, 1999). Drawbacks of video self-modeling for children with ASD include: (a) an increased number of edits of the child with ASD performing the target behavior, (b) a decreased attitude from the child with ASD to cooperate, (c) a lack of understanding or inability from the child with ASD to complete the target behavior, and (d) an increased number of prompts needed for the child with ASD (Ganz, Earles-Vollrath, & Cook, 2011).

**Efficacy of Video Prompting**

Video prompting is a subset of video-based instruction and has been identified as an instructional strategy where the learner views segmented prompts that highlight the desired skill (e.g., stepping with opposition, releasing ball towards target; NPDC, 2015). This is followed by the learner attempting to correctly model the observed video demonstration (Banda et al., 2011). Researchers have reported that children with ASD best learn when instruction is structured and based on the current learning strengths of the individual, allowing them the opportunity to focus on one element of a skill at a time (Staples & Reid, 2010). For this reason, individuals working with children with ASD should implement multiple resources to increase the opportunities for learning. Children with ASD who have been provided multiple forms of support (e.g., visual, video-based

instruction) have demonstrated improvements in the performance of gross motor skills (Bremer & Lloyd, 2016) [L1; T14].

The instructional strategy of video prompting allows the instructor the opportunity to provide the learner with multiple views of a skill sequenced in consecutive steps (i.e., 1-2, 3-4, 5-6) and allows the learner to learn the skill from beginning to end. The use of video prompting may positively affect social and communication development, and provide greater opportunities for participation in age-appropriate activities (Cannella-Malone et al., 2006). Past researchers have reported positive outcomes for learning daily living skills, such as tying shoes and cooking (Bellini et al., 2007; Cannella-Malone et al., 2011; Delano, 2007; Mechling, 2005), transitional behaviors (Cihak, Smith, Cornett, & Coleman, 2012), and communication skills after implementation of video prompting (Sansosti & Powell-Smith, 2008). Video prompting has also demonstrated positive outcomes for learning aquatic play skills (Yanardag et al., 2013) [L1; T15]. The above outcomes reported by researchers demonstrate evidence supporting video prompting as an effective instructional strategy for performing or learning a skill for children with ASD.

## Verbal Prompting

Verbal prompting was recognized by the NPDC (2015) as an EBP for children with ASD and includes any verbal assistance to help an individual perform a behavior correctly (Akmanoglu-Uludag & Batu, 2005) [L1; T16]. This NPDC recognition was based on the results from 19 investigations in which prompting was successfully

implemented (e.g., simultaneous prompting; Akmanoglu & Batu, 2005; hand-over hand; Batchelder, McLaughlin, Weber, Derby, & Gow, 2009; tactile prompting; Shabani et al., 2002) for children with ASD.

Verbal prompting is one of five identified types of prompting (i.e., gestural, verbal, visual, model, physical). The hierarchy of least-to-most prompting begins with full independence (i.e., no prompts given) and ends with a full controlling prompt (i.e., physical prompt; Neitzel & Wolery, 2009). Due to the complexity of physical education classrooms and sports settings, verbal prompting offers a simplistic instructional strategy (Lee & Solomon, 1992), which should include the teaching identifying the: (a) targeted behavior, (b) target stimulus, (c) cues or task directions, and (d) activities and times of teaching (Neitzel & Wolery, 2009).

Verbal prompting allows the researcher the opportunity of providing assistance during the antecedent (i.e., prior to beginning the movement), behavior (i.e., during the movement) or consequence (i.e., after the movement; NPDC, 2015). Implementing verbal prompting as an instructional strategy has been associated with positive outcomes in communication skills, adaptive skills, play skills, academic skills, and on-task behavior (NPDC, 2015). Based on the literature, verbal prompting is the universal application for children with ASD.

## Social Learning Theory Predicts Performance

The concept of children learning through modeling or observing another person's behavior has existed for over 40 years within Bandura's social learning theory (1976).

This theory posits that the behavioral changes that occur in individuals are a result of the learner identifying important components of an observed skill both auditory and visually and differentiating between effective and ineffective movements based on that observation. Bandura (1976) reported that children acquire a vast number of skills by observing the performance of others with similar characteristics (i.e., age, gender, ethnicity) rather than by personal experience. Due to persistent difficulties in social and communication skills, children with ASD many times prefer learning through visual demonstration (Alexander & Schwager, 2012). Visual demonstrations can be cues provided in place of and/or in combination with verbal cues and used to provide information about the activity, steps to completion, and expected target behavior (NPDC, 2015).

Determining the type of visual support for a child with ASD depends on the child's identified strengths and may include a variety of options (e.g., peer-mediated instruction, video-based instruction). Designing a lesson plan that implements a visual cue (e.g., video prompting) should include: (a) communicating what skill is going to be demonstrated for the child with ASD, (b) informing the child with ASD that he or she will be performing the same behavior, and (c) highlighting the key movements needed for completing the desired behavior (Alexander & Schwager, 2012). Visual cues allow the child with ASD to go through the four stages of social learning theory by: (a) directing his or her focus on the specific behavior (attention), (b) identifying key movements

(retention), (c) performing the desired movement (motor reproduction), and (d) providing visual feedback (motivation).

Researchers have reported visual supports successfully improving a variety of behaviors (e.g., social skills, Krantz, & McClannahan, 1998; play skills, Bass & Mulick, 2007; school transitions, Dooley, Wilczenski, & Torem, 2001). While there has been a limited amount of research specifically focused on improving the performance of gross motor skills based on the use a visual support (e.g., Breslin & Rudisill, 2011; Mechling, & Swindle, 2013; Yanardag et al., 2013), it is believed that use of a visual support (i.e., video prompting) with fidelity would allow the child with ASD to successfully complete the four stages of learning within social learning theory and produce the desired behavior (e.g., overhand throw).

## Summary of the Research Review

Children with ASD are likely to demonstrate low levels of performance during gross motor skills performance (Berkeley et al., 2001). To enhance the performance of a discrete movement (e.g., throwing), teachers should sequence the components within the skill beginning where the student shows the most need and progressing his or her instruction of the components towards a mastery level (Kelly & Melograno, 2004). Additionally, researchers have reported that children with ASD may have significant delays when performing gross motor manipulative movements (Berkeley et al., 2001; Whyatt & Craig, 2012) [L2; T17]. For this reason, researchers and practitioners should focus their research on designing interventions to improve the performance of gross

motor skills for children with ASD. Furthermore, researchers, practitioners, and parents of children with ASD need to understand what an EBP is, and how to properly implement with fidelity for their student, participant, or child with ASD.

## Summary of Adapted Physical Activity Taxonomy

Overall, the *APAT* was applied to on 17 total investigations for children with ASD (Carano, 2014). Of the 17 investigations, 4 (i.e., 23%) received a Level 1 recommendation, 8 (i.e., 47%) received a Level 2 recommendation, and 5 (i.e., 29%) received a Level 3 recommendation. Based, on these results 12 of the 17 (i.e., 70%) studies were determined by the researcher to be “strong” (i.e., Level 1) or “moderate” (i.e., Level 2) in their level of evidence.

Level of recommendation for all 17 investigations was based on the design of the *APAT* (Carano, 2014). Of the 17 total investigations, 11 (i.e., 64%) received an A level of recommendation, 2 (i.e., 11%) received a B level of recommendation, and 4 (23%) received a C level of recommendation. Based on these results, 16 of the 24 (i.e., 67%) investigations were pertinent to adapted physical activity, designed around an EBP, and the overall outcomes could be applied to an educational, recreational, or adapted sports settings (Carano, 2014).

# CHAPTER III

# METHOD

The purpose of this investigation was to compare the impact of three instructional conditions: (a) Direct Instruction only, (b) Direct Instruction plus Video Prompting, and (c) Direct Instruction plus Verbal Prompting on the performance of the overhand throw for children with ASD. An alternating treatment design was used across six participants to determine which if these instructional condition had the greatest impact on improving the overhand throwing performance in children with ASD. The information within this chapter is designed to address the method used to compare the impact of the three instructional conditions. This information is related to the method in the following sections: (a) Participant Information, (b) Instrumentation, (c) Procedures, (d) *Achievement-Based Curriculum Model*, (e) Research Design, and (f) Data Analyses.

## Participant Information

Six children (i.e., 5 male, 1 female), attending a private school in Texas and diagnosed with ASD with Level 1 severity, were recruited for this investigation. The participants' ages ranged from 8 to 13 years ($M$ = 11.4). Each participant demonstrated fewer than 70% of the total essential elements for the overhand throw as measured using *Everyone Can! Skill Development and Assessment in Elementary Physical Education* during the baseline phase (*Everyone Can*; Kelly et al., 2010). Participants also demonstrated behavior that did not require "very substantial" or "substantial" behavioral

or communication support (APA, 2013), as reported by the school principal, vice principal, and homeroom teacher. Additionally, each participant had no known prior or present injuries that prevented full range of motion based the Student Medical Screening Form for Parents from *TAHPERD Adapted Physical Education Manual of Best Practices* (see Appendix B; Silliman-French & Buswell, 2017). Finally, each participant demonstrated the ability to respond to verbal direction, "Throw the ball at the target." In addition, each participant was required to have written parental consent to participate in this investigation.

## Instrumentation

The participants' overhand throw was assessed using the *Everyone Can* overhand throw assessment (Kelly et al., 2010). The *Everyone Can* overhand throw assessment was used to determine participants' percentage of correct essential elements performed. The Coach's Eye application was used to record throwing performances, provide video prompts for each participant, and facilitate independent scoring by both research assistants (Techsmith Corporation, 2011).

### *Everyone Can*

*Everyone Can* is a combination of both the *I-CAN* and *Developing the Physical Education Curriculum*: *Achievement-Based Approach* (*ABC-Model*; Kelly et al., 2010; Kelly & Melograno, 2004; Wessel, 1976). *I-CAN* was developed by Wessel and funded by the U.S. Department of Special Education and Rehabilitative Services to address the physical education of students with disabilities in public schools. The *ABC-Model* was

developed to address standard-based physical education programs (Kelly & Melograno, 2004). The *Everyone Can* model is based on sequential performance objectives (i.e., instructional and behavioral; Kelly et al., 2010). When implemented with fidelity, *Everyone Can* provides a framework for: (a) program planning, (b) assessing, (c) implementation planning, (d) teaching, and (e) evaluation (Kelly et al., 2010). The focus of this investigation was specifically on the qualitative essential elements of the overhand throw as assessed by *Everyone Can* (Kelly et al., 2010).

**Coach's Eye**

Coach's Eye (Techsmith Corporation, 2018) is an application (app) available on multiple devices (e.g., smartphones, iPads, tablets) and can be purchased on iTunes and Google Play. Coach's Eye allows the user to record in real time, in any environment (e.g., gymnasium, outside, classroom), and provides immediate feedback options that can be displayed on any other device (e.g., handheld devices). Coach's Eye gives the instructor a variety of options including: (a) slow motion video; (b) frame-by-frame video; (c) voice over recording; (d) telestration (e.g., video marking) on a video with lines, arrows, circles, and squares; and (e) timed recording and a video spotlight feature. For this investigation, video prompts consisted of frame-by-frame videos with telestration features which include lines, arrows, and circles. The "team member" subscription was purchased allowing the primary researcher and both research assistants full access to recorded videos.

## Procedures

All participants for this study were recruited from a private school in Texas. The following paragraphs are related to: (a) Recruitment of Participants and (b) Recruitment and Training of Research Assistants.

### Recruitment of Participants

Recruitment of participants began after gaining institutional review board (IRB) approval at Texas Woman's University (TWU) through flyers and speaking directly with parents, caretakers, and classroom teachers of potential participants (see Appendix C). Information about the investigation and consent forms were mailed (via United States Postal Service delivery) to all parents and/or caretakers of potential participants (see Appendix D). Parents were informed that each participant was free to withdraw from this investigation at any time and any questions or concerns should be directed to the researcher or to the IRB Committee. Verbal assent was obtained from each participant before this investigation began.

### Recruitment and Training of Research Assistants

Two adapted physical education (APE) teachers who have successfully passed a graduate course in APE assessment at TWU were recruited to serve as research assistants. Training of both research assistants consisted of: (a) a visual demonstration provided by the researcher of Steps 1 through 6 of the *Everyone Can* overhand throw instructional tool (Kelly et al., 2010; see Appendix E), and (b) successfully passing a written test with a score of 100% (see Appendix F).

## Achievement-Based Curriculum Model

*Everyone Can* provides a framework based on the *I-CAN* and *ABC-Model* that includes program planning, assessment, teaching, and evaluation (Kelly & Melograno, 2004; Kelly et al., 2010; Wessel, 1976). The following paragraphs provide evidence for using *Everyone Can* and how the framework has been fused into the development of this investigation (Kelly et al., 2010).

### Program Planning

The *Texas Essential Knowledge and Skills* (TEKS) for physical education provided an outline of the motor milestones children are expected to meet based on age and grade level (Texas Administrative Code, 2017). Given that the participants in this investigation ranged from 8 to 13 years, the TEKS for Grades 3 through 6 were reviewed for mastery criteria of the content being taught and for the expected gross motor skill performance. The overhand throw criteria for this investigation mirrors the TEKS as follows: (a) participants will be able to demonstrate rotation of various body parts (TEKS 116.2); (b) demonstrate elements of the overhand throw (TEKS 116.3); (c) develop a movement sequence with a beginning, middle, and end; and (d) demonstrate key elements of manipulative movements for overhand throw (TEKS 116.5). Accurately performing the qualitative essential elements of the *Everyone Can* provides opportunities for the participant to improve his or her specific body movements for each of the above TEKS criterion (Kelly et al., 2010).

**Assessment**

For this investigation, the *Everyone Can* overhand throw instructional technique was used to score each participant's performance (Kelly et al., 2010). Participants were assessed on their ability to complete the following pairs of qualitative essential elements: (a) side orientation and T-position, (b) hand above shoulder and weight shift, and, (c) ball released toward target and follow through. Pairs of qualitative essential elements were chosen based on the sequential order of the *Everyone Can* overhand throw elements and a previous study where essential elements were similarly (i.e., sequential order) paired together (Kelly et al., 2010; Lo, Burk, & Anderson, 2014).

To ensure observer drift did not take place, an interobserver agreement was calculated at the completion of each treatment session throughout this investigation (Kazdin, 2010). Calculating an interobserver agreement requires at least two observers recording the same behavior using the same scoring system (Richards et al., 2014). For this investigation, the primary researcher video recorded all overhand throwing trials for each participant during the baseline, instructional conditions phases, most effective instructional condition, and maintenance phase. The primary researcher then uploaded daily videos of each participant’s performance to the Coach’s Eye “team member” account in a shared folder for each of the two research assistants to score individually. Videos remained on the Coach’s Eye app for 24 hours for both research assistants to view. After the 24-hour period all videos on the Coach’s Eye “team member” account were removed. The primary researcher saved a copy of each video to a secure folder

within the Coach's Eye app labeled "overhand throwing trials." If a discrepancy in scores occurred and the interobserver agreement dropped below 80%, the primary researcher retrained the research assistants synchronously to come to a 100% agreement on the qualitative essential elements in question within the *Everyone Can* (Kelly et al., 2010) overhand throw (Barlow, Nock, & Hersen, 2009).

**Implementation Planning**

An alternating treatment design was used to compare the effect of three independent variables (i.e., direct instruction only, direct instruction plus video prompting, direct instruction plus verbal prompting) on one dependent variable (i.e., percentage of essential elements performed on the *Everyone Can* overhand throw). The primary researcher conducted each trial with individual participants throughout all phases of the investigation in the gymnasium of the school.

Prior to data collection, the researcher video recorded a typically developing peer (i.e., 9-year-old) performing each of the qualitative essential elements of the *Everyone Can* overhand throw. Two adapted physical educators (APE) professors from TWU separately verified that the essential elements were correctly performed through video analyses. Using the *Coach's Eye* video telestration feature the primary researcher designed each of the qualitative essential elements (i.e., Steps 1-6) of *Everyone Can* into pairs of sequential qualitative essential elements (i.e., Steps 1-2 paired, Steps 3-4 paired, Steps 5-6 paired; Lo et al., 2014; see Table 1). The following paragraphs outline the

planning and implementation of each instructional condition throughout this investigation.

Table 1

*Pairing of Essential Elements for the Video Prompting Series*

| **Series 1** | **Series 2** | **Series 3** |
|---|---|---|
| 1. Side Orientation | 3. Hand Above Shoulder | 5. Ball Released Towards Target |
| 2. T-Position | 4. Weight Shift | 6. Follow Through |

**Direct instruction only**. The condition of direct instruction consisted of the primary researcher providing each participant only the verbal directive, “Throw the ball at the target.” Direct instruction was a component of the other two intervention phases, and direct instruction alone was the condition implemented during the baseline, instructional conditions phases, and maintenance phase.

**Direct instruction plus video prompting.** During video prompting treatment sessions, participants received video prompting followed by direct instruction. Video prompting consisted of each participant being shown the video prompt of the specific paired series of essential elements based on the participant’s current performance level. Each participant received the verbal prompt and the direct instruction before attempting his or her first overhand throwing trial. Participants received the instructional conditions before each of the 10 overhand throwing trials.

**Direct instruction plus verbal prompting**. During verbal prompting treatment sessions, participants received verbal prompting followed by direct instruction. Verbal prompting consisted of each participant receiving the verbal prompt of the specific paired

series of qualitative essential elements based on the participant's current performance level. Each participant received the verbal prompt and the direct instruction before attempting his or her first overhand throwing trial. Participants received the instructional condition before each of the 10 overhand throwing trials. The researcher and research assistants used six qualitative essential elements, definitions, and the verbal prompts to evaluate and cue each participant during his or her performance (see Table 2).

**Plateau in performance.** If a participant did not successfully meet the scoring criteria after all instructional conditions had been implemented an equal number of times (i.e., three consecutive treatment sessions, 30 overhand throwing trials) he or she was deemed to have plateaued in performance and his or her performance was noted by the researcher. In contrast, if a participant performed each scoring criterion at 100% with no change in performance across all trials on the specific essential elements (i.e., ceiling effect), the participant was considered to have also plateaued. To determine if a performance of a behavior change occurred based on the implementation of the different instructional conditions each participant continued moving forward within each phase (Richards et al., 2014). All data for each participant in this investigation were recorded, graphed, and analyzed to represent the percentage of essential elements performed correctly based on the implementation of each instructional condition.

## Instructional Conditions

All instructional conditions within this investigation were implemented in the participant's school gymnasium using a one-on-one format between the researcher and

participant. The following sections are used to outline the (a) Evaluation, (b) Performance Setting, and (c) Pilot Study Results which led to this present investigation.

**Evaluation**

For this investigation, participants were eligible to receive one of two scores on the paired qualitative essential elements per each overhand throwing trial (i.e., 10 overhand throwing trials per treatment session) by the researcher and the two research assistants: (a) observed = “X” or (b) not observed = “O” (Kelly et al., 2010). All scores for each participant throughout this investigation were determined through video analysis. Participants received an “X” score if the essential element was completed correctly and in sequential order. Elements that were performed correctly but not sequentially and elements performed incorrectly received an “O” score. To determine when a change in performance of the overhand throw occurred for each participant, both research assistants scored all essential elements of each overhand throwing trial through video analysis. Participants threw at a black 8 ft x 8 ft (4.8768 m) target, extending up from the base of the wall, that included an inset 4 ft x 4 ft (2.4383 m), and 2 ft x 2 ft (1.2192 m) white square located in the middle (see Appendix G).

**Performance Setting**

Each participant had a 30-minute time block of time reserved for each treatment session in the gymnasium. All equipment being used (i.e., iPad, *Cannon 2000x*, target, throwing equipment) was set up prior to each participant beginning each treatment session.

Table 2

*Qualitative Essential Elements, Definitions, and Verbal Prompts of the Everyone Can Overhand Throw*

| Qualitative Essential Elements | Definitions | Verbal Prompts |
|---|---|---|
| 1. Side orientation. | Standing with non-dominant side facing *Everyone Can* target. | "Body sideways." |
| 2. T-position. | Non-dominant hand facing the target, eyes on target. | "Point to target." |
| 3. Hand above shoulder. | Throwing hand passes above shoulder. | "Throwing hand above shoulder." |
| 4. Weight shift. | Weight on same foot as throwing hand. | "Step toward target." |
| 5. Ball released towards target. | Shoulders and hips rotate to face square with target. | "Shoulders and hips face target." |
| 6. Arm follows through. | Throwing arm passes eye level and continues downward. | "Follow through towards knee." |

Participants were encouraged to wear loose athletic clothing (i.e., t-shirt) and athletic tennis shoes.

Using two video camera perspectives, all overhand throwing trials were recorded by the researcher. The first video camera (i.e., *Cannon 2000x*) was placed 10 ft (3.048 m) directly behind the throwing marker for each participant and pointed directly at the throwing target. This camera was used to record continuous movements throughout each treatment session of each overhand throwing trial, as well as, determine the percentage of essential elements performed for each participant. The second camera (i.e., iPad) remained with the researcher and was positioned at a side-angle perspective of 90 degrees and at a distance of 10 ft (3.05 m) from the participant. The iPad camera was used to record the percentage of qualitative essential elements performed for each overhand throwing trial.

**Pilot Study**

A pilot study with two purposes was conducted prior to this investigation. The first purpose was to determine if video prompting used as an instructional condition had a functional relation to overhand throwing performance for a child with ASD. The second purpose was to determine if direct instruction plus video prompting had a functional relation to the overhand throwing performance for a child with ASD. The investigators hypothesized that video prompting would result in greater overhand throwing performance on the paired series of qualitative essential elements performed from *Everyone Can* (Kelly et al., 2010). Further, it was determined that direct instruction plus

video prompting was more effective for performing the paired series of qualitative essential elements for a child (CA = 9 years) with ASD. Therefore, the investigators determined that more research was needed to determine if direct instruction plus video prompting had a greater impact on the overhand throwing performance then direct instruction only and direct instruction plus verbal prompting for children with ASD.

## Research Design

In this investigation, an alternating treatment design was used that involved a baseline, instructional conditions phases, most effective instructional condition phase and one maintenance phase (Richards et al., 2014). Specifically, the instructional conditions are: (a) Direct instruction only, (b) Direct Instruction plus Video Prompting, and (c) Direct Instruction plus Verbal Prompting. Therefore, information related to the implementation of each phase of this investigation is reported in the following sections: (a) baseline phase, (b) instructional conditions phases, (c) most effective instructional condition, and (d) maintenance phase is presented in the following sections.

### Baseline Phase

During the baseline phase, all participants were only provided the verbal direct instruction, “Throw the ball at the target.” Participants stood behind a 2-inch (5.08 cm) by 8-inch (20.32 cm) rubber poly spot mat placed at a recommended distance of 40 ft (12.192 m), 50 ft (15.24 m), or 60 ft (18.288 m) from the wall (*Everyone Can;* see Table 3). Each participant received a total of 10 overhand throwing trials for the baseline treatment session. Through video analysis the researcher and two research assistants

independently analyzed all overhand throwing trials to determine the percentage of essential elements completed correctly based on the six essential elements of *Everyone Can* (Kelly et al., 2010). Participant performance of the six essential elements determined placement (i.e., series one, series two, series three) in the intervention of instructional conditions phases. To insure each participant focused on the qualitative essential elements and was not overwhelmed by the distance component of the throw, each participants' distance of overhand throwing was adjusted to his or her present level of ability by beginning at the recommended distance and moving closer (i.e., 5 ft, 10 ft, 15 ft) to the wall target until each participant successfully throws the required distance 66% of the time (i.e., 2 out of 3; Kelly, personal communication, August 5, 2016).

Table 3

*Everyone Can Grade Level, Recommended Throwing Distance, and Ball Type*

| Grade | Distance | Type of Ball and Size |
|---|---|---|
| Kindergarten | 40 ft (12.92 m) | Tennis Ball 2.5-inch (0.762 m) circumference |
| First Grade | 40 ft (12.92 m) | Tennis Ball 2.5-inch (0.762 m) circumference |
| Second Grade | 50 ft (12.24 m) | Softball 12-inch (0.3048 m) circumference |
| Third Grade | 50 ft (12.24 m) | Softball 12-inch (0.3048 m) circumference |
| Fourth Grade | 60 ft (18.288 m) | Softball 12-inch (0.3048 m) circumference |

**Instructional Condition Phases**

Six different sequences of overhand throwing instructional conditions (i.e., direct instruction, direct instruction plus video prompting, direct instruction plus verbal

prompting) were randomly assigned based on selection by each participant (Alberto, Cihak, & Gama, 2005). To reduce a carryover effect, the researcher counterbalanced all instructional conditions (Alberto et al., 2005). Each participant randomly selected tennis balls that were marked with a number (i.e., 1, 2, 3, 4, 5, 6) representing the order of instructional conditions for the following three treatment sessions. Numbers marked on each tennis ball represented the following order:

1. Direct instruction only, direct instruction plus video prompting, direct instruction plus verbal prompting;
2. Direct instruction plus video prompting, direct instruction plus verbal prompting, direct instruction only;
3. Direct instruction plus verbal prompting, direct instruction only, direct instruction plus video prompting;
4. Direct instruction only, direct instruction plus verbal prompting, direct instruction plus video prompting;
5. Direct instruction plus video prompting, direct instruction only, direct instruction plus verbal prompting; and
6. Direct instruction plus verbal prompting, direct instruction plus video prompting, direct instruction only.

Participants repeated this same process (i.e., randomly selecting a marked tennis ball) every fourth treatment session and continued this pattern until the investigation was completed for each participant. For example, if on Day 1 the participant drew the marked

tennis ball #5 (i.e., direct instruction plus video prompting, direct instruction only, and direct instruction plus verbal prompting), he or she began with 10 overhand throwing trials under the direct instruction plus video prompting condition. On Day 2, he or she had 10 overhand throwing trials under the direct instruction only condition. On Day 3, he or she completed the randomized sequence and performed 10 overhand throwing trials under the direct instruction plus verbal prompting condition. On Day 4, the participant drew a new marked tennis ball and repeated this process.

Marked tennis balls were not replaced in the bag unless all marked balls had been selected. If a participant performed the required essential elements in series one (e.g., side-orientation, T-position) at or above 70% (i.e., 7 out of 10) in at least one of the treatment sessions after each instructional condition had been implemented a same number of times he or she was determined to have successful learned that paired series of essential elements and moved to the next paired series of essential elements (i.e., series two), beginning the next treatment session. At this point the selection of a marked tennis ball (i.e., instructional condition) started over.

**Most Effective Condition Phase**

One week after the conclusion of the intervention phase (wash out period; Roberts et al., 2015), the researcher re-introduced the most effective instructional condition from the intervention phase to verify results (Richards et al., 2014). Each participant was given a total of 10 overhand throwing trials during this most effective condition phase. During this phase each participant was presented with the instructional condition that had the

greatest impact on his or her performance throughout the treatment sessions. For example, if a participant performed the essential elements of the overhand throw within all three series at 35% under direct instruction plus video prompting, 65% under direct instruction only, and 85% under verbal prompting plus direct instruction, the participant then received verbal prompting plus direct instruction for the essential elements of the most effective condition. In the event none of the instructional conditions impact the performance of the overhand throw at a greater percentage the research will implement direct instruction plus video prompting to attempt to further support the purpose of this investigation. No other instructional condition was used during this phase.

### Maintenance Phase

The maintenance phase occurred one week after the completion of the most effective condition phase (wash out) and consisted of direct instruction only (Roberts et al., 2015). Each participant was only provided the direct instruction "Throw the ball at the target." During this maintenance phase, each participant was given a total of 10 overhand throwing trials. No other instructional condition was given during this maintenance phase. Figure 1 details the number of throwing trials each participant earned within each phase of this investigation, as well as, scoring criteria.

## Data Analyses

An alternating treatment design was used to compare which, if any, of these instructional conditions was associated with the greatest impact on the performance of the essential elements of the overhand throw. This design allowed for visual analysis of the

percentage of correct essential elements performed and visual analysis of data points for each participant (Richards et al., 2014) across all phases.

**Descriptive Statistics**

For this investigation the mean percentage of performance for the instructional condition that had the greatest impact on strategy during the intervention phase will be reported. *Mean* percentage of performance will be calculated by adding up the total percentage of essential elements performed during the intervention phase, dividing by the total number of times the instructional strategy was implemented (i.e., 3 times) and then multiplying by 100.

| Baseline Phase | Instructional Conditions Phase | Most Effective Instructional Condition Phase | Maintenance Phase |
|---|---|---|---|
| • One Baseline session.<br>• Ten overhand throwing attempts with direct instruction only.<br>• Total number of essential elements performed correctly was recorded for the one treatment session.<br>• Lowest number of essential elements performed were determined starting point in the instructional condition phase. | • All participants randomly selected one of the three instructional conditions for each treatment session for a minimum of three treatment sessions.<br>• Participant's success was determined by his or her ability to perform ≥ 70% (i.e., 7 out of 10 trials) of the essential elements on at least one of the three instructional conditions.<br>• Paired series of essential element steps (1-2, 3-4, 5-6 [Lo et al., 2014]). | • Most Effective Instructional condition consisted of the investigator re-introducing the most effective instructional condition during the instructional conditions phase to verify results. Each participant was given a total of 10 overhand throwing trials during this phase. No other instructional condition used during this phase. | • Maintenance Phase consisted of the participant being re-introduced to the baseline instructional condition (i.e., direct instruction only). Each participant in maintenance Phase was asked to "Throw the ball."<br>• Each participant was given 10 overhand throwing trials per one session (Richards et al., 2014). |

*Figure 1*. Research phases. Each treatment session involved only one of the three instructional conditions (i.e., direct instruction only, direct instruction plus video prompting, and direct instruction plus verbal prompting) and a total of 10 overhand throwing throw.

# CHAPTER IV

# RESULTS

The purpose of this investigation was to compare the impact of three instructional conditions: (a) Direct Instruction only, (b) Direct Instruction plus Video Prompting, and (c) Direct Instruction plus Verbal Prompting on the performance of the overhand throw in children with autism spectrum disorder (ASD). Based on social learning theory, behavioral changes occur as a result of the learner identifying important components (i.e., visual, auditory) of a skill and differentiating between effective and ineffective movements (Bandura, 1976). This theory was adopted to guide the present investigation and determine if direct instruction plus video prompting would have the greatest impact (i.e., increased performance of the essential elements) on improving the overhand throw performance in children with ASD. Based on the literature review presented in Chapter II of this dissertation, the primary researcher believed direct instruction plus video prompting would have the greatest impact on the overhand throw performance of children with ASD. Therefore, the findings of this investigation are presented in the following sections: (a) Participant Demographics, (b) Interobserver Agreement, (c) Performance Criteria, (d) Individual Results, and (e) Summary.

## Participant Demographics

All participants were between 8 to 13 years of age, attended the same private school in Texas, and were diagnosed with ASD. All six of the participants were selected

through the established performance criteria developed by the Dissertation Committee and the researcher in Chapter III of this Dissertation for participation in this investigation. See Table 4 below for each participant's demographic information.

Table 4

*Participant Demographics*

| Participant | Gender | Age | Grade Level |
|---|---|---|---|
| 1 | Male | 12 | 6th grade |
| 2 | Male | 13 | 6th grade |
| 3 | Male | 12 | 5th grade |
| 4 | Male | 8 | 3rd grade |
| 5 | Male | 13 | 6th grade |
| 6 | Female | 9 | 3rd grade |

## Interobserver Agreement

Interobserver agreement was determined by dividing the total number of agreements by the total number of disagreements, and multiplying that number by 100 (Richards et al., 2014). For this investigation, two research assistants independently evaluated the throwing form of all overhand throwing trials for each participant through video analysis (all videos were filmed and uploaded to Coach's Eye by the researcher). See Table 5 for the interobserver agreement for each of the six participants throughout each phase of this investigation. Final results for interobserver agreement between the

two research assistants demonstrated a desirable (i.e., ≥ 90%) outcome (Richards et al., 2014).

Table 5

*Interobserver Agreement*

| Participant | Baseline Phase | Series One | Series Two | Series Three | Most Effective Phase | Maintenance Phase |
|---|---|---|---|---|---|---|
| 1 | 100% | 100% | 100% | 98% | 100% | 100% |
| 2 | 95% | 97% | 95% | 100% | 97% | 93% |
| 3 | 98% | 97% | 95% | 100% | 93% | 100% |
| 4 | 100% | 95% | 90% | 100% | 93% | 81% |
| 5 | 100% | 100% | 98% | 100% | 100% | 98% |
| 6 | 99% | 100% | 99% | 100% | 98% | 100% |

*Note*: Based on the percentage of interobserver agreement within all phases on this investigation, the researcher determined the interobserver agreement to be desirable (Richards et al., 2014).

## Performance Criteria

All six participants met the performance criteria (i.e., < 70% of essential elements performed) for inclusion in this investigation (i.e., moved beyond the baseline phase). Performance criteria, established by the Dissertation Committee and primary researcher and discussed in Chapter III, were determined during the baseline phase when direct instruction only was implemented. For every participant, 10 overhand throwing trials were evaluated based on the 6 essential elements equaling a total of total of 60 essential elements (i.e., 10 throws × 6 essential elements = 60 total essential elements). See Table

6 for the percentage of essential elements performed for each participant during the baseline phase.

Table 6

*Percentage of Essential Elements Performed in Baseline Phase for Each Participant*

| Participant | Side Orientation | T-Position | Hand Above Shoulder | Weight Shift | Throw Ball at Target | Follow Through | Cumulative Performance |
|---|---|---|---|---|---|---|---|
| 1 | 0% | 0% | 100% | 100% | 100% | 100% | 67% |
| 2 | 20% | 0% | 0% | 100% | 0% | 0% | 6% |
| 3 | 0% | 30% | 80% | 100% | 100% | 90% | 61% |
| 4 | 0% | 0% | 100% | 0% | 0% | 0% | 6% |
| 5 | 0% | 0% | 100% | 0% | 0% | 0% | 6% |
| 6 | 0% | 0% | 90% | 0% | 0% | 0% | 15% |

*Note*: All percentages are based on 10 overhand throwing trials. Performance in baseline determined each participant's placement in the series (i.e., 1, 2, 3) of essential elements within the phases.

All participants who did not meet the baseline performance criteria (established by the Dissertation Committee and primary researcher and described in Chapter III of this Dissertation) were determined to have plateaued (i.e., < 70% performance of the essential elements within a series) in performance. Of the six participants, two participants performed 100% of the essential elements (i.e., ceiling effect) in at least one of the three (i.e., 1, 2, 3) series. In at least one of the three series throughout the intervention phase four participants plateaued in their overhand throwing performance. Each participant who met the baseline phase criteria went forward in this investigation and completed all phases (i.e., baseline phase, intervention phase, most effective condition phase,

maintenance phase) to determine which, if any, of the instructional conditions had the greatest impact on his or her overhand throwing performance.

The use of an alternating treatment design allowed for the comparison of three separate interventions on the same overhand throwing performance (i.e., dependent variable; Richards et al., 2014). In order to visually analyze the data points, each individual overhand throwing performance for the six participants were graphed (see Figures 2 through 7).

## Individual Results

### Participant 1

Participant 1, was a 12-year old male in the sixth grade diagnosed with ASD. Based on *Everyone Can* Participant 1 successfully (i.e., 2 out of 3) threw a 2-inch (.3048 m) softball from 35 ft (10.66 m) prior to baseline and throughout each phase of this investigation (Kelly et al., 2010; see Figure 2). Parent input, provided using the Student Medical Screening Form for Parents from the *TAHPERD Adapted Physical Education Manual of Best Practices* confirmed that Participant 1 had no previous injuries preventing participation in this investigation (Silliman-French & Buswell, 2017).

**Baseline phase.** For the 10 overhand throwing trials in the baseline phase, Participant 1 performed none of the essential elements for Series 1 (i.e., side orientation, T-position), 100% for Series 2 (i.e., hand above shoulder, weight shift), and 100% for Series 3 (i.e., throw the ball at the target, follow-through) for a cumulative performance of 67%. Based on the performances of the essential elements and the performance criteria

(established by the Dissertation Committee and primary researcher and described in Chapter III) for the baseline phase, Participant 1 began the intervention phase in Series 1.

**Intervention phase.** Preceding the treatment days in Series 1, Participant 1 randomly selected ball #2 (i.e., intervention sequence of direct instruction plus video prompting, direct instruction plus verbal prompting, and direct instruction only). For the three treatment days, Participant 1 performed 90% (Day 1), 95% (Day 2), and 100% (Day 3). Based on the performance criteria established by the Dissertation Committee and primary researcher in Chapter III for the intervention phase, Participant 1 performed ≥ 70% in all the instructional conditions and was moved to Series 2 (see Figure 2).

Prior to the first treatment day in Series 2, Participant 1 randomly selected ball #5 (i.e., intervention sequence of direct instruction plus video prompting, direct instruction only, and direct instruction plus verbal prompting). For all three treatment days under the three different instructional conditions, Participant 1 performed 100% of the essential elements (i.e., ceiling effect) demonstrating the highest level of possible performance in this investigation related to the essential elements. Based on this performance, Participant 1 was moved forward to Series 3.

Before the first treatment days in Series 3, Participant 1 randomly selected ball #3 (i.e., intervention sequence of direct instruction plus verbal prompting, direct instruction only, and direct instruction plus video prompting). For all three treatment days under the three different instructional conditions, Participant 1 performed 100% of the essential elements (i.e., ceiling effect). Based on visual analysis of the data analysis across the

three instructional conditions of the intervention phase, there was substantial overlap between each of the three instructional condition phases during intervention. As such, determining which of the three instructional strategies was inconclusive. Based on the percentage of essential elements completed within each of the three series, direct instruction plus video prompting had the greatest impact (*M* = 100%) followed by direct instruction plus verbal prompting (*M* = 98%) and direct instruction only (*M* = 97%) on the performance of the essential elements throughout the intervention phase.

**Greatest impact: Instructional condition.** Direct instruction plus verbal prompting was implemented following the first washout period (i.e., one-week no contact with researcher; Roberts et al., 2015). During implementation, Participant 1 performed 100% of all essential elements of the overhand throw. This performance was comparable to previous performances during the implementation of direct instruction plus verbal prompting.

**Maintenance phase.** Following the second washout period (i.e., one-week of no contact with the researcher; Roberts et al., 2015), a return to baseline condition (i.e., intervention removed) was implemented by the researcher and direct instruction only was implemented to determine if overhand throwing performance was maintained or improved throughout this investigation. During maintenance, Participant 1 performed 100% of the essential elements, which equates to an increase of 32% in performance from baseline. See Figure 2 for the performance across all phases of this investigation for Participant 1.

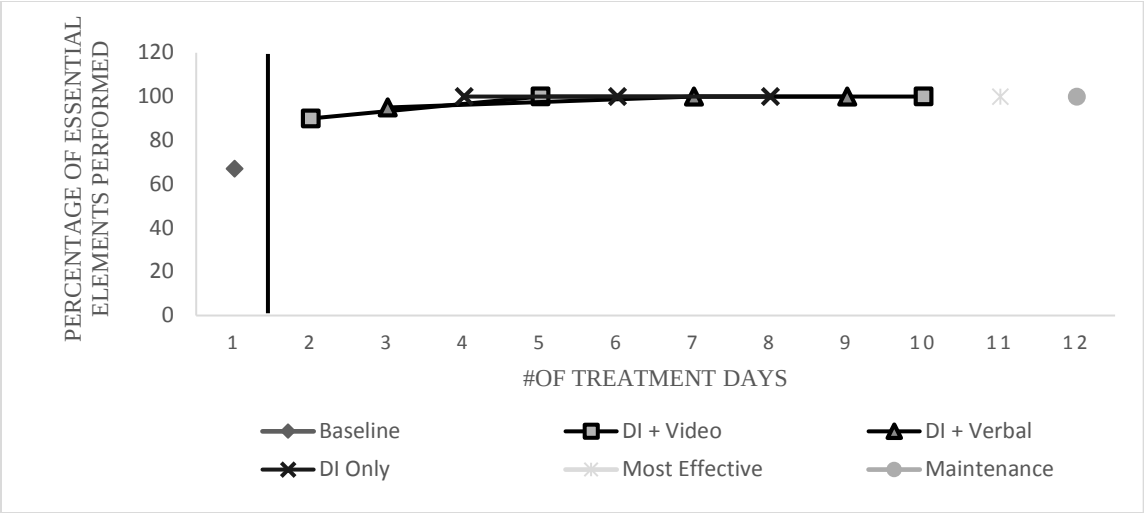


*Figure 2.* Participant 1: Percentage of Essential Elements Performed.

**Participant 2**

Participant 2, was a 13-year old male in the sixth grade diagnosed with ASD. Based on *Everyone Can*, successfully (i.e., 2 out of 3) threw a 12-inch (.3048 m) softball from 30 ft (9.14 m) prior to beginning baseline and throughout each phase of this investigation (Kelly et al., 2010). Parent input, provided using the Student Medical Screening Form for Parents from the *TAHPERD Adapted Physical Education Manual of Best Practices* confirmed that Participant 2 had no previous injuries preventing participation in this investigation (Silliman-French & Buswell, 2017).

**Baseline phase.** For the 10 overhand throwing trials in the baseline phase, Participant 2 performed none of the essential elements for Series 1 (i.e., side orientation, T-position), 50% for Series 2 (i.e., hand above shoulder, weight shift), and none of the essential elements for Series 3 (i.e., ball released towards target, follow-through) for a cumulative performance of 6%. Based on the performances of the essential elements

within the baseline phase and performance criteria (established by the Dissertation Committee and primary researcher and described in Chapter III), Participant 2 began the intervention phase in Series 1.

**Intervention phase.** Preceding the first treatment day in Series 1, Participant 2 randomly selected ball #2 (i.e., intervention sequence of direct instruction plus video prompting, direct instruction plus verbal prompting, direct instruction only). For the three treatment days, Participant 2 performed 25% (Day 1), 95% (Day 2), and 85% (Day 3) of the essential elements. Based on the performance criteria established in Chapter III intervention phase, Participant 2 performed ≥ 70% during 2 of the 3 instructional conditions and was moved forward to Series 2.

Prior to the first treatment day in Series 2, Participant 2 randomly selected ball #5 (i.e., intervention sequence of direct instruction plus video prompting, direct instruction only, direct instruction plus verbal prompting). For the three treatment days, Participant 2 performed 70% (Day 1), 50% (Day 2), and 100% (Day 3) of the essential elements. Based on the performance criteria established in Chapter III, Participant 2 performed ≥ 70% during two of the three instructional conditions (i.e., direct instruction plus video prompting, direct instruction plus verbal prompting) and was moved forward to Series 3.

Before the first treatment day in Series 3, Participant 2 randomly selected ball #1 (i.e., intervention sequence of direct instruction only, direct instruction plus video prompting, direct instruction plus verbal prompting). For the three treatment days, Participant 2 performed 50% (Day 1), 50% (Day 2), and 85% (Day 3) of the essential

elements. Based on visual analysis of the data analysis across the three instructional conditions of the intervention phase, direct instruction plus verbal prompting had the greatest impact on the percentage of essential elements performed. As such, determining which of the three instructional strategies was inconclusive. Based on the percentage of essential elements completed within each of the three series, direct instruction plus verbal prompting was determined to have the greatest impact (*M* = 95%) followed by direct instruction only (*M* = 68%) and direct instruction plus video prompting (*M* = 52%) on the performance of the essential elements throughout the intervention phase

**Greatest impact: Instructional condition.** Following the first washout period, direct instruction plus verbal prompting was implemented. During implementation, Participant 2 performed 70% of the total essential elements during all 10 of his overhand throwing trials and was moved forward to the maintenance phase. This performance demonstrated that Participant 2 had improved by 64% in the percentage of essential elements performed from baseline.

**Maintenance phase.** Following the second washout period, a return to baseline condition (i.e., intervention removed) was implemented by the researcher and direct instruction only was implemented to determine if overhand throwing performance was maintained or improved throughout this investigation. Within this final treatment phase, Participant 2 performed 80% of the essential elements during all 10 of his overhand throwing trials. See Figure 3 for an illustration of the performances across all phases of this investigation for Participant 2.

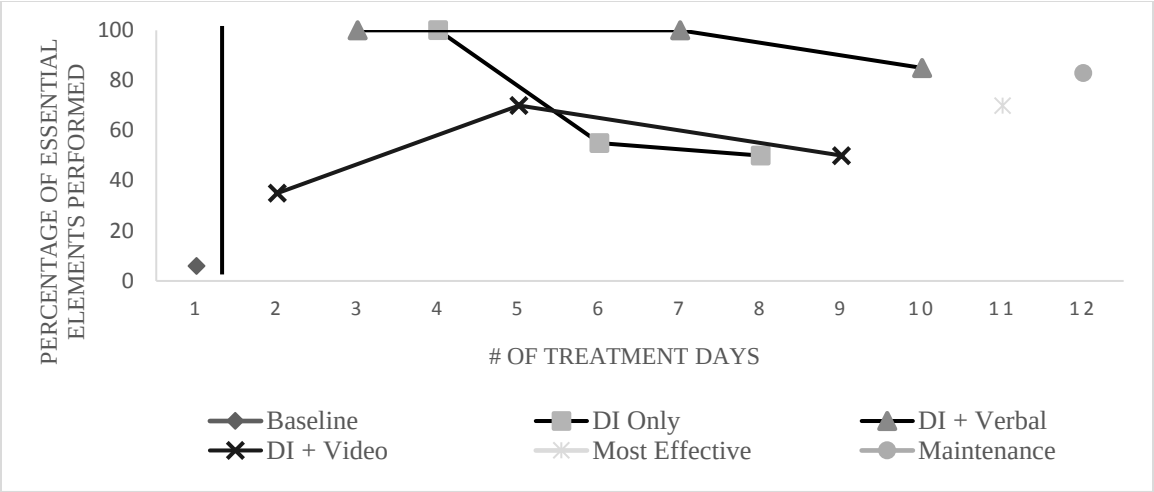


*Figure 3*. Participant 2: Percentage of Essential Elements Performed.

**Participant 3**

Participant 3, was a 12-year old male in the fifth grade diagnosed with ASD. Based on *Everyone Can*, Participant 3 successfully (i.e., two out of three attempts) threw a 12-inch (.3048 m) softball from 20 ft (6.96 m) prior to beginning baseline and throughout each phase of this investigation (Kelly et al., 2010). Parent input, provided using the Student Medical Screening Form for Parents from the *TAHPERD Adapted Physical Education Manual of Best Practices* confirmed that Participant 3 had no previous injuries preventing participation in this investigation (Silliman-French & Buswell, 2017).

**Baseline phase.** For the 10 overhand throwing trials in the baseline phase, Participant 3 performed 15% of the essential elements for Series 1 (i.e., side orientation, T-position), 90% for Series 2 (i.e., hand above shoulder, weight shift), and 95% for Series 3 (i.e., throw ball at the target, follow through) for a cumulative performance of 61%.

Based on the performances of the essential elements and the performance criteria (established by the Dissertation Committee and primary researcher and described in Chapter III), Participant 3 began the intervention phases in Series 1.

**Intervention phase.** Preceding the first treatment day in Series 1, Participant 3 randomly selected ball #1 (i.e., intervention sequence direct instruction only, direct instruction plus video prompting, direct instruction plus verbal prompting). For the three treatment days, Participant 3 performed 15% (Day 1), 70% (Day 2), and 90% (Day 3) of essential elements. Based on the performance criteria established in Chapter III, Participant 3 scored ≥ 70% during two of the three instructional conditions and was moved forward to Series 2.

Prior to the first treatment day in Series 2, Participant 3 randomly selected ball #3 (i.e., intervention sequence of direct instruction plus verbal prompting, direct instruction only, direct instruction plus video prompting). For the three treatment days, Participant 3 performed 95% (Day 1), 100% (Day 2), and 100% (Day 3) of the essential elements. Based on the performance criteria established in Chapter III, Participant 3 scored ≥ 70% during all three of the instructional conditions and was moved forward to Series 3.

Before beginning the treatment days for Series 3, Participant 3 randomly selected ball #2 (i.e., intervention sequence of direct instruction plus video prompting, direct instruction plus verbal prompting, direct instruction only). For the three treatment days, Participant 3 performed 100% of all essential elements within each instructional condition and was moved forward to the most effective conditions phase. Based on visual

analysis of the data analysis across the three instructional conditions of the intervention phase, there was substantial overlap between each of the three instructional condition phases during intervention. As such, determining which of the three instructional strategies was inconclusive. Based on the percentage of essential elements performed within each of the three series, direct instruction plus verbal prompting was determined to have the greatest impact (*M* = 95%) followed by direct instruction plus video prompting (*M* = 90%) and direct instruction only (*M* = 70%) on the performance of the essential elements throughout the intervention phase.

**Greatest impact: Instructional condition.** Following the first washout period direct instruction plus verbal prompting was implemented for Participant 3. During implementation, Participant 3 performed 95% of the essential elements on all 10 of his overhand throwing trials. This performance was consistent (i.e., within 5%) with each implementation of direct instruction plus verbal prompting within the three series (i.e., 1, 2, 3) of the intervention phase demonstrated a 30% increase in performance of essential elements post implementation of the instructional strategies.

**Maintenance phase**. Following the second washout period, a return to baseline condition (i.e., intervention removed) was implemented by the researcher and direct instruction only was used to determine if overhand throwing performance was maintained or improved throughout this investigation. Participant 3 performed 83% of the essential elements on all 10 of his overhand throwing trials in the maintenance phase. Figure 4 details the performance across all phases of this investigation.

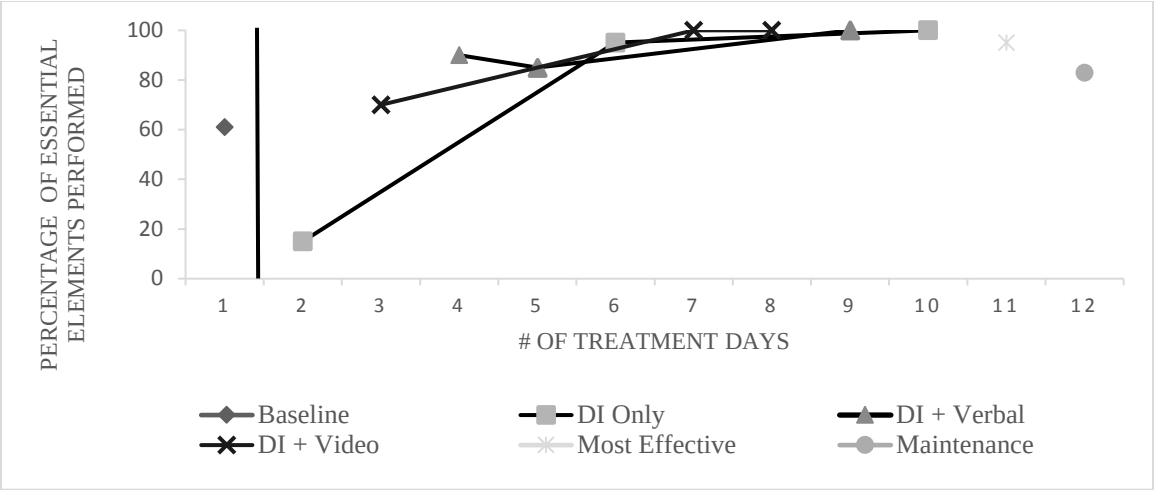


*Figure 4*. Participant 3: Percentage of Essential Elements Performed.

**Participant 4**

Participant four, was an 8-year old male in the third grade diagnosed with ASD. Based on *Everyone Can*, Participant 4 successfully (i.e., two out of three attempts) threw a 12-inch (.3048 m) softball from 20 ft (6.96 m) prior to beginning baseline and throughout each phase of this investigation (Kelly et al., 2010). Parent input, provided using the Student Medical Screening Form for Parents from the *TAHPERD Adapted Physical Education Manual of Best Practices* confirmed that Participant 4 had no previous injuries preventing participation in this investigation (Silliman-French & Buswell, 2017).

**Baseline phase.** For the 10 overhand throwing trials in the baseline phase, Participant 4 performed none of the essential elements during Series 1 (i.e., side orientation, T-position), 50% of the essential elements during Series 2 (hand above shoulder, weight shift), and none of the essential elements during Series 3 (i.e., release

ball towards target, follow-through) for a cumulative performance of 6%. Based on the performances and the performance criteria (established by the Dissertation Committee and primary researcher and described in Chapter III), Participant 4 began the intervention phase in Series 1.

**Intervention phase.** Preceding the first treatment day in Series 1, Participant 4 randomly selected ball #6 (i.e., intervention sequence of direct instruction plus verbal prompting, direct instruction plus video prompting, direct instruction only). For the three treatment days, Participant 4 performed 0% (Day 1), 55% (Day 2), and 0% (Day 3) of the essential elements. Based on the performance criteria established in Chapter III, it was determined that none of the instruction conditions impacted the performance (i.e., performance plateaued) of the overhand throw and Participant 4 was moved forward to Series 2.

Prior to the first treatment day in Series 2, Participant 4 randomly selected ball #5 (i.e., intervention sequence of direct instruction plus video prompting, direct instruction only, direct instruction plus verbal prompting). For the three treatment days, Participant 4 performed 65% (Day 1), 75% (Day 2), and 50% (Day 3) of the essential elements. Based on the performance criteria established in Chapter III, Participant 4 performed ≥ 70% during one of the three of the instructional conditions (i.e., direct instruction only) and was moved forward to Series 3.

Before the first treatment day in Series 3, Participant 4 randomly selected ball #2 (i.e., intervention sequence of direct instruction plus video prompting, direct instruction

plus verbal prompting, direct instruction only). For the three treatment days, Participant 4 performed 10% (Day 1), 0% (Day 2), and 0% (Day 3) of the essential elements. Based on visual analysis of the data analysis across the three instructional conditions of the intervention phase, there was substantial overlap between each of the three instructional condition phases during intervention. As such, determining which of the three instructional strategies was inconclusive. Based on the percentage of essential elements performed within each of the three series, direct instruction plus video prompting was determined to have the greatest impact (*M* = 43%) followed by direct instruction only (*M* = 25%) and direct instruction plus verbal prompting (*M* = 17%) on the performance of the essential elements within the intervention phase.

**Greatest impact: Instructional condition.** Following the first washout period, direct instruction plus video prompting was implemented for Participant 4. During implementation Participant 4 performed 63% of the essential elements on all 10 of his overhand throwing trials. This performance was consistent with two of the three performances (i.e., Series 1, 2) Participant 4 had under the direct instruction plus verbal prompting condition during the intervention phase.

**Maintenance phase**. Following the second washout period, a return to baseline condition (i.e., intervention removed) was implemented by the researcher and direct instruction only was implemented to determine if overhand throwing performance was maintained or improved throughout this investigation. Participant 4 performed 40% of the essential elements on all 10 of his overhand throwing trials in the maintenance phase.

This performance demonstrated that Participant 4 had increased his percentage of essential elements performed by 34% from baseline. See Figure 5 for an illustration of performance across all phases of this investigation for Participant 4.

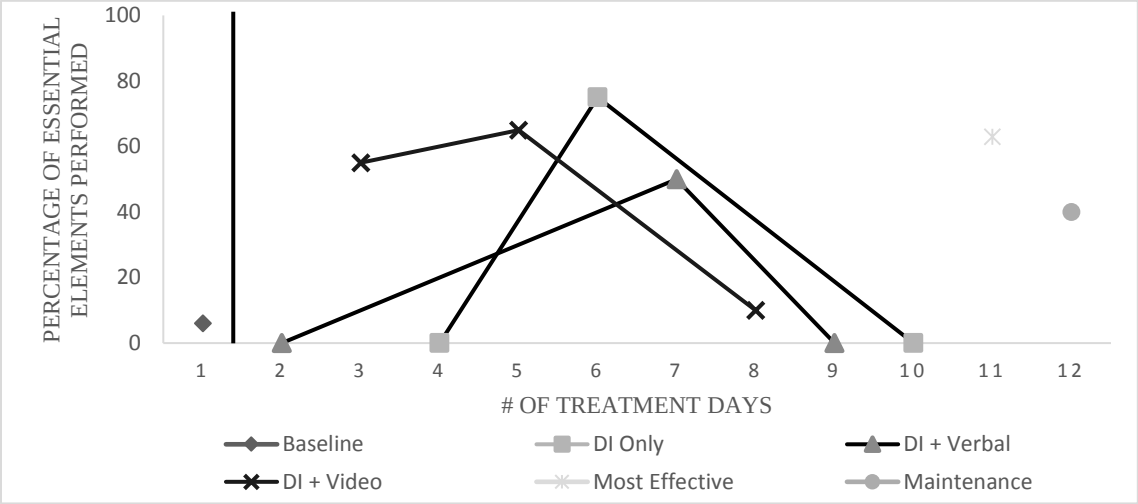


*Figure 5*. Participant 4: Percentage of Essential Elements Performed.

**Participant 5**

Participant five, was a 13-year old male in the sixth grade diagnosed with ASD. Based on *Everyone Can*, Participant 5 successfully (i.e., two out of three attempts) threw a 12-inch (.3048 m) softball from 35 ft (10.66 m) prior to beginning baseline and throughout each phase of this investigation (Kelly et al., 2010). Parent input, provided using the Student Medical Screening Form for Parents from the *TAHPERD Adapted Physical Education Manual of Best Practices* confirmed that Participant 5 had no previous injuries preventing participation in this investigation (Silliman-French & Buswell, 2017).

**Baseline phase.** For the 10 overhand throwing trials in the baseline phase, Participant 5 performed none of the essential elements during Series 1 (i.e., side orientation, T-position), 50% of the essential elements during Series 2 (i.e., hand above shoulder, weight shift), and none of the essential elements during Series 3 (i.e., throw the ball at the target, follow-through), for a total cumulative performance of 6%. Based on the performances of < 70% across all three series of the *Everyone Can* (Kelly et al., 2010), and the (established by the Dissertation Committee and primary researcher and described in Chapter III), Participant 5 began the intervention phase in Series 1.

**Intervention phase.** Preceding the first treatment day in Series 1, Participant 5 randomly selected ball #6 (i.e., intervention sequence of direct instruction plus verbal prompting, direct instruction plus video prompting, direct instruction only). For the three treatment days, Participant 5 performed none of essential elements. Based on the performance criteria established in Chapter III, Participant 5 scored < 70% and was determined to have plateaued in performance and was moved forward to Series 2.

Prior to the first treatment day in Series 2, Participant 5 randomly selected ball #2 (i.e., intervention sequence of direct instruction plus video prompting, direct instruction plus verbal prompting, direct instruction only). For all three treatment days under the three different instructional conditions, Participant 5 performed 50% of the essential elements. As such, Participant 5 was determined to have plateaued in the performance of essential elements and was moved forward to Series 3.

Before beginning Series 3, Participant 5 randomly selected ball #5 (i.e., intervention sequence of direct instruction plus video prompting, direct instruction only, direct instruction plus verbal prompting). For all three treatment days under the different instructional conditions, Participant 5 performed none of the essential elements and was determined to have plateaued in performance. Based on visual analysis of the data analysis across the three instructional conditions of the intervention phase, there was substantial overlap between each of the three instructional condition phases during intervention. As such, determining which of the three instructional strategies was inconclusive. Based on the percentage of essential elements remaining at the same level during the implementation of each instructional condition, the primary researcher made the decision to implement direct instruction plus video prompting within the greatest impact phase to provide additional evidence for or against direct instruction plus video prompting.

**Greatest impact: Instructional condition.** Following the first washout period, direct instruction plus video prompting was implemented. During implementation, Participant 5 performed 6% of the essential elements on all 10 of his overhand throwing trials. This performance demonstrated that direct instruction plus video prompting had no impact on his overhand throwing performance. Participant 5 was moved forward to the maintenance phase.

**Maintenance phase**. Following the second washout period a return to baseline condition (i.e., intervention removed) was implemented by the researcher and direct

instruction only was provided to determine if overhand throwing performance was maintained or improved throughout this investigation. Participant 5 performed 6% of the essential elements on all 10 of his overhand throwing trials in the maintenance phase. This performance mirrored the performance during the previous phase (i.e., greatest impact: instruction condition) and demonstrated that none of the interventions implemented within this investigation impacted the performance of the overhand throw for Participant 5. See Figure 6 for an illustration of performance across all phases of this investigation for Participant 5.

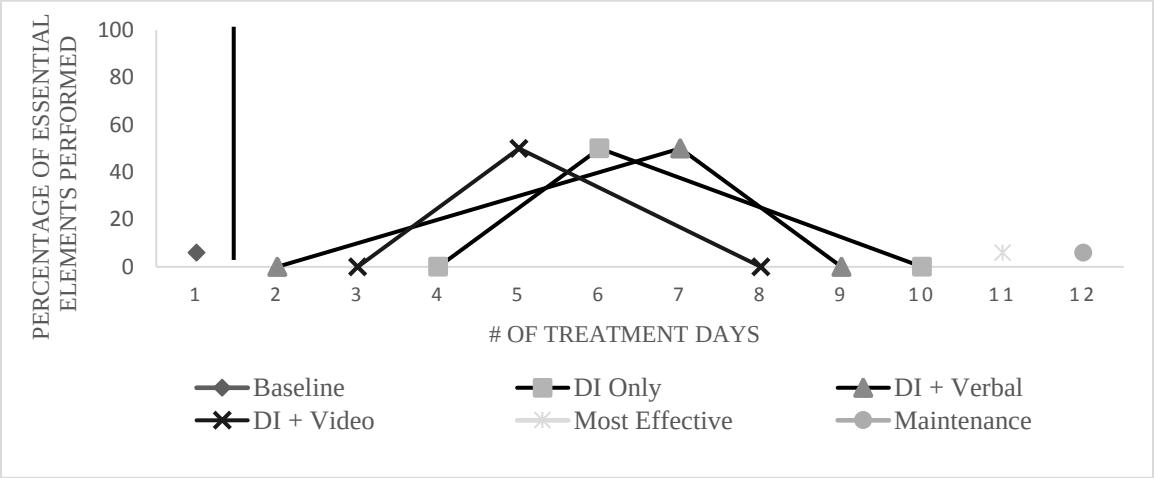


*Figure 6*. Participant 5: Percentage of Essential Elements Performed.

**Participant 6**

Participant 6, was a 9-year old girl in the third grade diagnosed with ASD. Based on *Everyone Can*, Participant 6 successfully (i.e., two out of three attempts) threw a 12-inch (.3048 m) softball from 15 ft (4.57 m) prior to beginning baseline and throughout each phase of this investigation (Kelly et al., 2010). Parent input, provided using the

Student Medical Screening Form for Parents from the *TAHPERD Adapted Physical Education Manual of Best Practices* confirmed that Participant 6 had no previous injuries preventing participation in this investigation (Silliman-French & Buswell, 2017).

**Baseline phase.** For the 10 overhand throwing trials in the baseline phase, Participant 6 performed none of the essential elements during Series 1 (i.e., side orientation, T-position), 45% of the essential elements during Series 2 (i.e., hand above shoulder, weight shift), and none of the essential elements during Series 3 (i.e., release ball towards target, follow-through) for a cumulative performance of 6%. Based on the performance of the essentials elements and performance criteria (established by the Dissertation Committee and primary researcher and described in Chapter III), Participant 6 began the intervention phase in Series 1.

**Intervention phase.** Preceding the first treatment day in Series 1, Participant 6 randomly selected ball #5 (i.e., intervention sequence of direct instruction plus video prompting, direct instruction only, direct instruction plus verbal prompting). For the three treatment days, Participant 6 performed none of the essential elements. Based on the performance criteria established previously in Chapter III, Participant 6 scored < 70% (i.e., plateaued) during all three instructional conditions and was moved to Series 2.

Prior to beginning of the first treatment day in Series 2, Participant 6 randomly selected ball #4 (i.e., intervention sequence of direct instruction only, direct instruction plus verbal prompting, direct instruction plus video prompting). For the three treatment days, Participant 6 performed 50% (Day 1), 50% (Day 2), and 50% (Day 3) of the

essential elements. Based on performing < 70% (i.e., plateaued) in all three instructional conditions Participant 6 was moved forward to Series 3.

Before beginning Series 3, Participant 6 randomly selected ball #3 (i.e., intervention sequence of direct instruction plus verbal prompting, direct instruction only, direct instruction plus video prompting). For the three treatment days, Participant 6 performed 50% (Day 1), 50% (Day 2), and 50% (Day 3) of the essential elements. Based on visual analysis of the data analysis across the three instructional conditions of the intervention phase, there was substantial overlap between each of the three instructional condition phases during intervention. As such, determining which of the three instructional strategies was inconclusive. Based on the performance of the essential of essential elements remaining at the same level during the implementation of each instructional condition, direct instruction plus video prompting was implemented within the greatest impact instructional condition phase.

**Greatest impact: Instructional condition.** Following the first washout period (i.e., no overhand throwing trials or contact with researcher), direct instruction plus video prompting was implemented. During implementation, Participant 6 performed 33% of the essential elements on all 10 of her overhand throwing trials, which demonstrated a 27% increase in performance from baseline.

**Maintenance phase**. Following the second washout period a return to baseline condition (i.e., intervention removed) was implemented by the primary researcher and direct instruction only was provided to determine if overhand throwing performance was

maintained or improved throughout this investigation. Participant 6 performed 30% of the essential elements on all 10 of the overhand throwing trials in the maintenance phase. Figure 7 details the performance across all phases of this investigation.

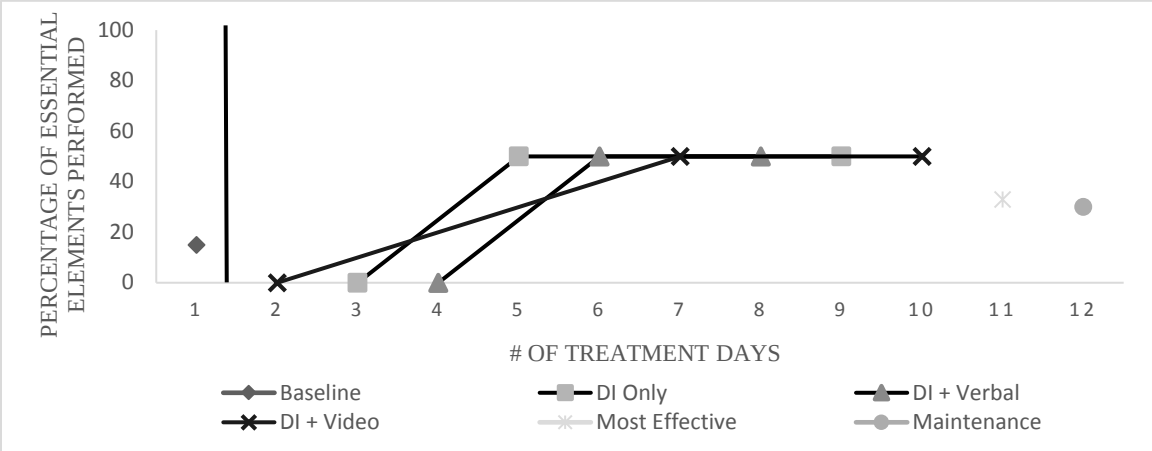


*Figure 7*. Participant 6: Percentage of Essential Elements Performed.

**Summary**

Based on an analysis of the individual data for each of the six participants the following results were determined: (a) direct instruction plus verbal prompting had the greatest impact on the performance of the essential elements of the overhand throw for one participant (i.e., 2), and (b) no other instructional condition was determined to be the most impactful for the remaining five participants. Impact was determined by the researcher adding the total percentage of essential elements performed for each participant under each instructional condition and dividing by the total number of times each instructional condition was implemented for each participant. These results will be discussed further in Chapter V of this dissertation.

# CHAPTER V

# DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS FOR FUTURE RESEARCH

In this chapter, the researcher will discuss the six participants' overhand throwing performance based on the *Everyone Can* essential elements (Kelly et al., 2010). A total of six children diagnosed with ASD between 8 to 13 years of age participated in this investigation. An analysis of the results will be presented in the following sections: (a) Discussion, (b) Conclusions, and (c) Recommendations for Future Research.

## Discussion

The purpose of this investigation was to compare the impact of three instructional conditions: (a) direct instruction only, (b) direct instruction plus video prompting, and (c) direct instruction plus verbal prompting on the performance of the overhand throw for children with ASD. The research question for this investigation was: Does the instructional condition of direct instruction plus video prompting have a greater impact on the performance of the essential elements of the overhand throw than direct instruction only or direct instruction plus verbal prompting? Bandura's social learning theory (1976), which posits that behavioral changes occur as a result of the learner identifying important components of an observed skill (visual, auditory) guided this investigation (Cardon, 2016; Sundberg & Michael, 2001). Based on social learning theory and the review of literature, direct instruction (i.e., auditory) plus video prompting (i.e., auditory-visual)

was expected to have the greatest impact on improving the overhand throwing performance for the participants in this investigation. The following sections illustrate the impact of each intervention on the performance of the overhand throw.

**Baseline Phase**

Researchers have reported children with ASD demonstrate delays in the performance of gross motor skills (e.g., overhand throw; Ament et al., 2015; Berkeley et al., 2001; Staples & Reid, 2010). Based on the review of literature for this investigation, children with ASD often demonstrate very robotic (e.g., rigid) movements, delays in motor planning, and retain or execute motor movements when required to move both sides of the body simultaneously (Alexander & Schwager, 2012). For children with ASD who have demonstrated delays in executing discrete movements, understanding the relationship between their movements and the movements' outcomes may not be easily understood. As a result of these delays, researchers have suggested that interventions for this population focus on improving gross motor skills (e.g., discrete movements; Haywood & Getchell, 2014).

During the baseline phase of this investigation, all six of the participants demonstrated a delay (i.e., < 70% of essential elements performed) in their ability to perform the overhand throw. Specifically, Alexander and Schwager (2012) reported that children with ASD have difficulty moving their arms during discrete movements without specific instructions, noting that many times, children will choose the most energy-efficient option. In the baseline phase, the researcher noted that each of the six

participants demonstrated difficulty performing the first essential element of the overhand throw (i.e., side orientation). This difficulty in performing the essential elements of the overhand throw was demonstrated throughout the baseline phase as each of the six participants performed < 30% of side orientation, which led to all six participants beginning on day 1 of intervention phase with the first series of essential elements (i.e., side orientation and T-position). Further, this omission of the first essential element impacted the ability of each participant to correctly perform the essential elements that followed (e.g., T-position, weight shift; Kelly et al., 2010). The difficulty in performing the first essential element by all six participants provided evidence for the researcher to implement further layers of support (i.e., visual, verbal) for each participant.

**Efficacy of Direct Instruction Only**

The implementation of direct instruction only occurred during baseline and within each series (i.e., 1, 2, 3) of the intervention phase. Researchers have reported that language development and comprehension vary within a diagnosis of ASD and many times children with ASD perform higher on non-verbal tests than verbal tests, due to difficulties with receptive communication (Alexander & Schwager, 2012; Coyne & Fullerton, 2014; Mayes & Calhoun, 2003). Baseline performances by all six participants demonstrated a delay in the performance of the essential elements (i.e., < 70%; see Table 6 in Chapter IV for group performance in baseline) of the overhand throw without added support (i.e., visual, verbal). For this reason, similar results were expected by the researcher during the intervention phase.

Within the intervention phase and through visual inspection, direct instruction only was shown to have an inconsistent impact on the performance of the essential elements for each of the six participants. It should be noted, that these results are contrary to past researchers who have reported the effectiveness of using direct instruction only on skill development (i.e., oral language skills, reading comprehension) for children with ASD (Flores & Ganz, 2009; Ganz & Flores, 2009). Based on the literature review and support for direct instruction only, the researcher concluded that the low performance may be due to motor planning delays within the population (Gowen & Hamilton, 2013). The researcher also believes that the type of direct instruction (i.e., providing a verbal command) implemented without a visual demonstration could have impacted the performance of each participant. Therefore, implementing direct instruction only provided no other assistance given to prompt (video, verbal) the student how he or she should be throwing the ball. Thus, one could assume that each participant had no understanding of the expectations or whether he or she was performing the correct movements (i.e., essential elements) of the *Everyone Can* overhand throw (Kelly et al., 2010).

**Efficacy of Video Prompting**

Through visual inspection of the intervention phase, direct instruction plus video prompting positively impacted the percentage of essential elements performed in at least 1 of the 3 series for each participant during the intervention phase. Of the six participants,

four demonstrated improvements in the performance of the essential elements when compared directly to their baseline performances.

The implementation of direct instruction plus video prompting during the intervention phase had a positive impact (i.e., based on highest mean percentage) for one participant (i.e., 4). Based on visual inspection direct instruction plus video prompting performance was the highest in 2 of the 3 series (i.e., 1, 2) during the intervention phase for Participant 4 only. These performances support previous researchers who purported that children with ASD can perform a movement with ample demonstration (e.g., visual) and practice (Gowen & Hamilton, 2013).

Researchers have reported improvements in performance of a behavior for children with ASD when a reduction in excess stimuli is provided and when the behavior has a high similarity to real-life experiences (Mechling & Gustafson, 2008). In evaluating these results with Bandura's (1976) social learning theory, the researcher concluded that direct instruction plus video prompting contributed to the increase in the percentage of essential elements by providing a pre-determined action plan of a specific highlighted movement (i.e., video prompting). This conclusion was based on the results of the study in conjunction with the literature support provided for video prompting in Chapter II of this dissertation (Bellini, Akullian, & Hopf, 2007; Canella-Malone et al., 2011; Delano, 2007; Mechling, 2005). Additionally, the results of this study are consistent with the work of Staples and Reid (2010), who reported that children with ASD best learn when instruction is structured and based on the current learning strengths of the individual.

**Efficacy of Verbal Prompting**

Through visual inspection of the intervention phase, direct instruction plus verbal prompting was deemed to have the greatest impact for two participants (i.e., 2, 3) as they performed their highest mean percentage of essential elements during the implementation of this instructional condition. These results could be attributed to Neitzel and Wolery (2009) report that verbal prompting offers a simplistic instructional strategy that can be implemented for children with ASD. Further, Bouxsein, Tiger, and Fisher (2008) reported that children were more likely to comply with a set of instructions when those instructions specified a target behavior (e.g., point to target) than more general instructions (e.g., throw the ball at the target). Additionally, Colozzi, Ward, and Crotty (2008), reported that verbal prompting was successful in improving selected play skills including one gross motor skill for children with pervasive development disorder-not otherwise specified (PDD-NOS).

These aforementioned results were unexpected by the primary researcher as verbal prompting only addresses two of the four stages (i.e., attention, retention) of learning within Bandura's (1976) social learning theory. As the researcher followed the protocol of Nietzel and Wolery by (a) identifying the target behavior, (b) identifying the target stimulus, and (c) pre-selecting the prompts or directions, attention and retention were addressed through direct instruction plus verbal prompting as the researcher verbally prompted each participant to the target behavior, and consistently provided the same verbal prompt for all overhand throwing trials. However, direct instruction plus

verbal prompting does not address the third and fourth stages of Bandura's social learning theory as it fails to provide a consistent visual model (i.e., motor reproduction, motivation). Thus, each participant was expected to perform the overhand throw without a visual support (e.g., video prompt) to guide his or her understanding of the essential elements and expected performance. As such, these results did not align with Bandura's (1976) social learning theory and point to the large spectrum of learning preferences for children diagnosed with ASD.

**Impact of the Intervention Phase**

For the intervention phase, the decision to implement direct instruction only, direct instruction plus video prompting, and direct instruction plus verbal prompting was based on the following rationale. First, all three of the interventions had previously been researched and recognized as either an evidence-based practice for children with ASD (i.e., video modeling, prompting; NAC, 2015; NPDC, 2015), or a proven systematic approach that has impacted children's performance in the physical education setting (i.e., direct instruction; Mosston & Ashworth, 2008). Based on this understanding of the efficacy of the three interventions, the research question was designed to implement the three interventions and determine which intervention would have the greatest impact on the overhand throwing performance for the participants. Second, each instructional strategy was randomly implemented within each series allowing the researcher to limit the crossover effect (Richards et al., 2014), which might have been observed had each intervention been implemented in a consistent order. Analyzing the results from this

investigation, the primary researcher believes there are inconsistency on the impact of the three instructional conditions on the performance of the essential elements of the overhand throw.

**Social Learning Theory Predicts Performance**

Within Bandura's (1976) social learning theory are the four stages of learning that individual's experience. This process of learning is outlined by the individual observing the different outcomes (e.g., positive, negative) of an observed (i.e., auditory, visual) behavior and building a hypothesis about which responses are most appropriate within different settings (Bandura, 1976). Based on the literature specific to social learning theory (1976) addressed in Chapter II of this dissertation, the researcher postulated that by providing each participant in this investigation with the same consistent model of an overhand throw, he or she would have the opportunity to experience these four stages.

Participation in this investigation also provided each child with ASD the opportunity to improve his or her performance of a gross motor skill (i.e., overhand throw). These additional opportunities are important as researchers have reported on the importance of providing early interventions (i.e., motor programming) to young children with ASD (Ketcheson, Hauck, & Ulrich, 2017); and that the development of gross motor skills serves as the basis for more advanced or sport specific skills (Burton & Milller, 1998). For these reasons, further research combined with an increase in performance opportunities of a gross motor skill is need to generalize future results for children with ASD aged 8 to 13 years.

## Conclusions

Within the limitations of this investigation, it was concluded that for five of the six participants, each of the implemented instructional conditions positively impacted overhand throwing performances when the mean percentages of participant performances were compared to baseline to maintenance phase (i.e., ranging from 24% to 64%). Possible factors that influenced these results are as follows. First, by providing a consistent visual and verbal prompt of each essential element of the overhand throw, participants were able to progress through the four stages of learning identified in Bandura's (1976) social learning theory. Second, by providing each participant multiple layers of instructional support (i.e., visual, verbal) across the skill of the overhand throw, each participant was able to build on their previous knowledge of an overhand throw. Finally, the research design and methods implemented (i.e., alternating treatment with baseline) in this investigation were designed to investigate the impact of the instructional conditions on the overhand throwing performance for each participant.

Based on the possible factors listed above the researcher believes the immediate (i.e., next day) changing of instructional conditions on a daily basis may have contributed to the improvements in the overhand performance for five of the six participants. Conversely, the results from the most effective phase to the maintenance phase were mixed as four of the six participants maintained or improved their performance of the overhand throw within these last two phases (i.e., greatest impact, maintenance). These results could be attributed to the number of trials (i.e., 120) each participant received

during the four phases (i.e., baseline, intervention, greatest condition, maintenance) of this investigation. Moreover, 1 of the 6 participants demonstrated a ceiling effect (i.e., 100% performance of essential elements for at least one series), which indicated the participant had reached the highest level of performance. Additionally, three of the remaining five participants plateaued (i.e., demonstrated no change in behavior) in at least 1 of the 3 series within this investigation. While the results were not conclusive for all the participants, there are factors that potentially explain some of the discrepancies and provide evidence for continued research focused on the variation of instruction to improve the performance of gross motor skills for children with ASD.

## Recommendations for Future Research

Based on the findings and limitations from this investigation the following recommendations are made for future investigations:

1. Replicate the existing investigation using a larger number trials to confirm efficacy of direct instruction plus video prompting. By increasing the number of trials and focusing on the most effective instructional strategy the researcher could impact the fidelity of the results.
2. Implement the instructional techniques of video prompting and verbal prompting simultaneously using an A-B-A-B withdrawal design to determine if the combination of the instructional strategies would have the greatest impact on performance. The use of an A-B-A-B design would allow the researcher to

demonstrate the impact of the intervention through the removal and return to baseline and then reintroduction following baseline (Richards et al., 2014).

3. Expand the intervention period and number of repetitions of direct instruction plus video prompting direct instruction plus verbal prompting across a variety of different gross motor skills (e.g., kicking, underhand roll, catching) to determine the impact across the performance of other object control motor skills. While the current literature supports the application of video-based instruction (e.g., direct instruction plus video prompting) in the general education setting, there has been a limited amount of support for the application of video-based instruction in the physical education setting as an instructional tool to improve the performance of gross motor skills for children with ASD. Researchers have also reported that with an increased opportunity for repetition and practice time children with ASD can perform skills at the same levels as their typically developing peers (Gowen & Hamilton, 2013).

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# APPENDIX A

## Adapted Physical Activity Taxonomy

Table 1

*Sensori-Motor and Daily Living Skills of Preschool Children With Autism Spectrum Disorders* (Jasmin, Couture, McKinley, Reid, Fombonne, & Gisel, 2009).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 3<br><br>LOR = B | 35 children (i.e., 25 with ASD, 10 children with PDD-NOS).<br><br>3 to 4 years<br><br>Male/Female | Correlational<br><br>*Peabody Developmental Motor Scale* (Folio & Fewell, 2000). | The purpose of this study was to determine the impact of sensori-motor skills on the performance of DLS in preschool children with ASD. | Children showed atypical sensory responses, very poor motor, and DLS. Sensory avoiding, an excessive reaction to sensory stimuli and fine motor skills were highly correlated with DLS, even when cognitive performance was considered. Sensori-motor deficits have an impact on the autonomy of children with ASD and interventions should focus on improving and supporting the development of sensori-motor skills. |

*Note.* LOE = Level of Evidence; LOR = Level of Recommendation; ASD = Autism Spectrum Disorder; PDD-NOS = Pervasive Developmental Disorder-Not Otherwise Specified; DLS = Daily living skills.

Dissertation keywords marked as related to this publication:

| | | | | |
|---|---|---|---|---|
| *Autism spectrum disorder* | *Video-based instruction* | √ | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

Table 2

*Delays and Deficits may Both Contribute to Atypical Development of Movement Skills by Children With Autism Spectrum Disorder* (Staples & Reid, 2010).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 3<br><br>LOR = A | A total of 28 participants<br>25 children with ASD, 3 TD children).<br><br>9 to 12 years<br><br>Male/Female | Quasi-Experimental<br><br>*Test of Gross Motor Development-2* (*TGMD-2; Ulrich, 2000*). | The purpose of this study was to compare the fundamental motor skills of 25 children with ASD ages 9-12 years to three typically developing aged matched peers using the *TGMD-2*. | The ASD and TD groups significantly differed on the mean locomotor score ($p < .01$).<br>Locomotor scores for children with ASD ranged from 8 to 44 (M = 25.6).<br>TD group ranged from 39 to 48 (M = 45.3).<br>Low scores for children with ASD reflect the quality of performance of the gross motor skills, demonstrating difficulty in movements that involved coordination of both sides for the body and arms and legs were needed. |

*Note.* LOE = Level of Evidence; LOR = Level of Recommendation; ASD = Autism Spectrum Disorder; TD = Typically Developing.

Dissertation keywords marked as related to this publication:

| | | | | | |
|---|---|---|---|---|---|
| √ | *Autism spectrum disorder* | *Video-based instruction* | √ | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

Table 3

*Locomotor and Object Control Skills of Children Diagnosed With Autism Spectrum Disorder* (Berkeley, Zittel, Pitney, & Nichols, 2001).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 2<br><br>LOR = A | 15 children with ASD.<br><br>6 to 8 years<br><br>Male/Female | Single-Subject Design: type<br><br>*Test of Gross Motor Development-2* (*TGMD-2;* Ulrich, 2000). | The purpose of this study was to compare the locomotor and object control skills of children aged 6 to 8 years with ASD to the comparative norms provided in the *TGMD-2.* | No major difference reported between locomotor subtest scores between boys (M = 3.85; Variance = 5.6) and girls (M = 3.30; Variance = 2.0).<br>Large difference reported on object control skills boys (M = 6.25; Variance = 14.5) girls (M= 2.90; Variance = 2.5).<br>Overall 73% of the population performed at a poor to very poor level based on *TGMD-2* categories (i.e., locomotor, object control). |

*Note.* LOE = Level of Evidence; LOR = Level of Recommendation; ASD = Autism Spectrum Disorder; M = Mean.

Dissertation keywords marked as related to this publication:

| | | | | | |
|---|---|---|---|---|---|
| √ | *Autism spectrum disorder* | *Video-based instruction* | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

Table 4

*Evidence for Specificity of Motor Impairments in Catching and Balance in Children With Autism* (Ament, Mejia, Buhlman, Erklin, Caffo, Mostofsky, & Wodka, 2015).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 1<br><br>LOR = A | 200 children participated in this investigation (i.e., 56 children with ASD, 63 with ADHD, 81 TD peers).<br><br>8 to 13 years<br><br>Male/Female | Correlational<br><br>*Movement Assessment Battery for Children-2* (*M-ABC-2*; Henderson, Sugden, & Barnett, 2007). | The purpose of this study was to determine if motor impairment exist in children with ASD and ADHD based on performance of *M-ABC-2*. | Both groups of participants (i.e., ASD, ADHD) demonstrated motor delays when compared to their TD peers.<br>Children with ASD demonstrated the greatest deficit in motor delays when compared to the ADHD group and TD group. |

*Note.* LOE = Level of Evidence; LOR = Level of Recommendation; ASD = Autism Spectrum Disorder; ADHD = Attention Deficit Hyperactivity Disorder; TD = Typically Developing.

Dissertation keywords marked as related to this publication:

| | | | | | |
|---|---|---|---|---|---|
| √ | *Autism spectrum disorder* | *Video-based instruction* | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

Table 5

*Gross Motor Performance and Physical Fitness in Children With Psychiatric Disorder* (Emck, Bosscher, Wieringen, Doreleijers, & Beek, 2009).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 2<br><br>LOR = A | 100 children with ED, PDD-NOS, and or BD participated in this investigation.<br><br>6 to 12 years<br><br>Male/Female | Quasi-Experimental<br><br>*Test of Gross Motor Development-2* (Ulrich, 2000). | The purpose of this study was to review empirical studies of gross motor performance and self-perception of motor competence in children with ED and PDD-NOS. | Large effect sizes of each disorder on gross motor performance were reported that amounted to a developmental delay of approximately 3 years for both locomotion and object control, indicating that the ED, PDD-NOS, BD groups performed significantly worse than TD children.<br>On average, all children performed poorly on the performance on gross motor skills. Motor problems were observed objectively and perceived motor skills for children with PDD-NOS demonstrating a low self-worth in this population. |

*Note.* LOE = Level of Evidence, LOR = Level of Recommendation, ED = Emotional Disorder; PDD-NOS = Pervasive Development Disorder-Not Otherwise Specified; BD = Behavioral Disorder.

Dissertation keywords marked as related to this publication:

| | | | | | |
|---|---|---|---|---|---|
| *Autism spectrum disorder* | *Video-based instruction* | √ | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

Table 6

*The Severity and Nature of Motor Impairment in Asperger's syndrome: A Comparison With Specific Developmental Disorder of Motor Function* (Green, Baird, Barnett, Henderson, Huber, & Henderson, 2002).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 2<br><br>LOR = A | 20 total children (i.e., 11 children with AS, 9 children with SDD-MF).<br><br>6.5 to 10.5 years<br><br>Males | Correlational<br><br>*Movement Assessment Battery for Children-2* (*M-ABC-2*; Henderson, Sudgen, & Barnett, 2007). | The purpose of this study was to objectively measure the extent and severity of motor impairment in children with AS and to determine if those motor difficulties differed from children classified as having SDD-MF. | The correlation between performance on ball skills and manual dexterity was significant ($p < .05$), as was that between ball skills and balance ($p < .05$).<br>Manual dexterity (involving a securely seated subject) with static and dynamic balance was non-significant.<br>All children with AS met the criteria to qualify for a motor impairment. Over 50% of the AS group was identified with significant delays in motor functioning. |

*Note.* LOE = Level of Evidence; LOR = Level of Recommendation; AS = Asperger's Syndrome: SDD-MF = Specific Developmental Disorder of Motor Functioning.

Dissertation keywords marked as related to this publication:

| | | | | | |
|---|---|---|---|---|---|
| √ | *Autism spectrum disorder* | *Video-based instruction* | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

Table 7

*Motor Signs Distinguish Children With High Functioning Autism and Asperger's Syndrome From Controls* (Jansiewicz, Goldberg, Newschaffer, Denckla, Landa, & Mosotofsky, 2006).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 2<br><br>LOR = B | 95 total participants (i.e., 45 children with HFA and AS, 55 TD children).<br><br>6 to 17 years<br><br>Male/Female | Quasi-Experimental<br><br>*Physical and Neurological Exam for Subtle Signs* (*PANNESS;* Denckla, 1985). | The purpose of this study was to compare the performances of 45 children with HFA and AS to 55 TD children on the PANNESS neurological examination motor control. | ASD group had a significant impairment on several measures of motor control (i.e., balance, speed of repetitive and timed movements) compared to the control group (i.e., typical developing).<br>In the study of motor control participants with HFA and AS were shown to have impaired performance on a wide range of motor performances (e.g., balance, gait, slower speed and more dysrhythmia with timed movements. |

*Note.* LOE = Level of Evidence; LOR = Level of Recommendation; ASD = Autism Spectrum Disorder TD = Typically Developing.

Dissertation keywords marked as related to this publication:

| | | | | | |
|---|---|---|---|---|---|
| √ | *Autism spectrum disorder* | *Video-based instruction* | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

Table 8

*Children Diagnosed With Autism Spectrum Disorders and Attention Deficit Hyperactivity Disorder* (Pan Tsai, & Chu, 2009).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 2<br><br>LOR = A | 91 total children participated in this study (i.e., 29 children with ASD, 28 children with ADHD, and 31 TD children.<br><br>6-10 years<br><br>Male/Female | Quasi-Experimental<br><br>*Test of Gross Motor Development* (*TGMD-2;* Ulrich, 2000). | The purpose of this study was to compare the movement skills of children with ASD, children with ADHD, and typical developing children. | Performance of fundamental motor skills: Significant differences were reported between group one ASD and group two ADHD in galloping, hopping, striking, catching, stationary dribble, and rolling.<br>Findings were consistent with previous researchers who have reported that children with ASD and ADHD perform poorly on the performance of gross motor skills compared to their typical developing peers. |

*Note.* LOE = Level of Evidence; LOR = Level of Recommendation; ASD = Autism Spectrum Disorder; ADHD = Attention Deficit Hyperactivity Disorder.

Dissertation keywords marked as related to this publication:

| | | | | | |
|---|---|---|---|---|---|
| √ | *Autism spectrum disorder* | *Video-based instruction* | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

Table 9

*The Reach-to-Grasp Movement in Children With Autism Spectrum Disorder* (Mari, Castiello, Marks, Marraffa, & Prior, 2003).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 3<br><br>LOR = C | 40 children (i.e., 20 children with ASD, 20 TD children).<br><br>8 to 13 years<br><br>Mixed | Correlational<br><br>Individual data collection for each participant. Reach-to-grasp target illuminated, video cameras tracked pattern of movement. | The purpose of this study was to compare research on the reach-to-grasp movement in children with ASD compared to age matched TD peers, as well as, introduce an experimental model that may be useful for rehabilitation and diagnostic purposes. | Movement patterns were significantly different between children with ASD identified with “low” IQ when compared to children with ASD identified with “high” IQ. Children identified with “low” IQ also performed significantly below the “average” and “high” IQ groups in movement duration and deceleration time. Finding support past literature that there are differences in motor performance between the groups of ASD. Further results of reach-to-grasp movement could be used in determining level of severity for the individual with ASD. |

*Note.* LOE = Level of Evidence; LOR = Level of Recommendation; ASD = Autism Spectrum Disorder; IQ = Intelligence Quotient.

Dissertation keywords marked as related to this publication:

| | | | | | |
|---|---|---|---|---|---|
| √ | *Autism spectrum disorder* | *Video-based instruction* | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

Table 10

*Anticipatory Planning in Children With Autism Spectrum Disorder: An Assessment of Independent and Joint Action Tasks* (Scharoun & Bryden, 2016).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 2<br><br>LOR = C | 28 total participants (i.e., 14 children with ASD, 14 TD children).<br><br>5 to 13 years<br><br>Male/Female | Correlational<br><br>Observational collection of data were done by having children picked-up a glass after instruction was provided by the researcher. | The purpose of this study was to further investigate the anticipatory motor planning in children with ASD by measuring end-and-beginning state of comfort. | Results from this investigation demonstrate children with ASD have deficits in motor planning and controlling independent movements.<br>Transitioning to a movement perspective may allow for a new diagnostic criteria and intervention protocol for children with ASD. |

*Note.* LOE = Level of Evidence; LOR = Level of Recommendation; ASD = Autism Spectrum Disorder; TD = Typically Developing.

Dissertation keywords marked as related to this publication:

| | | | | | |
|---|---|---|---|---|---|
| √ | *Autism spectrum disorder* | *Video-based instruction* | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

Table 11

*Acquisition of Internal Models of Motor Tasks in Children With Autism* (Gidley Larson, Bastian, Donchin, Shadmehr, & Mostofsky, 2008).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 3<br><br>LOR = C | Total of 41 participants (i.e., 21 children with HFA, 20 TD children.<br><br>8 to 13 years<br><br>Male/Female | Quasi-Experimental<br><br>*Wechsler Intelligence Scale for Children (WISC*; Wechsler, 1991). | Determine level of motor deficits for children with autism and acquisition levels of children with autism from two separate task (i.e., prism control, learning to control a novel tool). | Investigators suggested that motor adaptation in children with HFA is normal when compared to their typical developing peers. In summary children with autism exhibited the ability to adapt to normal external properties on a number of a task (i.e., throwing ball at target) when compared to their TD peers. |

*Note.* LOE = Level of Evidence; LOR = Level of Recommendation; HFA = High Functioning Autism; TD = Typically Developing.

Dissertation keywords marked as related to this publication:

| | | | | | |
|---|---|---|---|---|---|
| √ | *Autism spectrum disorder* | *Video-based instruction* | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

Table 12

*Children With Autism Adapt Normally During a Catching Task Requiring the Cerebellum* (Mostofsky, Bunoski, Morton, Goldberg, & Bastian, 2004).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 3<br><br>LOR = A | 16 total participants (i.e., 8 children with HFA, 8 TD children).<br><br>8 to 13 years<br><br>Males | Correlational<br><br>OPTOTRAK System measured was used to determine hand displacement upon catching the different sized balls (i.e., light, heavy) | The purpose of this study was to determine if children with high functioning autism suffered from damage to the cerebellar. | Participants in both groups adapted quickly to ball weight. All participants were able to accurately identify different weighted balls.<br>Results determined by the researchers demonstrated that children with HFA have normal cerebellar functioning.<br>In conclusion, children with HFA have the ability to adjust and have normal catching adaptation. It was also demonstrated that normal motor adaptation in children with high functioning autism. |

*Note.* LOE = Level of Evidence; LOR = Level of Recommendation; HFA = High Functioning Autism; TD = Typically Developing; OPTOTRAK = Northern Digital, Waterloo, On).

Dissertation keywords marked as related to this publication:

| | | | | | |
|---|---|---|---|---|---|
| √ | *Autism spectrum disorder* | *Video-based instruction* | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

Table 13

*Fine and Gross Motor Task Performance When Using Computer-Based Video Models by Students With Autism and Moderate Intellectual Disability* (Mechling & Swindle, 2013).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 2<br><br>LOR = A | 6 total participants (i.e., 3 children with autism, 3 children with MID).<br><br>7 to 11 years<br><br>Male/Female | Single-subject: Multiple probe design<br><br>Continuous (i.e., baseline, intervention, maintenance 1, maintenance 2). Fine motor skills consisted of turning on vibrating bee, stretching (i.e., holding two sides of elastic band). Gross motor Skills consisted of bouncing while sitting on ball and kicking a ball. | The purpose of this study was to investigate the effect of video modeling on fine and gross motor task for children with autism and children with moderate intellectual disability. | All participants showed an increase in fine and gross motor skills after the introduction of computer-based video modeling.<br>Based on visual observation (i.e., baseline, intervention, maintenance 1, maintenance 2) children with MID performed fine and gross motor skills at a higher rate when compared to the children with autism. |

*Note.* LOE = Level of Evidence; LOR = Level of Recommendation; MID = Moderate Intellectual Disability.

Dissertation keywords marked as related to this publication:

| | | | | | | |
|---|---|---|---|---|---|---|
| √ | *Autism spectrum disorder* | *Video-based instruction* | √ | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

Table 14

*School-Based Fundamental-Motor-Skill Intervention for Children with Autism-Like Characteristics: An Exploratory Study* (Bremer & Lloyd, 2016).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 1<br><br>LOR = A | 5 children with ASD like characteristics).<br><br>3 to 7 years<br><br>Male/Female | Quantitative<br><br>*Test of Gross Motor Development* (*TGMD-2*; Ulrich, 2000). | The purpose of this study was to demonstrate the impact of a fundamental motor skills training intervention on children with ASD and children with ASD like characteristics (i.e., need additional resources). | The researchers of this investigation reported that many of the children (i.e., 4 of the 5) improved on his or her ability to perform a number of the gross motor skills (i.e., jump, strike, roll, catch). |

*Note.* LOE = Level of Evidence, LOR = Level of Recommendation; ASD = Autism Spectrum Disorder.

Dissertation keywords marked as related to this publication:

| | | | | | |
|---|---|---|---|---|---|
| √ | *Autism spectrum disorder* | *Video-based instruction* | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

Table 15

*The Effectiveness of Video Prompting on Teaching Aquatic Play Skills for Children With Autism* (Yanardag, Akmanoglu, & Yilmaz, 2013).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 1<br><br>LOR = A | 3 children with ASD<br><br>6 to 8 years<br><br>Male/Female | Single-subject: Multiple probe design<br><br>Pre-Post with 3 maintenance phases at the 1st, 2nd, and 4th week. Duration of study lasted 12 weeks.<br>*Movement-ABC-2* (Sudgen & Henderson, 2007). | The purpose of this study was to determine the effectiveness on a video prompting procedure on teaching aquatic play skills to children with ASD. | All three children improved their performance of the three aquatic play skills and maintained this behavior over all maintenance phases.<br>Video-based instruction had a positive influence on aquatic skills.<br>Aquatic skills could be beneficial from improving motor performance of children with ASD. |

*Note.* LOE = Level of Evidence; LOR = Level of Recommendation; ASD = Autism Spectrum Disorder.

Dissertation keywords marked as related to this publication:

| | | | | | |
|---|---|---|---|---|---|
| √ | *Autism spectrum disorder* | *Video-based instruction* | *Gross motor skill performance* | √ | *Video prompting* | *Verbal prompting* |

Table 16

*Teaching Pointing to Numerals to Individuals With Autism Using Simultaneous Prompting* (Akmanoglu & Batu, 2005).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 1<br><br>LOR = C | 3 students with autism<br><br>6 to 17 years<br><br>Mixed | Single-subject: Multiple probe design.<br><br>Continuous (i.e., baseline, intervention, maintenance, generalization). Performance for each participant was evaluated through visual analysis. | The purpose of this study was to evaluate the effectiveness of simultaneous prompting in teaching pointing to individuals with autism. | Results from this investigation demonstrated that simultaneous prompting was an effective teaching strategy for increasing the performances of 3 students with autism ability to point to numerals (i.e., calendar pages). The researchers believe that these results demonstrate the efficacy of simultaneous prompting for children with autism in teaching both discrete and chained behaviors and also improving errorless responses. |

*Note.* LOE = Level of Evidence; LOR = Level of Recommendation.

Dissertation keywords marked as related to this publication:

| | | | | | |
|---|---|---|---|---|---|
| √ | *Autism spectrum disorder* | *Video-based instruction* | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

Table 17

*Motor Skills in Children Aged 7-10, Diagnosed With Autism Spectrum Disorder* (Whyatt & Craig, 2012).

| **Quality of Evidence** | **Participants** | **Design/Data Collection** | **Purpose** | **Summary of the Results** |
|---|---|---|---|---|
| LOE = 2<br><br>LOR = A | 59 total children participated in this investigation (i.e., 18 children with ASD, 19 age-matched TD children, 22 NVIQ matched group of children).<br><br>7 to 10 years<br><br>Male/Female | Correlational<br><br>Pre-Post *Movement Assessment Battery for Children 2* (*M-ABC-2*; Sudgen, Henderson, & Barnett 2007). | The purpose of this study was to \evaluate the motor skills of children using the *M-ABC-2* Sudgen, Henderson, & Barnett, 2007), in comparison to their aged matched typically developing peers. | Group performance on the *M-ABC-2* showed an overall poor performance by the ASD group compared to the two controlled groups (i.e., TD, NVIQ).<br><br>Performance comparisons across the groups demonstrated motor impairment in the area of ball skills and manual dexterity in the autism group. These results indicate children with ASD. Results from this investigation also demonstrated comparable levels of performance on dynamic balance. These results an overall impairment of motor functioning for children with ASD |

*Note.* LOE = Level of Evidence; LOR = Level of Recommendation; ASD = Autism Spectrum Disorder; NVIQ = Non-Verbal Intelligence Quotient.

Dissertation keywords marked as related to this publication:

| | | | | | |
|---|---|---|---|---|---|
| √ | *Autism spectrum disorder* | *Video-based instruction* | *Gross motor skill performance* | *Video prompting* | *Verbal prompting* |

APPENDIX B

Student Medical Screening Form for Parent(s)

Learning Knows No Bounds

## *Adapted Physical Education Screening Form*

| General Educator | Adapted Physical Education Teacher | Educational Diagnostician |
|---|---|---|
| **Initial** Date | **Initial** Date | **Initial** Date |

**Student** _____ **ID#** _____ **DOB** _____ **School** _____
**Type of class (unit) teacher** _____ **Evaluation requested by** _____ **Medical concerns** _____
**Major concerns about student in physical education** _____
**School contact for adapted physical education** _____
**Method of ambulation** _____ **Form of communication** _____

Please check(s) the appropriate responses: General Education (GE) column Adapted Physical Education (APE) column. Y = Yes; N = No; and S = Sometimes

| **PRESENT LEVEL OF Motor Movement Skills:** | Place a Y, N, or S | |
|---|---|---|
| | GE | APE |
| Demonstrates capability for voluntary movement | | |
| Reacts to noise/activity/touch | | |
| Rolls from front to back | | |
| Sits assisted/unassisted | | |
| Stands assisted/unassisted | | |
| Walks in cross pattern | | |
| Runs in cross pattern | | |
| Ascends/descends stairs | | |
| Jumps with mature pattern | | |
| Hops (1 foot) with mature pattern | | |
| Leaps with mature pattern | | |
| Gallops with mature pattern | | |
| Skips with mature pattern | | |
| Slides with mature pattern | | |
| Walks a straight line/heel-to-toe | | |
| Stands on one foot for 5 sec | | |
| Catches an 8.5 inch ball with mature pattern | | |
| Bounces and catches a playground ball to self | | |
| Kicks a stationary ball with mature pattern | | |
| Kicks a rolled ball with mature pattern | | |
| Throws a ball with mature pattern | | |
| Self-turn rope using rhythmic form while jumping | | |
| **Cognitive Development:** | | |
| Can remember visual and/or auditory information | | |
| Can understand cause and effect | | |
| Exhibits appropriate on-task behavior | | |
| Can follow directions | | |
| **Affective Development:** | | |
| Indicates a dislike for physical activity | | |
| Prefers to play solo | | |
| Has a low frustration tolerance, cries easily | | |
| Tends to be impulsive | | |
| Shows physical/verbal aggression toward others/self | | |
| Has a short attention span | | |
| Distracts others | | |
| Respects authority, rules, and others | | |

| **Motor and Physical Fitness:** | Place a Y, N, or S | |
|---|---|---|
| | GE | APE |
| ❑ Completes 3 to 5 sit-ups in 30 sec | | |
| ❑ Completes 8 push-ups (on toes and knees) in 30 sec | | |
| ❑ Jumping forward 36" | | |
| ❑ Runs 45' in 6 sec or less | | |
| ❑ Grasps both ankles with legs straight | | |
| ❑ Underweight appearance<br>❑ Overweight appearance | | |
| **Mobility Skills (nonambulatory): (Check all that the student demonstrates)** | | |
| ❑ Transfers in and out of wheelchair | | |
| ❑ Has acceptable range of motion | | |
| ❑ Can open doors | | |
| ❑ Can push up ramps | | |
| ❑ Can reverse direction | | |
| ❑ Can use brake | | |
| ❑ Can pivot in wheelchair | | |

**Recommendations to be completed by the *Adapted Physical Educator*:**

- ❑ The student is functioning within acceptable limits in GE and does not need any further assessment at this time.
- ❑ The student is able to be included in GE class with appropriate support by the GE and/or consultation services by the APE.
- ❑ The student appears to be experiencing difficulty in the area(s) indicated above and will need further assessment by the APE for appropriate placement with some type of special services.
- ❑ The student can benefit from activities provided by the classroom teacher.

**Comments/Dates of Observations:** _____

*Please return this completed form to the students' Special Education Diagnostician/Case Manager.*
*Thank you.*

| Signature | Date | Position |
|---|---|---|

*Note*. Modified and used with permission: Initially developed by the Fort Worth ISD APE staff (1994) and modified by the Denton ISD APE staff (2005).

APPENDIX C

Institutional Review Board Approval Letter - Texas Woman's University

**Institutional Review Board**
Office of Research and Sponsored Programs
P.O. Box 425619, Denton, TX 76204-5619
940-898-3378
email: IRB@twu.edu
http://www.twu.edu/irb.html

DATE: April 26, 2016

TO: Mr. David Adams
Kinesiology

FROM: Institutional Review Board (IRB) - Denton

*Re: Approval for Effect of Video Modeling and Reinforcement on Throwing Performance in Children with Autism (Protocol #: 18993)*

The above referenced study was reviewed at a fully convened meeting of the Denton IRB (operating under FWA00000178). The study was approved on 4/26/2016. This approval is valid for one year and expires on 4/26/2017. The IRB will send an email notification 45 days prior to the expiration date with instructions to extend or close the study. It is your responsibility to request an extension for the study if it is not yet complete, to close the protocol file when the study is complete, and to make certain that the study is not conducted beyond the expiration date.

If applicable, agency approval letters must be submitted to the IRB upon receipt prior to any data collection at that agency. A copy of the approved consent form with the IRB approval stamp is enclosed. Please use the consent form with the most recent approval date stamp when obtaining consent from your participants. A copy of the signed consent forms must be submitted with the request to close the study file at the completion of the study.

Any modifications to this study must be submitted for review to the IRB using the Modification Request Form. Additionally, the IRB must be notified immediately of any adverse events or unanticipated problems. All forms are located on the IRB website. If you have any questions, please contact the TWU IRB.

cc. Dr. David Nichols, Kinesiology

APPENDIX D

Participant Consent Form

TEXAS WOMAN'S UNIVERSITY
CONSENT TO PARTICIPATE IN RESEARCH

Title: Improving the Overhand Throw for Children with Autism Spectrum Disorder
Investigator: David Adams, Med, MA..... Dadams6@twu.edu
Advisor: Lisa Silliman-French, PhD..... LsillimanFrench@twu.edu

Explanation and Purpose of the Research

Your child is being asked to participate in a research study for Mr. David Adams dissertation at Texas Woman's University. The purpose of this investigation is to compare the effect of three instructional strategies: (a) direct instruction only, (b) direct instruction plus video prompting, and (c) direct instruction plus verbal prompting on the performance of the overhand throw in children with ASD.

Description of Procedures

As a participant in this study your child will be asked to spend up to 30 minutes a day for a minimum of 6 days and maximum of 15 days at The Novus Academy with Mr. David Adams (i.e., researcher). In the first phase of this study the researcher will ask your child to "throw the ball at the target". In the second phase the researcher will introduce three different teaching strategies to your child and will continue to ask them to throw the ball at the target. In the third phase the researcher will have your child throw the ball at the target after being re-introduced to the teaching strategy that he or she performed best with in the second phase. In the fourth phase the researcher will only tell your child to "throw the ball at the target". During each phase of this study your child will be videotaped with no sound. Video recordings will be used to analyze each of your child's overhand throwing attempts. Your child will complete the study after all four phases have been completed. For your child to be a participant in this study, you the parent/caregiver must provide written consent at the bottom of this form.

Potential Risks

Participation in this study is completely voluntary. Choosing not to participate will in no way affect the services provided to your child at The Novus Academy.

Another risk in this study is loss of confidentiality. Confidentiality will be protected to the extent that is allowed by law. To minimize risk, the researcher will store all data collected on a password-protected computer and a locked filing cabinet in his office. Your child will be given a code name (e.g. FITT-001, FITT-002) with a combination of letters/numbers that protect his or her identity. There will be a single sheet of paper linking your child's ID and name and will be kept separate from the other data. Only the researcher will know your child's real name. The investigation will be held at The Novus Academy where your child is currently a student and the researcher a faculty member. All video recordings and data analysis will be erased and shredded within 5 years after the study is finished. The results of the study will be reported in scientific magazines or journals but your child's name or any other identifying information will not be included. There is a potential risk of loss of confidentiality in all email, downloading, electronic meetings and internet transactions.

Loss of anonymity is also a risk in this study. To minimize risk the researcher will bring your child from their classroom into the study area. The study area will also be reserved during this time.

To ensure there is not a loss of time, the researcher will meet with your child and his or her teachers to set up a schedule for participation in this study. Your child will have the option of making up any missed days with the researcher. The study will not close until your child has completed all four phases.

_____Initials



Approved by the
Texas Woman's University
Institutional Review Board
**Approved: April 26, 2017**

Lastly, to avoid frustration from setting in your child will be allowed 10 overhand throwing trials for each day of this study. If your child becomes frustrated, the researcher will stop the study and allow your child a 5-minute cool down period. After the 5-minute cool down period the researcher will begin the study where your child left off. If your child continues to become frustrated the researcher will stop the study and allow your child to return to class.

The researchers will try to prevent any problem that could happen because of this research. You should let the researchers know at once if there is a problem and Mr. Adams will help you. However, TWU does not provide medical services or financial assistance for injuries that might happen because you are taking part in this research.

Please note participation is voluntary and participants may withdraw from the study at any time without penalty.

At the conclusion of this study you and your child will be provided with the results in one-on-one meeting with the researcher or via-email.

Participation and Benefits

Your involvement in this study is completely voluntary and you may withdraw from the study at any time. Results from this study could include: (a) improved self-confidence in throwing based activities, (b) improved opportunities for outside community or individual based sporting events, and (c) greater awareness of whole body movement.

Questions Regarding the Study

You will be given a copy of this signed and dated consent form to keep. If you have any questions about the research study you should ask the researchers; their phone numbers are at the top of this form. If you have questions about your rights as a participant in this research or the way this study has been conducted, you may contact the Texas Woman's University Office of Research and Sponsored Programs at 940-898-3378 or via e-mail at IRB@twu.edu.

_____ _____

Signature of Participant Date

*If you would like to know the results of this study tell us where you want them to be sent:

Email: _____

or

Address:

_____

_____

_____



Approved by the
Texas Woman's University
Institutional Review Board
**Approved: April 26, 2017**

APPENDIX E

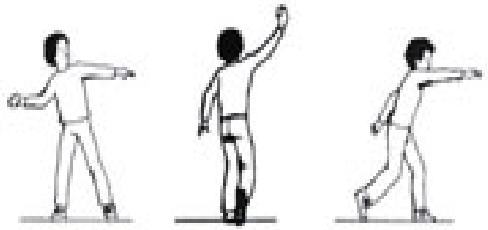
Visual Demonstration of the Overhand Throw

# EVERYONE CAN

## Assessment Item: OVERHAND THROW

**Equipment and Space Requirements:**

- Use a tennis ball (2.5-inch diameter) for Skill Level 1. Use a softball (12-inch circumference, official weight) with a no-sting surface for Skill Level 2 and Skill Level 3.
- Use a 4-foot square vertical target placed 2 feet off the ground (target markings may be taped to a wall).
- Throw in an outdoor field or large gymnasium at least 70 feet in length (10-foot staging area plus 60-foot throwing distance).

| Skill Levels | Focal Points | |
|---|---|---|
| 1. Demonstrate the mature overhand throw.<br>  <br>a, b c, d d, e, f | The student demonstrates the following focal points for the mature overhand throw while throwing a tennis ball toward a target with the dominant hand (right or left) on 2 of 3 trials:<br>a. **Side orientation**, standing with non-dominant side toward target, weight evenly distributed on both feet, feet shoulder width apart, eyes on target, ball held in dominant hand at waist level in front of body.<br>b. **T position** with almost complete extension of the throwing arm, with trunk rotation back.<br>c. **Throwing hand passes above shoulder**, with body rotation forward.<br>d. **Weight shift** to throwing arm side foot during extension of throwing arm, and weight shift to foot on the opposite side of the body as throwing arm passes above shoulder.<br>e. **Ball release toward target**, palm facing downward, knees and hips slightly flexed, trunk near vertical.<br>f. **Arm follows through** well beyond ball release toward target.<br>g. **Smooth integration** (not mechanical or jerky) of the previous focal points. | |
| 2. Demonstrate the mature overhand throw for distance. | The student with a mature overhand throw (Skill Level 1) will throw a softball for **distance** on 2 of 3 trials. | Throwing distances:<br>• Grades K-1 40 feet<br>• Grades 2-3 50 feet<br>• Grades 4-5 60 feet |
| 3. Demonstrate the mature overhand throw for accuracy.<br>  | The student with a mature overhand throw (Skill Level 1) and overhand throw for distance (Skill Level 2) will throw a softball for **accuracy** on 2 of 3 trials. | Accuracy criterion: Hit a 4-foot square vertical target placed 2 feet off the ground.<br>Throwing distances:<br>• Grades K-1 40 feet<br>• Grades 2-3 50 feet<br>• Grades 4-5 60 feet |

**Reference Data:** A baseline distance of 60 feet is used in fast pitch softball.

Figure 4. Overhand Throw Assessment Item

APPENDIX F

Research Assistant Written Test

Directions: Fill in the blank with the appropriate Everyone Can (Kelly et al., 2010) overhand throwing term. All possible answers can be located in the box below.

1. _____ is observed after the individual has released the ball towards the target?

2. _____ is observed when the individual is standing with his or her non-dominant hand at waist level in front of the body, feet shoulder width apart, and eyes on target?

3. _____ is observed when the throwing hand passes above the shoulder?

4. _____ is observed when the individual has his or her palm facing downward, knees and hips slightly flexed, and trunk near vertical?

5. _____ is observed when the individual has almost complete extension of the throwing arm, with trunk rotation back?

6. _____ is observed when the individual shifts his or her body weight to the throwing arm side foot during extension of the throwing arm?

| |
|---|
| Side orientation, T- position, Hand above shoulder, Weight shift, Ball released towards target, Follow through |

APPENDIX G

Participant Throwing Target