EFFECT OF VIDEO MODELING AND PRIMARY REINFORCERS ON THE PUSH-UP PERFORMANCE OF ELEMENTARY AGED MALE STUDENTS WITH AUTISM SPECTRUM DISORDERS

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DEDICATION

There are a few people this dissertation could be dedicated too. However, I have chosen to be a little unconventional and dedicate this dissertation to the one thing that has kept me the most sane during this entire process - running. I've often compared the dissertation process to marathon training. Weeks and weeks, or in this case years and years, of training to achieve a personal goal. The reasons I run are numerous but I'm thankful for GU, glide, gadgets, shots, massages, my race mom, and doctors that have kept my head and body in check during all this training. For the songs, often played on repeat, like the theme from "Rocky" to keep pushing me along. The ridiculous amount of money spent to run and finish the race. In all of this training, there have been some really fast runs where no one could catch me, some terribly slow runs that seemed like they were never going to end, times I ran alone, times where buddies motivated me to keep going, a few personal bests, and some not so personal bests. But in the end, I finished the race! Running, I can't thank you enough for being the one thing that has motivated me all these years to keep going and finish strong. In keeping with the theme of "Rocky," I can finally say, "Yo, Adrian … I did it!"

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ABSTRACT

PAMELA M. TROCKI-ABLES, B.S., M.S.

EFFECT OF VIDEO MODELING AND PRIMARY REINFORCERS ON THE PUSH-UP PERFORMANCE OF ELEMENTARY AGED MALE STUDENTS WITH AUTISM SPECTRUM DISORDERS

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The prevalence of Autism Spectrum Disorders (ASD) has been on the rise since the early 1990's (Centers for Disease Control, 2012). As a result, more children than ever are being diagnosed with ASD. However, since 2002, there has been a more significant increase which has almost doubled. Currently 1 in 88 children (11.3 per 1,000) in the United States has been identified as having an Autism Spectrum Disorder which is a 23% increase since the last report was released from the Centers for Disease Control (CDC) in 2009.

With the prevalence of Autism Spectrum Disorders increasing, it has become necessary for those teaching students with ASD to use and implement evidence-based practices (EBP) in all areas. The purpose of this investigation was to determine the effect of two evidence-based practices, specifically video modeling and reinforcement, on the push-up performance of elementary aged males with Autism Spectrum Disorders.

Participants were 5 elementary aged males with an Autism Spectrum Disorder and a speech impairment but no secondary intellectual disability. Participants were asked to perform push-ups, based on *FITNESSGRAM* criteria, in their home environment under three different treatment conditions. The treatment conditions included video modeling, primary reinforcers, and no video modeling or primary reinforcers (control). In addition, this investigation included a generalization phase in which one push-up session was conducted 3 days after the last treatment session.

A randomized alternating-treatment design was used in this investigation (Richards, Taylor, & Ramasamy, 2013) and from the data collected, repeated measurements of the dependent variable (i.e., number of push-ups performed) were analyzed. The data from this study were analyzed through visual inspection of graphic data. Additionally, a Friedman's analysis of variance by ranks was used to determine if there was a statistically significant difference in push-up performance among the three treatments.

Based on visual inspection of the data, 2 out of 5 participants performed their best push-ups under both Treatment 1 (video modeling) and Treatment 2 (primary reinforcer) and 3 out of 5 participants performed their best push-ups under Treatment 1 (video modeling). Based on statistical treatment of the data, differences between Treatment 1 (video modeling) and Treatment 2 (primary reinforcer) on push-up performance was not statistically significant; however, both Treatment 1 (video modeling) and Treatment 2 (primary reinforcer) were statistically significant when compared to Treatment 3 (control).

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INTRODUCTION

According to the Centers for Disease Control and Prevention (CDC, 2012), the prevalence of Autism Spectrum Disorders (ASD) has been on the rise since the early 1990's. As a result, more children than ever are being diagnosed with Autism Spectrum Disorders. However, since 2002, there has been a more significant increase which has almost doubled. Currently 1 in 88 children (11.3 per 1, 000) in the United States has been identified as having an Autism Spectrum Disorder which is a 23% increase since the last report was released from the CDC in 2009 (http://www.cdc.gov/ccbdd/autism/index.html). Autism Spectrum Disorders are a group of developmental disabilities that encompass a triad of characteristics that includes varying degrees of impairment in: (a) social skills, (b) communication, and (c) behavior (i.e., specifically repetitive and stereotyped behaviors) that typically appear prior to 3 years of age (American Psychological Association, 2000).

With the prevalence of Autism Spectrum Disorders on the rise, federal regulations have made it necessary for those teaching these students to use and implement evidence-based practices (EBP), [No Child Left Behind, 2001; National Professional Development Center on Autism Spectrum Disorders, 2014]. Twenty-seven evidence-based practices have been identified by the National Professional Development Center on Autism Spectrum Disorders (2014) and include practices such as Discrete Trial Training, Prompting, Reinforcement, Visual Supports, Antecedent Based Interventions (ABI), Task Analysis, and Video Modeling. From these, this investigation is focused on video modeling and the use of primary reinforcers to understand the relationship between ASD, physical fitness, and evidence-based practices. Specifically related to video modeling and primary reinforcers, the following literature is reviewed under the following headings: (a) Autism Spectrum Disorders and Physical Fitness; (b) Theoretical Framework; (c) Use of Video Modeling as an Instructional Approach for Students with Autism Spectrum Disorders; and (d) Use of Primary Reinforcers for Students with Autism Spectrum Disorders.

Autism Spectrum Disorders and Physical Fitness

Autism Spectrum Disorders are primarily considered a psychiatric disorder (American Psychiatric Association, 2000), further, individuals with ASD may also have physical deficiencies such as fine and gross motor problems (Provost, Heimerl, & Lopez, 2007), impairments in movement and sequencing motor tasks (Green et al., 2009), balance problems (Minshew, Sung, Jones, & Furman, 2004), and muscle weakness (Hardan, Kilpatrick, Keshavan, & Minshew, 2003). These decreased physical deficits can result in reduced participation in physical activities (Cairney, Hay, Faught, Corna, & Flouris, 2006) and lower than average performance in regard to different components of physical fitness (Cantell, Crawford, & Doyle-Parker, 2008).

While many researchers have determined deficiencies in balance, coordination, motor planning, and fine and gross motor skills for individuals with Autism, research is limited in the area of muscular strength and individuals with Autism Spectrum Disorders (Kern et al., 2010; Hardan et al., 2003). In an investigation by Hardan, et al. (2003), the researchers examined the grip strength in 40 individuals with ASD, without intellectual disabilities, and 41 typically developing peers (control group) and reported that grip strength was weaker in the individuals with autism, without intellectual disabilities, than in the control group. Kern, et al. (2010) further investigated muscular strength, specifically hand muscular strength by measuring grip strength, in children with ASD and reported that hand grip strength is often related to the severity of the Autism Spectrum Disorder. It was further indicated that the more severe the Autism Spectrum Disorder the poorer the strength. Anecdotal information reported from both Kern, et al. (2010) & Hardan, et al. (2003), suggested that children with autism have lower muscular strength when compared to typically developing peers.

The severity of the Autism Spectrum Disorder may influence performance in activities requiring muscular strength and decreased muscular strength may be a contributing factor in the balance, coordination, motor planning and overall movement patterns of children with Autism Spectrum Disorders. With limited research in the area of muscular strength and overall physical fitness for children with Autism Spectrum Disorders it becomes necessary to examine the use of evidence-based practices to assist with improving performance in activities or tasks that are related to muscular strength (i.e., push-ups) and physical fitness.

Federal regulations have made it necessary for those teaching students with Autism Spectrum Disorders to use evidence-based practices (EBP), however, the implementation of these practices has been fairly limited in the area of physical education (No Child Left Behind [NCLB], 2002). While reinforcement, visual supports, prompting and task analysis have been widely used in improving the level of learners' physical fitness a relatively unresearched evidence-based practice is the use of video modeling and primary reinforcement to improve physical fitness, specifically upper body strength of students with Autism Spectrum Disorders.

The Texas Education Code 38.101 stated that "*All students, regardless of a disability, should be included in this initiative to exemplify the importance of health for every child."* (TEA, 2013, p. 2). The use of the *FITNESSGRAM* (Meredith & Welk, 2010) as an assessment for all students in grades 3 to12 in physical education classes in Texas was mandated by Senate Bill 530 during the 80th Legislative Session (TEA, 2007). Students with disabilities are not excluded from the *FITNESSGRAM* assessment unless they have documented medical conditions preventing them from participation. With the instatement of Senate Bill 530, it becomes critical to find additional avenues and use effective EBP to assist with improving performance in physical fitness for students with disabilities, specifically those with an Autism Spectrum Disorder, who often struggle with participating in state mandated assessments, particularly in physical education.

Theoretical Framework

Bandura's social learning theory and its components served as the theoretical framework for this investigation. Video modeling and the implementation of its techniques are deeply rooted in Bandura's social learning theory whose underlying concept supports that human behavior is primarily learned by observing and modeling others (Bandura, 1977). Modeling refers to the process by which an individual demonstrates behavior that can be imitated. Through observation and modeling individuals learn how to perform new behaviors and in turn these new learned behaviors, serve as a guide for future responses (Bandura, 1977).

Observational learning, an element within the social learning theory, refers to the cognitive and behavioral change that occurs as a result of observing others engaged in similar actions and is "shown most clearly when models exhibit novel patterns of thought or behaviors which the observers did not already possess but which, following observation they can produce in similar form" (Bandura, 1986, p. 49). Based on the social learning theory, there are four distinct processes that are needed for observational learning to occur. These four processes include attentional, retentional, production, and motivational (Bandura, 1986).

The attentional process is the initial process and "determines what is selectively observed in the profusion of modeling influences and what information is extracted from ongoing modeled events" (Bandura, 1986, p. 51). In order for an individual to be an active participant in the attentional process the individual must be able to take in sensory stimuli and focus on a specific task.

The second process necessary for observational learning to occur as part of Bandura's social learning theory is the retentional process. In order for individuals to yield benefit from the behaviors of others, "the modeled information must be represented in memory in symbolic form" (Bandura, 1986, p. 55). For the retentional process to be successful the individual must be able to symbolically process observed behavior and turn it into something meaningful. According to Carroll and Bandura (1986), the retention of observed behavior is enhanced through visual monitoring, cognitive rehearsal and behavioral reproduction of observed behaviors.

Production, the third process in observational learning, involves "converting symbolic conceptions into appropriate actions" (Bandura, 1986, p. 63). This is when the individual can accurately reproduce the observed or modeled behavior. In order to reproduce the modeled behavior the individual is required to have the basic elements of the task to perform the observed behavior and then build upon the basic elements to improve performance.

The fourth and final process is the motivational process and refers to learning that occurs in the presence of reinforcement. According to Bandura (1986), individuals are "more likely to exhibit modeled behavior if it results in valued outcomes than if it has unrewarding or punishing effects" (p. 68) and when positive incentives, such as reinforcement, are provided observed behaviors are translated into action more quickly.

The social learning theory, specifically observational learning, lends itself to support the main premise of this investigation. Adopting this theory as the theoretical framework for this study challenges the investigator to integrate the use of the four processes of observational learning, specifically the production and motivational processes, through video modeling and the use of primary reinforcers to improve physical fitness performance in the area of upper body strength for students with Autism Spectrum Disorders.

Use of Video Modeling as an Instructional Approach for Students with Autism Spectrum Disorders

The use of video modeling is relatively new but has been shown to be effective in teaching social, communication, and functional skills to students with Autism Spectrum Disorders (Bellini & Akullian, 2007). The use of video modeling has also been shown to reduce self-stimulatory and challenging behaviors often exhibited by students with Autism Spectrum Disorders such as tantrums, aggression, and off-task behaviors (Coyle & Cole, 2004). Video modeling is considered a visually based teaching approach and individuals with Autism Spectrum Disorders tend to favor visual teaching methods and process visuospatial information better than auditory information (Hermelin & O'Connor, 1970; Sigafoos, O'Reilly, & de la Cruz, 2007). In addition, researchers have suggested that when instruction is facilitated with the use of visual cues or visual supports, individuals with ASD demonstrate the ability to acquire, maintain, and generalize a wide range of academic, functional, self-care, leisure, and communication skills (Buggey, 2009).

Video modeling is a procedure where a student is shown a video of another individual performing a targeted behavior or completing a desired skill. Skills that have been effectively taught to individuals with Autism Spectrum Disorders using video include self-help skills, activities of daily living, play skills, communicative skills, and social skills (Sigafoos, O'Reilly, & de la Cruz, 2007). While video modeling has been used to teach many skills to students with Autism Spectrum Disorders, there is limited research (Bellini & Akullian, 2007; Goodwin, 1995; Dowrick & Dove, 1980) on the use of video modeling to teach desired skills in physical education.

Students with Autism Spectrum Disorders are required to participate in the *FITNESSGRAM*, as part of state mandated physical fitness testing. However, their characteristic motor and strength deficiencies often limit their performance on such state mandated tests (Thelen, 2013). Upper body strength and endurance for children and youth is important as it plays a role in good posture and successful performance in many daily activities (Meredith & Welk, 2010). The need to improve upper body strength and endurance, through the use of other instructional methods, becomes important for students with Autism Spectrum Disorders and thus enforces the case for using video modeling with individuals with Autism Spectrum Disorders as a visual instrument approach that may improve physical fitness performance, particularly upper body strength.

Use of Reinforcement for Students with Autism Spectrum Disorders

Reinforcement is an evidence-based practice that has been used in a variety of settings, including physical education, for students with Autism. According to the National Professional Development Center on Autism Spectrum Disorders, reinforcement "establishes the relationship between the learner's behavior/use of skill and the consequence of that behavior/skill" (2014, p. 79). Reinforcement is most effective when it is individualized for a student with an Autism Spectrum Disorder and when it is provided in response to a student's ability to demonstrate a targeted skill. In many cases, reinforcement is used in conjunction with other evidence-based practices to increase the likelihood that a desired behavior will occur in the future (National Professional Development Center on Autism Spectrum Disorders, 2014). When considering the influence of modeling and reinforcement on improving time-on-task during cooperative play skills of children with autism, Goodwin (1995) reported that modeling when paired with reinforcement produced higher results in time-on-task during cooperative play skills followed closely by reinforcement alone.

Participation in physical exercise is often difficult for students with Autism Spectrum Disorders because of poor motor functioning and low motivation (Koegel, Koegel, & McNerney, 2001; Reid, O'Connor, & Lloyd, 2003). In a systematic review of studies that involved individuals with ASD and physical exercise, Lang et al. (2010)

reported the use of reinforcement, specifically primary reinforcers, may be used and potentially encourage participation in exercise, particularly when exercise is not a preferred activity or embedded into a preferred activity. This supports the case for using reinforcement, specifically primary reinforcers, as an instructional approach that may improve physical fitness skills, particularly upper body strength, for individuals with Autism Spectrum Disorders. Primary reinforcers refer to items or things that are often considered life sustaining, naturally reinforcing, and tangible. Primary reinforcers can include, but are not limited too, foods, liquids, toys, and stickers (Shea & Bauer, 2011). For the purpose of this study food was the primary reinforcer chosen.

Purpose

The purpose of this study was to determine the effect of video modeling and primary reinforcers on the push-up performance by elementary aged males with Autism Spectrum Disorders. In this investigation, participants were asked to perform push-ups, based on the *FITNESSGRAM* criteria, under three different treatment conditions: (a) video modeling, (b) primary reinforcers, and (c) no video modeling or primary reinforcers (control).

Definition of Terms

The following terms and definitions were essential to the purpose of this study. The definitions and terms are as follows:

Autism Spectrum Disorder: A group of developmental disabilities that includes "the presence of markedly abnormal or impaired development in social interaction and communication and a markedly restricted repertoire of activities and interests prior to 3 years old" (American Psychological Association, 2000, p. 66). Autism Spectrum Disorder includes Autism, Asperger Syndrome, and Pervasive Developmental Disorder-Not Otherwise Specified.

Evidence Based Practice: "Interventions that researchers have shown to be effective for students with ASD and have been established through scientific journals using randomized or quasi-experimental design studies, single subject design studies or combination of evidence" (National Professional Development Center on Autism Spectrum Disorders, 2014, p. 1).

FITNESSGRAM: "A comprehensive fitness assessment battery for youth. It includes a variety of health-related physical; fitness tests designed to assess cardiovascular fitness, muscular strength, muscular endurance, and body composition" (Meredith & Welk, 2010, p. 3).

Observational Learning: "The cognitive and behavioral change that occurs as a result of observing others engaged in similar actions" (Bandura, 1986, p. 49).

Primary Reinforcer: Tangible supports that "satisfy a physical need by making the individual feel good" (National Professional Development Center on Autism Spectrum Disorders, 2014, p. 1) and includes, but is not limited too, items such as food and drinks.

Reinforcement: "The relationship between the learner's behavior/use of skill and the consequence of that behavior/skill." (The National Professional Development Center on Autism Spectrum Disorders, 2014, p. 79).

Self-Efficacy: "The confidence felt by people regarding their ability to successfully carry out a task" (Buggey, 2009, p. 124).

Social Learning Theory: "Approaches the explanation of human behavior in terms of a reciprocal interaction between cognitive, behavioral, and environmental determinants" (Bandura, 1977, p. vii) and emphasizes that human behavior is primarily learned by observing and modeling others.

Video Modeling: "A procedure in which a learner is shown a videotape of a model performing a target behavior or completing a desired task" (Sigafoos, O'Reilly, & de la Cruz, 2007, p.1).

Limitations

This study is subject to the following limitations:

1. Participants were not representative of a larger population due to the unique characteristics of ASD.
2. The participants' ability to perform the specified task in the home setting.
3. The participants' degree of effort when performing the specified task in the home setting.

Delimitations

This study was subject to the following delimitations:

1. The participants with Autism Spectrum Disorder.

2. The exclusive use of the 90 degree push up as measured by the *FITNESSGRAM* (Meredith & Welk, 2007)
3. The exclusive use of elementary-aged males between the ages of 8 and 10 years.
4. The exclusive use of video modeling and primary reinforcers.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this study was to determine the effect of video modeling and primary reinforcers on the push-up performance of elementary aged males with Autism Spectrum Disorders. Both video modeling and reinforcement have been identified as two of twenty-seven evidence-based practices by the National Professional Development Center on Autism Spectrum Disorders (2014) that can be used when teaching students with ASD. With more children than ever being diagnosed with Autism Spectrum Disorders (ASD) it becomes necessary to use evidence-based practices in all educational areas, including physical education. In this chapter, the investigator reviewed the literature that was related to Autism Spectrum Disorders, physical fitness, with a focus on strength, and the use of evidence-based practices, specifically video modeling and reinforcement, for children with Autism Spectrum Disorders.

This chapter was organized in four sections: (a) Strength of Recommendation Taxonomy, (b) Autism Spectrum Disorders and Physical Fitness, (c) Use of Video Modeling as an Instructional Approach for Students with Autism Spectrum Disorders, and (d) Use of Reinforcement for Students with Autism Spectrum Disorders. These four sections provided support for the potential importance of using evidence-based practices to improve physical fitness performance, specifically upper body strength, for students with Autism Spectrum Disorders.

Strength of Recommendation Taxonomy

The Strength of Recommendation Taxonomy (SORT; Ebell et al., 2004) was used to evaluate individual research articles, as well as, the strength of recommendation for a body of evidence of all studies that involved students with ASD, video modeling, reinforcement, and physical fitness. SORT specifically involves a systematic review of literature, determination of individual literature, determination of individual literature and body of all pertinent literature, and recommendation for sound educational practices. The evaluation should address the three key elements: quality, quantity, and consistency of evidence. The following terms are derived from the SORT.

Systematic Review

Systematic review uses a taxonomy that was incorporated in the present investigation and involved a critical evaluation of existing evidence that focuses on the clinical questions, including a comprehensive literature search assessment of the quality of studies, and reporting the findings in an organized manner. Research evidence was also presented in the publication of original research and involves the collection of original data or the systematic review of other original research publications.

Level of Evidence

Level of evidence refers to both individual studies and the quality of evidence from multiple studies about a specific question or the quality of evidence supporting an intervention. There are three levels of recommendation in this taxonomy to assess individual studies which are: Level 1, based on consistent and high quality participant-oriented evidence; Level 2, based on consistent and limited-quality participant-oriented evidence; and Level 3, based on typical practice, opinion, prevention, or screening.

Strength of Recommendation

These recommendations are typically based on the body of evidence. This approach considers the types of outcomes measured by the studies, number, consistency, logic of evidence, and the relationship between advantages, disadvantages, and cost. There are three grades of strength of the body of evidence in the SORT taxonomy to evaluate studies as a group: Grade A is based on consistent and high-quality teacher preparation evidence; Grade B is based on consistent and limited-quality teacher preparation evidence; and Grade C is based on usual practice, opinion, prevention, or screening.

There are four general types of research methodologies used in the educational field and within this literature review by the Council for Exceptional Children (CEC); [Odom et al., 2005] and include: (a) Experimental and Quasi-Experimental Research, (b) Single-Subject, (c) Correlational, and (d) Qualitative Designs. Based on the results of the SORT taxonomy, the experimental and quasi-experimental research designs are the strongest design when compared to the other three. This is because its indicators are similar to Level 1 of SORT which includes randomization, control and experimental group, consistency for the outcome measures, substantiation of the validity, and assessment of the quality of implementation.

Single-subject research, the second methodology, is also a strong design and better than correlational and qualitative designs because it has a baseline and intervention. This design is similar to Level 2 of SORT because most of the time there is no random selection of the population in this design. The control group designs can be used to further demonstrate external validity of findings established through single-subject methodology.

The third methodology is correlational research design. Correlational studies are quantitative, multi-subject designs in which participants have not been randomly assigned to treatment conditions. Based on SORT, this is not a strong design and is evaluated as a Level 2 or 3. Tests of this design are also not reliable or unreliable; therefore, the researchers who use this design should provide reliability coefficients for the data being analyzed when the focus of their research is not psychometric.

The fourth methodology is the qualitative research design. The qualitative design is considered a Level 3 in SORT because there is no treatment or random selection in this design. In addition, this design is based on usual practice, opinion, prevention, or screening; therefore, it is a weak design. A positive aspect of this design is it allows the researchers to establish readers' confidence in the conclusions drawn from the data and to discount rival hypotheses from conclusions that the researcher has drawn from the data.

Given these recommendations, the body of literature that has been provided to support this investigation has been graded at the B Level, which was obtained from identifying the level of quality for each individual research study. Each research article was evaluated based on level of evidence from the SORT assessment and individual analyses are presented after the corresponding section within this chapter. This current body of literature included 15.8% of Level 1 studies, 68.4% of Level 2 studies, and 15.8% of Level 3 studies.

Autism Spectrum Disorders and Physical Fitness

Much of the research related to Autism Spectrum Disorders focuses on activity patterns and levels of activity with limited research in the area of physical fitness, particularly upper body strength, for students with ASD (Lang, Koegel, Ashbaugh, Regester, Ence, & Smith, 2010; Pan & Frey, 2006). In addition, research in physical fitness and Autism Spectrum Disorders often emphasizes using exercise, specifically cardiovascular activities such as walking, jogging, swimming, and bike riding, along with instructional approaches such a reinforcement, prompting, and self-monitoring to decrease self-stimulating or maladaptive behaviors but not on the performance of other physical fitness skills that are also important for students with Autism Spectrum Disorders (Lang et al., 2010).

Students with Autism Spectrum Disorders are often less active than their same-aged typically developing peers and lower activity levels are often a result of social and behavioral deficits associated with Autism Spectrum Disorders. These deficits can include difficulty with understanding social cues, engaging in social exchanges or reciprocal conversations, and various stereotypic behaviors that can impact performance and hinder the desire to want to participate in activities, particularly those activities that require participating in a team environment or high level skills (Block & Groft, 2003; Todd & Reid, 2006).

Pan and Frey (2005) suggested deficits that are often associated with autism can limit opportunities to participate in physical activity with peers, which is a primary mode of participation in activities. In addition, participation in physical activity for children and youth with autism is higher in elementary school where children and youth are provided more regular recess and physical education opportunities than students in middle school and high school. The physical activity patterns of typically developing children and youth are often influenced and positively correlated by the physical activity level and support of parents but it is unclear how parents' physical activity and support influences youth with Autism Spectrum Disorders as the disability itself often has a significant impact on many daily activities (Pan & Frey, 2005).

In a similar investigation, Rosser-Sandt and Frey (2005), compared the physical activity levels between children with and without ASD's. These investigators examined the daily amount of moderate to vigorous physical activity (MVPA) children with and without Autism Spectrum Disorders engaged in during general physical education, recess and after school or home activities. Researchers have suggested that there were no differences between children with and without Autism Spectrum Disorders at any physical activity setting, both groups were more active during recess when compared to after school and children with Autism Spectrum Disorders were similarly active in recess and physical education. The researchers indicated that while many of the children with Autism Spectrum Disorders currently acquired 60 min of physical education per day, this may change and physical activity levels may decrease as these children transition to middle school and high school. Further, the researchers indicated that decreases and changes in physical activity level, in middle school and high school, may occur when opportunities for recess and physical education change and can further impact overall daily physical activity and patterns of physical activity.

When investigating the efficacy of a 14-week aquatic program on physical fitness skills in children with and without Autism Spectrum Disorders, (Pan, 2011; L1; see Table 1) investigated 30 children, 15 with high-functioning ASD and their typically developing siblings, and evaluated their physical fitness skills after participating in the 28 sessions aquatic program. Sessions were conducted 2 times per week for 60 min each session with an emphasis placed on utilizing the principles of motor learning, physical fitness learning, and structured teaching. Results of this investigation indicated that improvements in aquatics skills and all areas of physical fitness (i.e., cardiovascular endurance, muscular strength/endurance, flexibility, and body composition) except for body composition were observed in both groups of children, those with high-functioning ASD and their typically developing siblings.

While research is limited in the area of muscular strength, specifically upper body strength, for students with Autism Spectrum Disorders a few studies have been conducted to examine the issue of muscular strength. Whyatt and Craig (2011; L1; see Table 2) compared motor skills, specifically related to motor control, manual dexterity, and ball skills of 59 children, 18 with autism and 41 typically developing. Using the Movement Assessment Battery for Children (M-ABC2) to measure and compare motor skills, results from this investigation supported previous research that children with autism experience a level of general motor impairment, particularly in manual dexterity, but this impairment may be related to cognitive deficits associated with Autism Spectrum Disorders rather than overall motor ability.

Kern et al. (2010; L2; see Table 3) examined the correlation between muscle strength and severity of autism and research suggested that muscular strength, when measured by hand grip strength, is lower in children whose autism is more severe. Factors that may influence muscular strength can be influenced by the characteristic deficits in motor coordination, impairments in motor development, poor sensory-motor functioning, and hypotonia. In addition, Kern et al. (2010; L2; see Table 3), suggested there could be a connection between levels of carnitine, an amino acid in the body that is associated with muscle strength or weakness, and children with autism who often have lower levels of carnitine in their systems.

In another investigation related to muscular strength and individuals with autism, Hardan, Kilpatrick, Keshavan, and Minshew (2003; L2; see Table 4) examined the volumes of the basal ganglia in individuals with autism, without an intellectual disability, and assessed motor performance using the Finger Tapping Test, The Grooved Pegboard Test and the measurement of Grip Strength using a hand dynamometer. Based on the findings from this investigation it was suggested that grip strength was weaker in those individuals with autism and motor deficits than observed in individuals with autism are "either not caused by the basal ganglia or are not associated with gross anatomic or pathologic abnormalities of these structures" (p. 9). Rather, other brain structures involved in motor movement such as the cerebellum and frontal lobe, might contribute too many of the motor abnormalities associated with autism.

When teaching five individuals with autism to ride a stationary bike and lift weights using Nautilus equipment, Lochbaum and Crews (2003; L2; see Table 5) used reinforcement, verbal prompts, and modeling of target behaviors to improve aerobic fitness and muscular strength. Three participants in this investigation were taught to ride a stationary bike and two participants were taught to lift weights, bench press, leg press, and low row, using Nautilus equipment. Outcomes from this research indicated an increase in aerobic fitness with improvement for each of the three participants between 33 and 50%. Muscular strength for Participant 1 improved 19% on the bench press, 47% on the low row, and 29% on the leg press and for Participant 2 there was a 28% improvement on the bench press, 21% on the low row, and 12% on the leg press, respectively. The researchers detailed above, indicated there is opportunity for improvement in aerobic fitness and muscular strength when additional instructional strategies or teaching procedures are used.

Table 1

The Efficacy of an Aquatic Program on Physical Fitness and Aquatic Skills in Children with and without Autism Spectrum Disorders

Auth/Level	Design/Data Collection	Population	Purpose/ Intervention	Summary of the Results
Pan (2011) 1	Quan: Repeated measures	30 children; 15 with ASD and their siblings between the ages of 7 and 12 in Kaohsiung City, Taiwan **Gender** 10 female non ASD 5 male non ASD 15 male ASD **Topics Addressed:** Reinforcement: NO Autism: YES Video Model: NO Strength: YES **Demographics:** ASD: YES Speech: NO Age: YES Gender: YES	**Purpose:** To examine the efficacy of a 14-week aquatic program on physical fitness and aquatic skills for children with ASD and their siblings without a disability. **Intervention:** Aquatic fitness program	Based on the results, improvements were seen in aquatic skills and physical fitness for both groups. Improvements were attributed to the accumulated effects of the curriculum based instruction and assessment.

Note. Auth = Author; Quan = Quantitative

Table 2

Motor Skills in Children Aged 7-10 Years, Diagnosed with Autism Spectrum Disorder

Auth/Level	**Design/Data Collection**	**Population**	**Purpose/ Intervention**	**Summary of the Results**
Whyatt & Craig (2011) 1	Quan: ANOVA MANOVA	59 children(18 with autism) age 7 to 13 years from a primary school with a special unit for children with autism **Gender** 28 Male 31 Female **Topics Addressed:** Reinforcement: NO Autism: YES Video Model: NO Strength: YES **Demographics:** ASD: YES Speech: YES Age: YES Gender: NO	**Purpose:** To assess motor skills in children with autism as compared to children without autism as related to motor control, manual dexterity, ball skills, and balance. **Intervention:** M-ABC2 BPVS-II WNV	These results support previous research that children with autism experience a level of general motor impairment compared to typically developing children. However, these deficits may be due to cognitive deficits rather than motor impairment. Separating apart levels of performance while considering cognitive factors creates a better profile of motor ability.

Note. Auth = Author; Quan = Quantitative; M-ABC2 = Movement Assessment Battery for Children; BPVS-II = British Picture Vocabulary Scales II; WNV = Wechsler Nonverbal Scale of Ability

Table 3

Autism Severity and Muscle Strength

Auth/Level	**Design/Data Collection**	**Population**	**Purpose/ Intervention**	**Summary of the Results**
Kern (2010) 2	Quan: Correlation	37 community participants between the ages of 7 and 10 with ASD prospectively recruited by word of mouth **Gender** 32 Male 5 Female **Topics Addressed:** Reinforcement: NO Autism: YES Video Model: NO Strength: YES **Demographics:** ASD: YES Speech: NO Age: YES Gender: NO	**Purpose:** To examine the relationship between muscular strength as defined by grip strength and the severity of the Autism Spectrum Disorder. **Intervention:** Grip strength dynamometry	Based on the results, further research is needed to determine the correlation, consistency and extent of muscle weakness and possible treatments as related to ASD.

Note. Auth = Author; Quan = Quantitative

Table 4

Motor Performance and Anatomic Magnetic Resonance Imaging (MRI) of the Basal Ganglia in Autism

Auth/Level	**Design/Data Collection**	**Population**	**Purpose/ Intervention**	**Summary of the Results**
Hardan (2003) 2	Quan: Descriptive 3 Motor Tests MRI	40 individuals with autism aged 8 to 45 years and 41 individuals without autism aged 9 to 43 years **Gender** 77 Male 4 Female **Topics Addressed:** Reinforcement: NO Autism: YES Video Model: NO Strength: Yes **Demographics:** ASD: YES Speech: NO Age: NO Gender: NO	**Purpose:** To examine and compare the volumetric measurements of the basal ganglia in individuals with autism during specific motor tasks to individuals without autism. **Intervention:** Finger tapping test Grooved pegboard test Grip strength	Results support the existence of motor deficits in individuals with autism as exhibited through grip strength and finger tapping tests. These data suggest these deficits may not be related to structural abnormalities in the basal ganglia but rather the cerebellum or frontal lobe areas of the brain.

Note. Auth = Author; Quan = Quantitative; MRI = Magnetic Resonance Imaging

Table 5

Viability of Cardiorespiratory and Muscular Strength Programs for the Adolescent with Autism

Auth/Level	**Design/Data Collection**	**Population**	**Purpose/ Intervention**	**Summary of the Results**
Lochbaum & Crews (2003) 2	Quan: 2 Exercise conditions -Aerobic -MST 2 Fitness variables -Aerobic fitness (PWC) -Muscular strength	5 adolescents / young adults aged 16 to 21 years, all diagnosed as autistic with mild mental retardation **Gender** Unreported **Topics Addressed:** Reinforcement: NO Autism: YES Video Model: NO Strength: YES **Demographics:** ASD: YES Speech: NO Age: NO Gender: NO	**Purpose:** Conduct exercise training programs with individuals with ASD to demonstrate potential for CV improvement and to motivate others to do the same. **Intervention:** MST Aerobic exercise	These results demonstrated that both aerobic and muscular strength training programs lead to positive fitness gains. Combined with the known psychological benefits of physical activity, individuals with autism could benefit greatly from additional fitness programming and research.

Note. Auth = Author; Quan = Quantitative; ASD = Autism Spectrum Disorders; MST = Muscular Strength Training; CV = Cardiovascular; PWC = Power Work Capacity

Use of Video Modeling as an Instructional Approach for Students with Autism Spectrum Disorders

Video modeling is a research based instructional approach that has been a well-validated in the behavioral sciences as a successful method to be used when teaching learners with Autism Spectrum Disorders (Bellini & Akullian, 2005; L3; see Table 7; Corbett & Abdullah, 2005; Sigafoos, O'Reilly, & de la Cruz, 2007). Video modeling has been used to teach and target a variety of behaviors in areas such as language, communication, social behavior, play, self-help skills, and academics but limited research has been conducted on the use of video modeling in relation to learning or improving physical fitness skills in individuals with Autism Spectrum Disorders. Individuals with Autism Spectrum Disorders often benefit from visually cued instruction and show strengths in processing visual information rather than verbal information. Video modeling lends itself as an instructional approach to key into students with ASD preferred mode of learning and the acquisition of skills when using video modeling is often very rapid when compared to other instructional approaches (Corbett, 2003 & McCoy & Hermansen, 2007).

Many studies have been conducted with the use of video modeling to teach language and communication skills, increase appropriate behavioral responses, daily living, and self-help skills. However, video modeling used in physical education is limited. In performing daily living skills, Shipley-Benamou, Lutzker, and Taubman (2002; L2; see Table 11) examined the use of instructional video modeling, from the participants viewing perspective, to teach daily living skills to children with autism. Participants in this investigation were 3 children who were all 5 years old. Daily living skills addressed included making orange juice, preparing a letter, pet care, cleaning a fish bowl, and setting the table. Results from this investigation suggested that instructional video modeling was effective in promoting skill acquisition related to daily living skills and skills were maintained during the post-video and the one month follow up phase for all 3 children.

In a similar study that examined the use video priming to reduce disruptive transition behaviors in 3 young children with autism, Schreibman, Whalen, and Stahmer (2000; L2; see Table 8) examined preparing participants through the use of video priming to more effectively handle transitions and behavior during transitions. Video priming is a technique that is used to help individuals make future events more predictable by allowing viewing of desired behaviors, using a video, prior to the event occurring. Results from this investigation suggested that disruptive transition behaviors were reduced for all 3 children across transitions when video priming was used. In addition, reduction in disruptive behaviors were maintained at the one month follow-up/generalization phase.

Many researchers have focused on teaching play sequences, cooperative play, and improving play related statements rather than learning motor skills or physical fitness skills. The following research addressed investigations related to play and the effect of video modeling on play sequences, cooperative play, and improving play related statements.

Charlop-Christy, Le, and Freeman (2000; L2; see Table 9) and Gena, Couloura, and Kymissis (2005; L2; see Table 13) examined the use of in-vivo modeling and video modeling and its effect on learning developmental skills such as expressive labeling of emotions, spontaneous greetings, self-help skills, cooperative play, social play, independent play, and affective behavior in the context of play activities. Results from Charlop-Christy, Le, and Freeman suggested that video modeling led to quicker acquisition of skills than in-vivo modeling and behaviors generalized after presentations of video modeling but not after in-vivo modeling. Gena, Couloura, and Kymissis results indicated that both video modeling and in-vivo modeling, when used in conjunction with reinforcement contingencies, were both effective in teaching appropriate affective responding in the context of play activities for 3 preschoolers with autism in their home setting. In a similar investigation conducted in the home setting by Taylor, Levin, and Jasper (1999; L3; see Table 10), the researchers examined the effects of video modeling on increasing play-related statements in children with Autism Spectrum Disorders toward their siblings. Based on the results it was suggested that the video modeling intervention was effective in teaching scripted play comments but video modeling did not lead to the demonstration of unscripted comments. Further, in the second part of this investigation, it was suggested that using a forward chaining video modeling procedure did lead to an increase in play related comments by the child with an Autism Spectrum Disorder to his typically developing sibling.

D'Ateno, Mangiapanello, and Taylor (2003; L2; see Table 12) examined the use of video modeling to teach a preschooler with autism complex play sequences with videotaped play sequences including both verbal and motor responses. Based on the results, it was concluded that video modeling was an effective intervention to promote long sequences of play behavior in this child, increase play skills, and the introduction of the video modeling led to an increase in the number of both verbal and motor play responses for this preschool child with and Autism Spectrum Disorder.

Using video self-modeling to teach physical fitness skills, specifically aquatics skills, Dowrick and Dove (1980; L3; see Table 6), in the only article that addressed physical fitness skills and video modeling together, examined the use of video self-modeling to improve swimming performance in children with spina bifida. Three children, two boys and one girl, between the ages of 5-years-old and 10- years old were each videotaped performing aquatics skills. The videotapes were then edited and the participants were shown the videotapes of themselves performing the targeted task or desired swimming skill. Based on the results it was suggested that after three exposures to the individual videotapes, gains in targeted swimming skills were observed and Child 1, Child 2, and Child 3 improved their scores by 5, 4, and 2, respectively.

While video modeling has shown itself to be effective in the acquisition and generalization of various skills for individuals with ASD, in a review of models and the effects of video modeling by McCoy and Hermansen (2007), researchers suggested that the effects of models should be further evaluated when combined with other interventions. Further investigations using other evidence-based practices when combined with video modeling are needed for individuals with Autism Spectrum Disorders.

Table 6

The Use of Self-Modeling to Improve the Swimming Performance of Spina Bifida Children

Auth/Level	**Design/Data Collection**	**Population**	**Purpose/ Intervention**	**Summary of the Results**
Dowrick & Dove (1980) 3	Qual: Observational	3 children with spina bifida between the ages of 5 and 10 years at the Auckland Crippled Children's Society. **Gender** 2 Male 1 Female **Topics Addressed:** Reinforcement: NO Autism: NO Video Model: YES Strength: NO **Demographics:** ASD: NO Speech: NO Age: YES Gender: NO	**Purpose:** To examine the use of video taped replay showing only positive behaviors to three children with spina bifida that were learning to swim. **Intervention:** VTR	Based on the results, behavioral changes were observed and continuing improvements developed that led the researchers to report a practical technique had been developed through the use of edited VTR.

Note. Auth = Author; Qual = Qualitative; VTR = Video Taped Replay

Table 7

A Meta-Analysis of Video Modeling and Video Self-Modeling Interventions for Children and Adolescents with Autism Spectrum Disorders

Auth/Level	**Design/Data Collection**	**Population**	**Purpose/ Intervention**	**Summary of the Results**
Bellini & Akullian (2005) 3	Qual: Meta-Analysis 23 Single subject design studies	73 Children and adolescents with ASD by 20 primary researchers across 13 states and 4 countries. Participants ranged in age from 3 to 20 years. **Gender** Unreported **Topics Addressed:** Reinforcement: YES Autism: YES Video Model: YES Strength: NO **Demographics:** ASD: YES Speech: YES Age: YES Gender: NO	**Purpose:** To examine the effectiveness of VM and VSM interventions for children and adolescents with ASD. **Intervention:** VM VSM	Based on the results, VM and VSM were identified as effective intervention strategies for addressing functional, social, communication, and behavioral skills in children and adolescents with ASD.

Note. Auth = Author; Qual = Qualitative; VM = Video Modeling; VSM = Video Self-Modeling

Table 8

The Use of Video Priming to Reduce Disruptive Transition Behavior in Children with Autism

Auth/Level	Design/Data Collection	Population	Purpose/ Intervention	Summary of the Results
Schreibman, Whalen, & Stahmer (2000) 2	Quan: Multiple-baseline design Baseline Treatment Post Treatment 1-mo Follow Up	3 children diagnosed with autism with severe behavior problems in transition situations during every day routines **Gender** 3 Male **Topics Addressed:** Reinforcement: NO Autism: YES Video Model: YES Strength: NO **Demographics:** ASD: YES Speech: NO Age: YES Gender: NO	**Purpose:** To examine the efficacy of priming children with disruptive behavioral difficulties using short videos prior to upcoming transitions. **Intervention:** Short video primers	Based on the results, disruptive behaviors were reduced for all children across transitions using video priming techniques. Reductions in disruptive behaviors were maintained at the 1-month follow up generalization.

Note. Auth = Author; Quan = Quantitative

Table 9

A Comparison of Video Modeling with In-Vivo Modeling for Teaching Children with Autism

Auth/Level	**Design/Data Collection**	**Population**	**Purpose/ Intervention**	**Summary of the Results**
Charlop-Christy (2000) 2	Quan: Quasi Experimental Multiple baseline design across 2 modeling conditions Video Modeling In Vivo Modeling	5 children ages 7 to 11 who attended after school behavior therapy sessions biweekly **Gender** 4 Male 1 Female **Topics Addressed:** Reinforcement: NO Autism: YES Video Model: YES Strength: NO **Demographics:** ASD: YES Speech: YES Age: NO Gender: NO	**Purpose:** To compare the effectiveness of video modeling and in vivo modeling for teaching developmental skills from their normal curriculum to children with autism. **Intervention:** VM I-VM	Based on the results, video modeling led to faster task acquisition than live modeling and was also effective at promoting generalization. Motivation and attention maintaining qualities are discussed through the video modeling results.

Note. Auth = Author; Quan = Quantitative; VM = Video Modeling; I-VM = In-Vivo Modeling

Table 10

Increasing Play-Related Statements in Children with Autism toward Their Siblings Effects of Video Modeling

Auth/Level	**Design/Data Collection**	**Population**	**Purpose/ Intervention**	**Summary of the Results**
Taylor, Levin, & Jasper (1999) 3	Qual: Multiple baseline probe 2 experiments Scripted and unscripted	2 children, ages 6 and 8, enrolled in the Alpine Learning Group for children with Autism **Gender** 1 Male 1 Female **Topics Addressed:** Reinforcement: NO Autism: YES Video Model: YES Strength: NO **Demographics:** ASD: YES Speech: YES Age: NO Gender: NO	**Purpose:** To assess the effect of two experiments incorporating video modeling procedures to introduce scripted play comments between a sibling and an adult in practice sessions. **Intervention:** VM	Based on the results, video modeling was an effective tool for teaching these children with autism to make play comments toward their sibling. A higher number of play comments was made following the video modeling intervention than prior.

Note. Auth = Author; Qual = Qualitative; VM = Video Modeling

Table 11

Teaching Daily Living Skills to Children with Autism through Instructional Video Modeling

Auth/Level	**Design/Data Collection**	**Population**	**Purpose/ Intervention**	**Summary of the Results**
Shipley-Benamou, Lutzker, & Taubman (2002) 2	Quan: Multiple probe design across tasks IVM Baseline Intervention Replication probes Post treatment 1-mo follow up 5 Tasks	3 Children (5 years old) with autism from an early childhood center able to sit and attend to a visual model for 5 to 10 minutes **Gender** 2 Male 1 Female **Topics Addressed:** Reinforcement: NO Autism: YES Video Model: YES Strength: NO **Demographics:** ASD: YES Speech: NO Age: NO Gender: NO	**Purpose:** To determine the efficacy of a functional task video filmed from participant's viewpoint for producing skill acquisition in children with autism. **Intervention:** Participant perspective VM	Based on these results, IVM was effective for all three children in promoting skill acquisition related to daily living skills. The skill acquisition was maintained during the post-video and 1-month follow up phase.

Note. Auth = Author; Quan = Quantitative; IVM = Instructional Video Modeling; VM = Video Modeling

Table 12

Using Video Modeling to Teach Complex Play Sequences to a Preschooler with Autism

Auth/Level	Design/Data Collection	Population	Purpose/ Intervention	Summary of the Results
D'Ateno, Mangiapanello, & Taylor (2003) 2	Quan: Multiple-baseline procedure across response categories Randomly determined order of intervention play sequences Criteria for introducing next treatment condition: 8 verbal; 8 motor responses (modeled or not-modeled verbal and motor responses) per session across two consecutive experimental intervention sessions	One child with autism, aged 3 years and 8 months, enrolled at the Alpine Learning Group, a center-based education program for children with autism **Gender** 1 Female **Topics Addressed:** Reinforcement: NO Autism: YES Video Model: YES Strength: NO **Demographics:** ASD: YES Speech: NO Age: YES Gender: NO	**Purpose:** The purpose of the present study was to assess the effects of VM alone. No experimenter implemented contingencies (prompts) on the acquisition of motor and verbal play sequences in a preschool-age child with autism were incorporated. **Intervention:** Play sequences VM	Based on these results, VM intervention led to the rapid acquisition of both verbal and motor responses for all play sequences. Complex sequences of verbal and motor responses were acquired without the use of error-correction procedures or explicit experimenter implemented reinforcement contingencies.

Note. Auth = Author; Quan = Quantitative; VM = Video Modeling

Table 13

Modifying the Affective Behavior of Preschoolers with Autism Using In-Vivo or Video Modeling and Reinforcement Contingencies

Auth/Level	**Design/Data Collection**	**Population**	**Purpose/ Intervention**	**Summary of the Results**
Gena, Couloura, & Kymissis (2005) 2	Quan: Multiple baseline design across subjects with a return to baseline	3 Preschoolers with autism, 1 living in Athens, Greece and 2 in New York **Gender** 2 Male 1 Female **Topics Addressed:** Reinforcement: YES Autism: YES Video Model: YES Strength: NO **Demographics:** ASD: YES Speech: NO Age: YES Gender: NO	**Purpose:** Twofold: (1) To modify the affective behavior of 3 preschoolers with autism in the context of play settings in home and (2) to compare the effects of VM to I-V M in teaching the children contextually appropriate responses. **Intervention:** I-V M VM Reinforcement -Verbal Praise -Token	Based on these results, VM and I-V M were effective in teaching appropriate affective responding to preschoolers with autism at home and in the context of play activities.

Note. Auth = Author; Quan = Quantitative; VM = Video Modeling; I-V M = In-Vivo Modeling

Use of Reinforcement for Students with Autism Spectrum Disorders

Individuals with Autism Spectrum Disorders often lack motivation to engage in sustained physical activity (Todd, Reid, & Butler-Kisber, 2010; L2; see Table 15) therefore increasing the need for providing evidence-based practices, such as reinforcers, to influence individuals with Autism Spectrum Disorders to engage in physical activity for longer periods of time. Reid, O'Connor, and Lloyd (2003) outlined and identified several instructional practices that should be considered when teaching students with ASD in physical education. Of the instructional practices identified, the use of Applied Behavior Analysis (ABA), specifically reinforcement, was recognized as an effective practice. Further, when used appropriately to acquire or improve desired behaviors, reinforcers can be effective for students with Autism Spectrum Disorders in the physical education setting.

While research in the use of reinforcement (i.e., primary reinforcers, secondary reinforcers, token economies, peers as reinforcers) has been well documented in behavior analysis, general education, and special education literature for many years; there has been limited research in the effectiveness of reinforcement in the physical education setting (Alstot, 2012; L2; see Table 14). Research in the use of reinforcement in physical education has not been specific to Autism Spectrum Disorders alone but has included individuals with other disabilities and those in general education.

Todd, Reid, and Butler-Kisber (2010; L2; see Table 15), used a cycling program for three students with moderate to profound disabilities and all with a primary diagnosis of autism to determine the effects of self-monitoring, goal setting, and self-reinforcement, specifically primary reinforcers, on cycling behavior. Primary reinforcers were given to the participants by the investigators during the first 12 sessions of the cycling program at a rate of one per circuit at the completion of the circuit. For sessions 13-31, primary reinforcers were available at the start and finish points respectively. Participants, if desired, could self-reinforce upon completing a cycling circuit with the available primary reinforcers. In the area of primary reinforcers, outcomes from this research indicated that two of the three participants continued to self-reinforce using the primary reinforcers at the average rate of one edible per circuit completed and one participant only self-reinforced using the available primary reinforcers 65% of the time for sessions 13-31.

In a similar investigation, Todd and Reid (2006; L2; see Table 16) used self-monitoring boards, verbal cueing, and edible reinforcers to increase physical activity in individuals with Autism Spectrum Disorders when snowshoeing, walking, or jogging. Edible reinforcers were used frequently in the beginning of the study and provided at every quarter circuit the participants completed. As the study progressed, providing edible reinforcers decreased to one edible reinforcer for one full circuit completed. In addition to using the edible reinforcers, the participants also used self-monitoring boards and were taught to mark each circuit completed with a happy face marker to document progress during each session. Results from this investigation suggested that the use of self-monitoring, edible reinforcers, and verbal cueing were all associated with increased sustained participation in a snowshoeing, walking, or jogging program.

Trocki-Ables, French, and O'Connor (2001; L1; see Table 17), investigated the use of three different types of reinforcement, token exchange, verbal praise, and token exchange combined with verbal praise, on the performance of a 1-mile/1.6-km walk/run by 5 elementary aged males with Attention Deficit Hyperactivity Disorder (ADHD). Each participant completed 8 exercise sessions for each treatment, for a total of 24 sessions, and was tested once a day for 5 consecutive school days over a 6-week period. Results from this study suggested that when provided the opportunity to earn reinforcement, each participant walked or ran in less time than when no reinforcement was given. In addition, visual inspection of the data indicated that 4 of the 5 participants performed best when token exchange and verbal praise paired with token exchange were provided as reinforcement.

When looking at two instructional models to teach children with autism, Collier and Reid (1987; L2; see Table 19) examined the use of the extra-stimulus prompt model and within-stimulus prompt model to teach a bowling task to children with autism in a one-on-one setting at the school the participants attended. Both of these instructional models involved the use of physical prompts, visual prompts that included complete skill demonstration, partial skill demonstration, gestural prompting, and verbal prompts. Researchers hypothesized that the within-stimulus prompt model, which provided prompts within the structure of the task and de-emphasized the use of prompts, would be superior to the extra-stimulus model, which provided prompts as needed on a continuum and emphasized the use of prompts. The use of visual prompts in this in investigation may be a contributing factor to success of the bowling task as visual prompts tend to mimic modeling and can be reinforcing for student with Autism Spectrum Disorders. Contrary to what the researchers hypothesized, results from this investigation suggested that those participants in the extra-stimulus prompt model performed significantly better in the bowling task than those participants in the within-stimulus model. Further, the prompts provided in the investigation, specifically physical, visual, and verbal, are prompts that were frequently encountered in the student's daily environment and may have also been a factor in overall success of completing the designated task.

In two investigations examining the effects of peer-administered token reinforcement and the use of peer-tutors as models for motor performance in an integrated physical education class, Alstot (2012; L2; see Table 14) and Houston-Wilson, Dunn, van der Mars, and McCubbin (1997; L2; see Table 18) concluded that using trained peers to provide token reinforcement and modeling can improve motor performance and be a useful tool in both general and integrated physical education classes. In these investigations researchers examined the use of peers providing reinforcement and serving as a model and potential reinforcement in a general and integrated physical education class respectively.

Alstot (2012; L2; see Table 14) examined the use of peer-administered token economies on the jump rope behavior of 10 typically developing students in a third grade elementary physical education class. Results from the study suggested that 9 out of 10 participants improved jump rope performance ranging from 2% to 9% with an average increase of 33 successful jumps per token economy session when compared to baseline sessions. In addition, the general physical education teacher's perception of using the token economy was that it was effective in helping her student learn and improve jump rope skills and teaching peers to administered tokens was easy.

Houston-Wilson et al. (1997; L2; see Table 18) investigated the effect of trained and untrained peer tutors on the motor performance in an integrated physical education class. This investigation included 6 participants, ages 9 to 11, with developmental disabilities and 6 typically developing peers who served as peer tutors for the participants with developmental disabilities. Motor skills analyzed in this investigation included horizontal jump, catch, overhand throw, forehand strike, and sidearm strike and were noted as skills that were taught in the participants' integrated physical education class during the investigation. Trained peer tutors were provided instruction and training on how to use appropriate verbal cueing, provide reinforcement, and task analysis of motor skills when working with the participants with developmental disabilities. Results from this study suggested that when typically developing peer tutors are properly trained they are more effective in assisting students with developmental disabilities reach a higher level of motor performance than untrained peer tutors. Further, results indicated that using trained peer tutors may be an effective tool to use in an integrated physical education class. Students with developmental disabilities often require additional support to perform skills at a higher level and trained peer tutors can serve as additional support, as well as, reinforcement to students with developmental disabilities.

Mangus, Henderson, and French (1986; L2) investigated the implementation of a token economy by peer tutors to increase the on-task physical activity time of 5 children with autism. In this investigation, the peer tutors were trained to provide tokens to the students with autism while they continuously walked on a balance beam. An individualized reinforcement schedule was created for each student. When the students with autism earned five tokens from the peer tutors they exchanged the tokens for an edible reinforcer. Results from this investigation indicated that 4 of the 5 students with autism improved their time on task on the balance beam in at least one of the intervention phases and the use of peer tutors to provide tokens to the students with autism was effective.

In summary, the use of reinforcement through peer models, instructional models, token economies, and primary and secondary reinforcers has been shown to be effective when used in typically developing children and children with disabilities, including those with Autism Spectrum Disorders. While research in the use of reinforcement has been conducted in variety of educational arenas, the use of reinforcement in physical education for students with Autism Spectrum Disorders is limited and further investigations are needed to understand the effect reinforcement has on students with Autism Spectrum Disorders in the physical education setting.

Table 14

The Effects of Peer-Administered Token Reinforcement on Jump Rope Behaviors of Elementary Physical Education Students

Auth/Level	Design/Data Collection	Population	Purpose/ Intervention	Summary of the Results
Alstot (2012) 2	Quan: Alternating treatment design 5 baseline sessions; 5 treatment sessions Response differentiation assessed Interobserver Agreement Treatment Integrity	10 Elementary aged students (3rd grade intact class); 3rd grade chosen as target population due to students' developmental level **Gender** 5 Male 5 Female **Topics Addressed:** Reinforcement: YES Autism: NO Video Model: NO Strength: NO **Demographics:** ASD: NO Speech: NO Age: YES Gender: NO	**Purpose:** To examine the effects of token economy, administered by a peer, on jump rope behaviors of elementary physical education students. **Intervention:** Token economy	These results indicated that 9 out of 10 participants increased the number of successful jump rope practice trials during the token reinforcement sessions as compared to the baseline sessions. Therefore, it was concluded that peer administered token economies could be a useful tool for physical educators as a positive influence on motor behaviors.

Note. Auth = Author; Quan = Quantitative

Table 15

Cycling for Students with ASD: Self-Regulation Promotes Sustained Physical Activity

Auth/Level	**Design/Data Collection**	**Population**	**Purpose/ Intervention**	**Summary of the Results**
Todd, Reid, & Butler-Kisber (2010) 2	Quan: Multiple baseline changing criterion design	3 adolescents, aged 15-17 Years, with severe autism **Gender** 2 Male 1 Female **Topics Addressed:** Reinforcement: YES Autism: YES Video Model: NO Strength: NO **Demographics:** ASD: YES Speech: NO Age: YES Gender: NO	**Purpose:** To investigate the effect of a self-regulation instructional strategy on sustained cycling that included goal setting, self monitoring, and self reinforcement. **Intervention:** Self monitoring Self reinforcement	Sustained participation in physical activity was promoted by self regulation interventions for adolescents with severe autism. Overall effectiveness of the intervention increased the sustained activity.

Note. Auth = Author; Quan = Quantitative

Table 16

Increasing Physical Activity in Individuals with Autism

Auth/Level	**Design/Data Collection**	**Population**	**Purpose/ Intervention**	**Summary of the Results**
Todd & Reid (2006) 2	Quan: Changing criterion design <u>3 Conditions</u> Baseline Self monitoring Verbal cuing 6 phases	3 secondary school students, aged 15 to 20 years, enrolled in a Canadian school for individuals with severe disabilities **Gender** 3 Male **Topics Addressed:** Reinforcement: YES Autism: YES Video Model: NO Strength: NO **Demographics:** ASD: YES Speech: NO Age: YES Gender: NO	**Purpose:** To investigate the efficacy of interventions on participation in snowshoeing and walking and jogging activities. **Intervention:** Self monitoring Verbal cues	Based on these results, an instructional strategy that included self monitoring, verbal cuing, and edible reinforcements was associated with increased sustained participation in physical activity.

Note. Auth = Author; Quan = Quantitative

Table 17

Use of Primary and Secondary Reinforcers after Performance of a 1-Mile Walk/Run by Boys with Attention Deficit Hyperactivity Disorder

Auth/Level	Design/Data Collection	Population	Purpose/ Intervention	Summary of the Results
Trocki-Ables, French, & O'Connor (2001) 1	Quan: Randomized multiple-treatment design 8 Exercise sessions 3 Types of reinforcement	5 boys, aged 8 to 10 years **Gender** 5 Male **Topics Addressed:** Reinforcement: YES Autism: NO Video Model: NO Strength: NO **Demographics:** ASD: NO Speech: NO Age: YES Gender: YES	**Purpose:** To investigate the effect of three types of reinforcers on performance and time-on-task of physical activity for boys with ADHD. **Intervention:** Primary reinforcement Secondary reinforcement	Based on these results, each boy walked or ran 1 mile faster when reinforcement was given.

Note. Auth = Author; Quan = Quantitative; ADHD = Attention Deficit Hyperactive Disorder

Table 18

The Effect of Peer Tutors on Motor Performance in Integrated Physical Education Classes

Auth/Level	Design/Data Collection	Population	Purpose/ Intervention	Summary of the Results
Houston-Wilson, Dunn, van der Mars, & McCubbin (1997) 2	Quan: Single subject delayed multiple baseline design Baseline Intervention by untrained peer tutors Intervention by trained peer tutors	6 participants aged 9 to 11 years with developmental disabilities **Gender** 5 Male 1 Female **Topics Addressed:** Reinforcement: YES Autism: NO Video Model: NO Strength: NO **Demographics:** ASD: NO Speech: NO Age: NO Gender: NO	**Purpose:** To investigate the effect of trained and untrained peer tutors on improving the motor performance of students with developmental disabilities in integrated (general) physical education classes. **Intervention:** Trained peer tutors Untrained peer tutors	Based on these results, motor performance in integrated physical education classes improved for individuals with developmental disabilities with trained peer tutors.

Note. Auth = Author; Quan = Quantitative

Table 19

A Comparison of Two Models Designed to Teach Autistic Children a Motor Task

Auth/Level	Design/Data Collection	Population	Purpose/ Intervention	Summary of the Results
Collier & Reid (1987) 2	Quan: Group design with 2 instructional models Within-stimulus model of bowling instruction Extra-stimulus model of bowling instruction Mann-Whitney U test	6 school-aged children (7 to 10 years) with autism enrolled in special education schools in Montreal, Canada **Gender** 6 Male **Topics Addressed:** Reinforcement: YES Autism: YES Video Model: NO Strength: NO **Demographics:** ASD: YES Speech: NO Age: NO Gender: NO	**Purpose:** To compare the efficacy of two instructional models designed to teach children with autism a bowling task. **Intervention:** <u>Model #1</u> Extensive physical, visual, verbal prompts <u>Model #2</u> Minimal prompts	Based on these results, the extra-stimulus prompt model with extensive physical, visual, and verbal prompts group performed significantly better in bowling than the within-stimulus prompt group with no differences in reinforcement or punishment.

Note. Auth = Author; Quan = Quantitative

CHAPTER III

METHOD

The purpose of the study was to determine the effect of video modeling and primary reinforcers on the push-up performance by elementary aged males with Autism Spectrum Disorders (ASD). To better understand the procedures used in this study, information is provided under the following headings: (a) Participants, (b) Procedures, (c) Instrumentation, and (d) Design and Analysis.

Participants

Participants were 5 elementary-aged males between 8 to 10 years of age, in 3rd, 4th, and 5th grade who were enrolled in a North Texas school district. Each participant was identified with an Autism Spectrum Disorder with a secondary speech disability but without a secondary intellectual disability. All participants received academic instruction in the general education classroom with support from special education when needed. Support from special education included a special education teacher, paraprofessional, or one-on-one facilitator assisting during academic instruction to facilitate learning and address behavior when necessary. In addition to receiving instruction in the general education classroom, all 5 participants participated in general physical education with their age appropriate peers. Three of the 5 participants went to general physical education with no support from special education personnel and 2 participants went to general physical education with a paraprofessional or facilitator. After prospective participants were identified, parents were contacted and consent for student participation was requested.

Procedures

Five procedural phases were used in the investigation. In Phase I, permission and consent forms were obtained. Parents were provided information about the study along with consent forms through the United States Postal Service delivery (Appendix A). On receiving consent confirmation, the parents of the approved participants were contacted by the investigator to schedule the baseline and treatment sessions to be conducted in the home setting. Consent to conduct this investigation was obtained from the Institutional Review Board at Texas Woman's University (Appendix B). Parents were informed that the participants were free to withdraw from this investigation at any time and any questions or concerns should be directed to the investigator or to Texas Woman's University Office of Research and Sponsored Programs.

In Phase II, each participant's parents were asked to choose their son's primary reinforcer from a menu of 12 commonly preferred snack choices. Some of the 12 snacks on the list were those items that were offered as primary reinforcers in the classroom and also given as snacks in the home setting. The parents were given the opportunity to identify another primary reinforcer if it was not one of the 12 possible primary reinforcers provided on the menu (Appendix C). The selected primary reinforcer for each participant were used during the treatment phase.

Phase III of this investigation focused on baseline data collection. The investigator scheduled 3 baseline sessions prior to starting the treatment phase to determine each participant's ability to perform a push-up based on the *FITNESSGRAM* (Meredith & Welk, 2010) criteria (Appendix E). If a participant was unsuccessful, based on *FITNESSGRAM* criteria, the participant was evaluated based on a modified push-up with criteria similar to the *FITNESSGRAM*. In addition to using the baseline sessions to determine which type of push-up participants would perform, the 3 baseline sessions were used to establish stability of performance, as well as, a standard of current performance of push-ups and for each participant. Collecting baseline data were often recommended when using alternating single subject treatment designs (Richards, Taylor, & Ramasamy, 2013).

After baseline data were collected and similar performance, number of push-ups, during each baseline achieved, the investigator began Phase IV of the investigation which involved scheduling the 24 treatment sessions for each of the participants to perform the designated activity (push-ups) in the home setting. The sessions were scheduled on consecutive weekdays and started the day after the baseline sessions were completed. Each session ranged from a minimum of 5 min to a maximum of 15 min in duration and the investigator scheduled sessions for each participant at approximately the same time each day. In addition, each participant performed the push-ups in the same location each day in the home setting and the location was determined by where there would be minimal distractions and the participant was comfortable. After completing the baseline phase and determining where and when data would be collected in the home setting, the participants began the treatment sessions which required the participants to perform push-ups, based on *FITNESGRAM* criteria.

The three treatment conditions were presented to each of the participants under a semi-randomly scheduled treatment schedule, where no more than three sessions of any treatment occurred consecutively (Richards, Taylor, & Ramasamy, 2013), that was determined by the investigator prior to beginning the study (Appendix D). During the investigation, the participants received 1 of 3 treatment conditions and were expected to complete 8 sessions of each of the 3 treatment conditions. Treatment conditions were video modeling, primary reinforcers, and control (no video modeling or primary reinforcer).

Prior to the treatment session the researcher provided brief instructions and information about the test and demonstrated correct push-up form, using the cadence CD provided in the *FITNESSGRAM* administration packet, to the participant. Instructions that were provided to the participants included the criteria performance established by the *FITNESSGRAM* (Appendix E) and a demonstration of correct push-up form using the cadence provided by the *FITNESSGRAM*. The instruction and demonstration provided was similar to what the participants experienced in their general physical education class when asked to perform push-ups. The objective was for the participant to complete as many correct 90° push-ups as possible in 1 min, demonstrating correct form, and under three different treatment conditions.

When the treatment condition was video modeling, after provided instruction and demonstration, the participant then watched a video of a cross-aged peer performing the targeted skill. After watching the video, the participant was asked to perform as many push-ups as possible demonstrating correct form for a 1 min period. The number of correct form push-ups were recorded for each session and the participant performed push-ups for a 1 min period or was stopped by the investigator after the second occasion the participant did not demonstrate the correct form. The number of push-ups and number of seconds each participant performed push-ups were recorded and charted (Appendix F).

When the treatment condition was primary reinforcers, instruction and demonstration were provided and the participant was asked to perform as many push-ups as possible demonstrating correct form for a 1 min period. The number of correct form push-ups were recorded for the session and the participant performed push-ups for a 1 min period or was stopped by the investigator after the second occasion the participant did not demonstrate the correct form. The primary reinforcer was given to the participant on completion of the push-ups if the participant matched or improved his previous number of push-ups from his last primary reinforcer session. The number of push-ups and number of seconds each participant performed push-ups were recorded and charted (Appendix F).

The third treatment condition, within this phase, there was no video modeling or primary reinforcer (control). After instruction and demonstration was provided by the investigator, the participant was asked to perform as many push-ups as possible demonstrating correct form for a 1 min period. The number of correct form push-ups and number of seconds to complete push-ups were recorded for the session and the participant performed push-ups for a 1 min period or was stopped by the principal investigator after the second occasion the participant did not demonstrate correct form. The number of push-ups and number of seconds each participant performed push-ups were recorded and charted (Appendix F).

Phase V of this investigation involved a generalization phase. Three days after the investigation was completed, the participants were asked to perform as many push-ups as possible prior to going to their general physical education or adapted physical education class at the elementary school they attended. Using the same procedure as in the baseline phase, the investigator provided push-up instructions based on the *FITNESSGRAM* criteria and demonstration. After push-up instructions and demonstration were provided, the participant was asked to perform as many push-ups as possible for a 1 min period. Generalization performance, the number of push-ups completed, was compared to baseline data to see if the participants could perform the same number of push-ups or more in a different environment from the one in which they performed during the interventions. The generalization session allowed the investigator to compare each participant's performance to that of the baseline and is an important component of single subject research (Richards, Taylor, & Ramasamy, 2013).

Instrumentation

FITNESSGRAM

The test item selected for this investigation was the push-up from the *FITNESSGRAM* (Meredith & Welk, 2010). The push-up is one of five physical fitness test items on the *FITNESSGRAM* (2010) and the clear criteria of this skill were well suited for video modeling and evaluation. The goals of the *FITNESSGRAM* are to promote enjoyable regular physical activity and to provide a comprehensive physical fitness assessment and reporting program for children and youths (Meredith & Welk, 2010).

The objective of the *FITNESSGRAM* (2010) push-up test was to examine the upper body strength and endurance of youth with an Autism Spectrum Disorder. The push-up test is the preferred test item to be used for evaluating upper body strength and endurance; as opposed to the pull-up or arm hang test, and is the test most often used by general physical educators in the participants' school district. The investigator met with each participant and his parents one time prior to the collecting baseline to determine each participant's ability to perform a push-up based on the criteria of the *FITNESSGRAM.* If unsuccessful based on the *FITNESSGRAM* criteria, participants were evaluated based on a modified push-up utilizing similar criteria to the *FITNESSGRAM* (Appendix E).

Performance for the *FITNESSGRAM* was evaluated based on the presence or absence of the following criteria: (a) participant pushed up until arms were straight,

(b) participant legs and back were kept straight, (c) participant lowered the body until the elbows bent at 90°, and (d) maintained a steady rhythm, not stopping to rest. Performance for the modified push-up was evaluated by the presence or absence of the following criteria: (a) participant pushed up until arms were straight, (b) participant bent legs at knees with knees in contact with the floor and back kept straight, (c) participant lowered the body until the elbows bent at 90°, and (d) maintained a steady rhythm, not stopping to rest. Participants were stopped when the second form correction or mistake was made. The score for the session was the number of correct push-ups performed.

Video Modeling

Video modeling is considered an evidence-based practice and is a procedure in which a learner is shown a video of a model performing a targeted behavior or completing a desired task (Sigafoos, O'reilly, & de la Cruz, 2007). The video modeling treatment involved making a video for the participants prior to the starting the treatment phase. A video was made by the investigator of a cross-aged peer performing push-ups for 45 s in the home setting as defined by the *FITNESSGRAM* criteria (Meredith & Welk, 2010). The same cross-aged peer video modeling example was used across all participants. For the video modeling sessions, the investigator first verbally presented the criteria for push-up performance, demonstrated push-ups based on *FITNESSGRAM* criteria while the participant observed, and then showed the participant the video of the successful performance of push-ups on an iPad. The iPad was used as it had a larger visual field and enabled the participant to see the video model's entire body performing the skill. The video was shown after the performance instructions and demonstration were provided to the participant by the investigator (Sigafoos, O'Reilly, & de la Cruz, 2007).

Primary Reinforcement

The investigator provided each participant's parent/guardian with a menu of 12 possible preferred snack choices (Appendix C) to determine each participant's preferred primary reinforcers. The menu of 12 possible reinforcers included apples, grapes, raisins, crackers, low-fat cookies, M & M's, popcorn, fruit-flavored drink, diet soft drink, skittles, sugarless gum, and jelly beans. In addition to the menu of possible preferred items, the parents/guardians were also provided the opportunity to list additional primary reinforcers that were not included on the menu of 12 possible primary reinforcers (Shea & Bauer, 2011).

Research Design and Data Analysis

According to Horner, et al. (2005), single-subject research is a methodology "used to define basic principles of behavior and establish evidence-based practices" (p. 165). Based on indicators from the Council of Exceptional Children (CEC) on single-subject research, while single-subject designs can involve only one participant, best practice is to involve 3 to 8 participants in order for the investigation to be clinically significant. A randomized alternating-treatment design was used in this investigation (Richards, Taylor, & Ramasamy, 2013) and from the data collected, repeated measurements of the dependent variable (i.e., number of push-ups performed) were analyzed. Each treatment condition consisted of eight sessions that began with a random selection of the treatment. The data from this study were analyzed through visual inspection of graphic data. Additionally, a Friedman's analysis of variance by ranks was used to determine if there was a statistically significant difference in push-up performance (by the participants) among the three treatments. The level of significance was set at .05 (Richards, Taylor, & Ramasamy, 2013).

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CHAPTER IV

PRESENTATION OF FINDINGS

The purpose of the study was to determine the effect of video modeling and primary reinforcers on the push-up performance of elementary aged males with Autism Spectrum Disorders. The findings from this investigation are presented under the following headings: (a) Descriptive Information and Individual Performance of each Participant, (b) Information on Group Performance, and (c) Summary.

Descriptive Information and Individual Performance of each Participant

Descriptive information about each participant relates to his age, grade level, type of push-up performed for the investigation, time of day and where push-ups were performed in the home, and preferred reinforcer. In addition family information the parents shared and extracurricular activities the participant was involved in outside of the home was added to the descriptive information for each participant.

Individual performance during the three randomly selected treatment conditions consisted of eight exercise sessions per treatment. Total number of push-ups completed during each treatment session was analyzed through visual inspection.

Participant One

Participant One (P1) performed push-ups in the living room at his home and the treatment sessions occurred at 3:15 p.m. Monday through Friday. This participant was a 10-year-old male, in fourth grade, who performed full push-ups, based on the

FITNESSGRAM criteria and was diagnosed with an ASD and a speech impairment. This participant's preferred primary reinforcer was selected from the reinforcer menu provided and was M & M candy. P1 was the youngest of five boys in his family and is a twin. The parents reported that the participant used to participate in baseball but had difficulty with being on teams. This was due to anger issues and this activity was stopped 2 years ago.

In addition, the parents reported that because of anger issues and issues with being on the same teams as his twin brother, this participant chose to no longer participate in community-based sports. Although this participant no longer participated in community-based sports, he continued to like football and enjoyed being a spectator at his older siblings' football games.

Performance during baseline phase. During the baseline phase, P1 performed full push-ups, based on *FITNESSGRAM* criteria, without receiving any of the treatment conditions. During Trial 1, P1 performed 8 push-ups. For Trials 2 and 3, the participant performed 6 push-ups. The average number of correct form push-ups for baseline was 6 push-ups for this participant. The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during video modeling treatment. During Treatment 1, the participant had the opportunity to watch a cross-aged peer perform push-ups and was then asked to perform push-ups after watching the same-aged peer video model. This participant's performance during the video modeling treatment ranged from a low of 4 push-ups to a high of 15 push-ups.

In addition to recording the number of push-ups performed during each trial, the investigator also documented comments made by the participant, when appropriate, regarding his feeling toward the treatment condition for a specific day or how he was generally feeling. Based on visual inspection of the data, Trials 1 through 4 showed improved performance each time after watching the video model, as well as, Trial 6 and Trial 8. Trials 5 and 7 both showed a decrease from previous video modeling trials with 6 and 4 push-ups completed. During Trial 5, the participant stated "My foot hurts and I don't want to do good today." The comment made by P1 after completing 4 push-ups during Trial 7 was "Look, I'm mad today, I don't like video day and I'm tired and done." Participant 1 commented numerous times during Treatment 1 trials that when the study was completed he wanted to be a video model so other children could watch his push-ups and do them as well as he did. The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during the primary reinforcer treatment. During Treatment 2, the participant had the opportunity to earn a predetermined primary reinforcer at the completion of push-ups if the participant matched or improved his performance from the previous primary reinforcer trial. This participant's primary reinforcer was M & M candy and if he matched or improved his performance from a previous primary reinforcer trial he was given a snack size package of M & M candy. This participant's performance for the primary reinforcer treatment ranged from a low of 8 push-ups to a high of 15 push-ups with the participant earning the primary reinforcer for 6 of the 8 trials. The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during the control treatment. During Treatment 3, the participant was asked to perform push-ups with no video model or opportunity to earn a primary reinforcer. The performance of push-ups for P1 during the control treatment ranged from a low of 5 to a high of 14. The high of 14 push-ups occurred on Trial 3 and the participant stated "I don't care what day it is, I'm in a good mood and going to do my best." During 6 of the 8 trials, the session was stopped because the participant dropped to the ground and said "I'm done," or "I'm done and that's good enough for nothing day." The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during generalization phase. One exercise session was conducted 3 days after the last treatment phase. During this session the participant performed push-ups with no video model or primary reinforcer just as in the baseline phase. The participant performed push-ups in the gymnasium prior to the start of his general physical education class. P1 performed 11 push-ups during the generalization session. Based on visual inspection of the data, P1's push-up performance increased from the baseline phase, indicating improvement from 6 push-ups performed during baseline to 11 push-ups performed during the generalization phase for a 55% improvement overall in push-up performance.

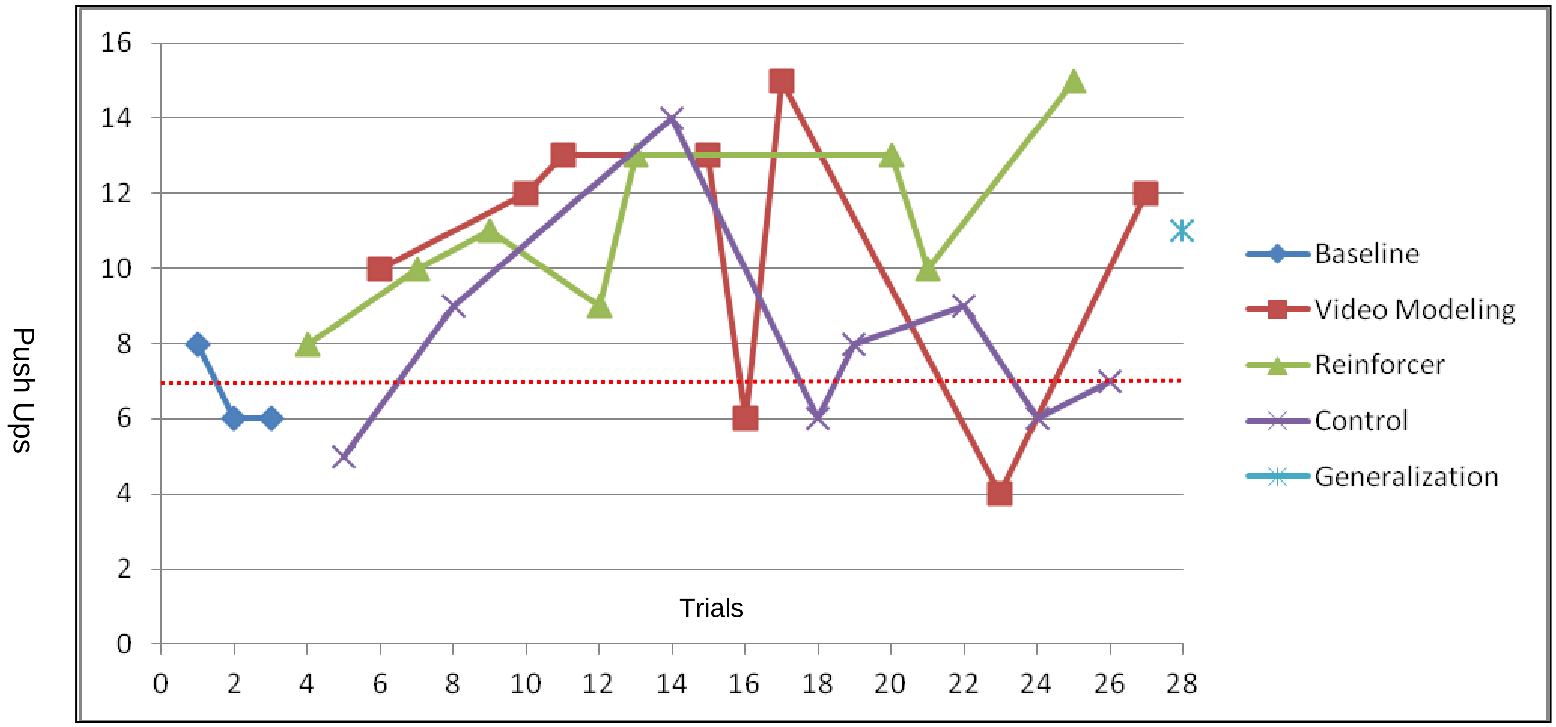

Figure 1. Graphic display of Participant 1's performance during 3 Baseline Trials, 24 randomly assigned Treatments and 1 Generalization Phase of this investigation. The dotted line represents the Healthy Fitness Zone specific to participant's age $\geq$ 7.

Participant Two

Participant Two (P2) performed push-ups in the living room at his home and the treatment sessions occurred at 5:00 p.m. Monday through Friday. This participant was a 10-year-old male, in fourth grade, who was diagnosed as having an Autism Spectrum Disorder and a speech impairment. P2 performed modified push-ups, based on the *FITNESSGRAM* criteria, and this participant's preferred primary reinforcer was selected from the primary reinforcer menu provided and was Skittles candies. P2 had a fraternal twin and although he did not participate in any organized community-based activities, his father reported he liked to be outside and is very active.

Performance during baseline phase. During the baseline phase, P2 performed modified push-ups, based on *FITNESSGRAM* criteria, without receiving any of the treatment conditions. On Trials 1, 2 and 3 the participant performed 4 modified push-ups. With the same consistent performance for all three trials, the average number of correct form push-ups for baseline was 4 push-ups for this participant. The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during video modeling treatment. During Treatment 1, the participant had the opportunity to watch a cross-aged peer perform push-ups and was then asked to perform push-ups after watching the cross-aged peer video model. This participant's performance for the video modeling treatment ranged from a low of 6 push-ups to a high of 13 push-ups. P2 improved his previous performance for each of the 8 trials in Treatment 1.

In addition to recording the number of push-ups performed during each trial, the investigator also documented comments made by the participant, when appropriate, regarding his feeling toward the treatment condition for a specific day or how he was generally feeling. P2 was very focused when watching the video model during Treatment 1 trials and would provide verbal praise to himself when finished with push-ups by making comments that included “I’m awesome,” “Yes, that’s a lot,” “I did it, that’s my job today.” The total number of push-ups per trial as well as the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during the primary reinforcer treatment. During Treatment 2, the participant had the opportunity to earn a predetermined primary reinforcer at the completion of push-ups if the participant matched or improved his performance from the previous primary reinforcer trial. P2’s primary reinforcer was Skittles candy and if he matched or improved his performance from the previous primary reinforcer trial he was given one snack sized package of Skittles candy. This participant’s performance during the primary reinforcer treatment ranged from a low of 6 push-ups to a high of 14 push-ups with the participant earning the primary reinforcer for 6 of 8 trials. Trials 6, 7, and 8 when P2 performed 12, 12, and 14 push-ups respectively he commented with “Skittles, I did it?” or “I’m good, that’s Skittles for me.” The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during the control treatment. During Treatment 3, the participant was asked to perform push-ups with no video model or opportunity to earn a primary reinforcer. The performance of push-ups for P2 during the control treatment ranged from a low of 4 to a high of 8. P2 referred to the control treatment as "nothing day" and would often drop to the floor, break his form and say "That's OK for nothing" or "I'm done, no Skittles or video today." The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during generalization phase. One exercise session was conducted 3 days after the last treatment phase. During this session the participant performed push-ups with no video model or primary reinforcer just as in the baseline phase. The participant performed push-ups in his classroom prior to the start of his adapted physical education class. When the investigator entered P2's classroom he immediately stood up from his seat, looked at his classroom teacher, and the investigator and said "It's push-up time, where do I go?" P2 performed 9 push-ups during the generalization session. Based on visual inspection of the data, P2's push-up performance increased from the baseline phase, indicating improvement from 4 push-ups performed during baseline to 9 push-ups performed during the generalization phase for a 44% improvement overall in push-up performance.

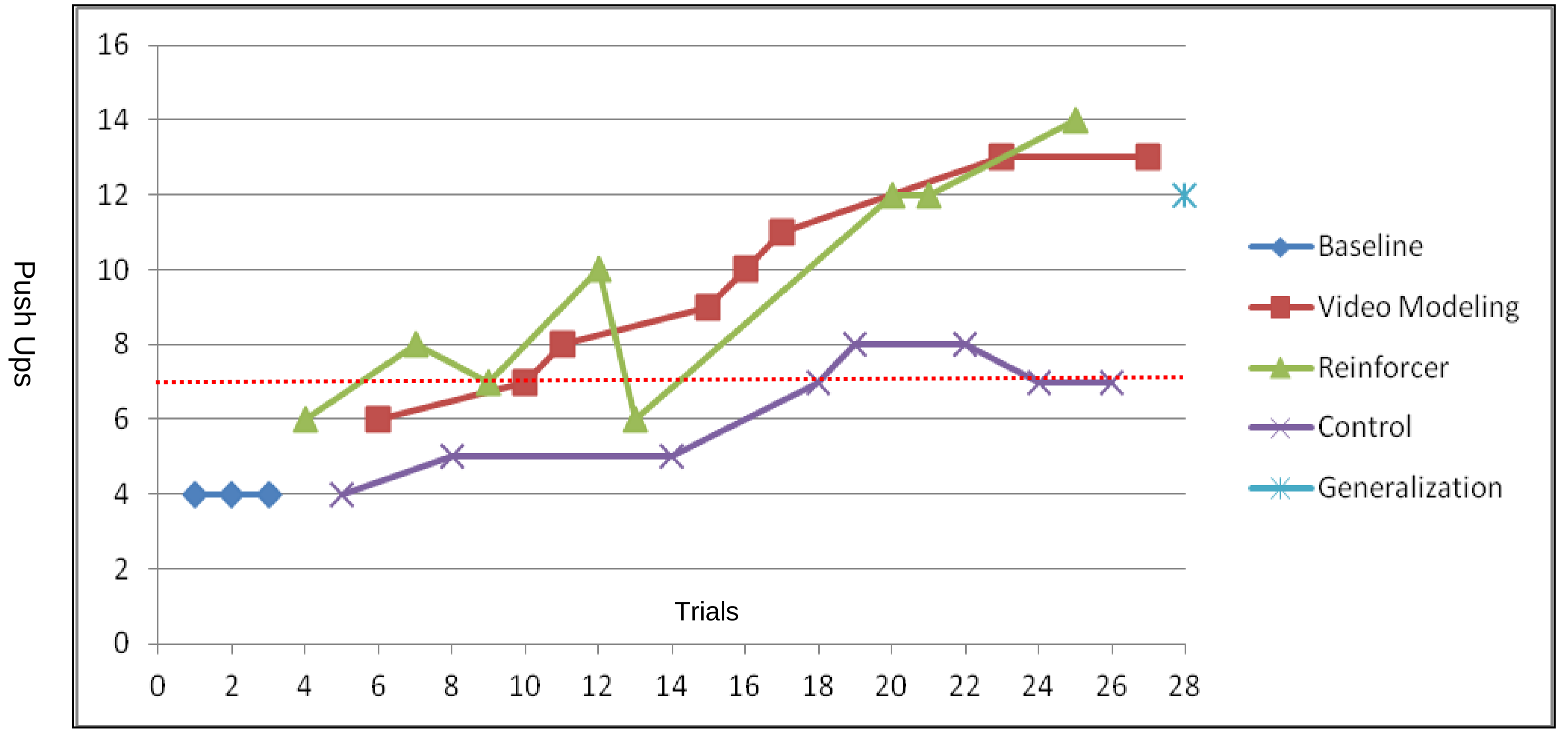

Figure 2. Graphic display of Participant 2's performance during 3 Baseline Trials, 24 randomly assigned Treatments and 1Generalization Phase of this investigation. The dotted line represents the Healthy Fitness Zone specific to participant's age $\geq$ 7.

Participant Three

Participant Three (P3) performed push-ups in the living room at his home and the treatment sessions occurred at 3:45 p.m. Monday through Thursday and at 4:30 p.m. on Fridays. This participant was an 8-year-old male, in third grade, and was diagnosed with an Autism Spectrum Disorder and speech impairment. This participant performed modified push-ups, based on the *FITNESSGRAM* criteria. P3's preferred primary reinforcers were selected from the primary reinforcer menu provided and were Skittles and jelly beans candy. This participant is the older of two children and participated in karate and hippotherapy.

Performance during baseline phase. During the baseline phase, P3 performed modified push-ups, based on *FITNESSGRAM* criteria, without receiving any of the treatment conditions. On Trial 1, the participant performed 6 push-ups. For Trials 2 and 3, the participant performed 4 and 5 push-ups respectively. The average number of correct form push-ups for baseline was 5 push-ups for this participant. The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during video modeling treatment. During Treatment 1, the participant had the opportunity to watch a cross-aged peer perform push-ups and was then asked to perform push-ups after watching the cross-aged peer video model. This participant's performance for the video modeling treatment ranged from a low of 5 push-ups to a high of 20 push-ups.

In addition to recording the number of push-ups performed during each trial, the investigator also documented comments made by the participant, when appropriate, regarding his feeling toward the treatment condition for a specific day or how he was generally feeling. Trials 1 through 4 showed improved performance each time after watching the video model, as well as, Trials 6 through 8. In Trial 5 there was a significant decrease from previous video modeling trials with 5 push-ups completed. During Trial 5, the participant stated "I'm just tired today and don't want to do anything." P3 watched the video model with great intent and on several occasions stated "I can do as many as him" (the video model) and "I can look like that." P3 achieved his highest number of push-ups for the investigation during Trial 7 of the video modeling treatment and performed 20 push-ups. On completing the 20 push-ups, the participant jumped up from the floor and stated "That's awesome right? I'm awesome." Anecdotal information from the participant's mother indicated that she noticed a big difference in P3's form during the video model treatment when compared to the other treatments. The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during the primary reinforcer treatment. During Treatment 2, the participant had the opportunity to earn a predetermined primary reinforcer at the completion of push-ups if the participant matched or improved his performance from the previous primary reinforcer trial. P3's primary reinforcers were Skittles and jelly beans candy. If the participant matched or improved his performance from the previous primary reinforcer trial he was given the choice of one snack sized package of Skittles or jelly beans candy. The participant chose Skittles on 4 trials and jelly beans on 2 trials. This participant's performance for the primary reinforcer treatment ranged from a low of 7 push-ups to a high of 17 push-ups with the participant earning the primary reinforcer for 6 of 8 trials. Prior to starting Treatment 2 trials, P3 asked "How many do I have to do to get candy?" on 5 of 8 trials and when performing a high of 17 push-ups during Treatment 2, Participant 3 stated "Whoa, I'm awesome, that's my best yet isn't it?" The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during the control treatment. During Treatment 3, the participant was asked to perform push-ups with no video model or opportunity to earn a primary reinforcer. The performance of push-ups for P3 during the control treatment ranged from a low of 4 to a high of 11. The participant dropped to the ground and stopped during 5 of the 8 trials and made comments that included "That's a lot for a nothing day," "I don't think I can do good for nothing," or "I'm tired today." The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during generalization phase. One exercise session was conducted 3 days after the last treatment phase. During this session the participant performed push-ups with no video model or primary reinforcer just as in the baseline phase. The participant performed push-ups in the gymnasium prior to the start of his general physical education class. P3 performed 12 push-ups during the generalization session. The general physical education teacher observed the participant when he performed push-ups and when he was finished told the investigator she had “never seen him perform push-ups with that good of form or that many times consecutively.” Based on visual inspection of the data, Participant 3’s push-up performance increased from the baseline phase, indicating improvement from 5 push-ups performed during baseline to 12 push-ups performed during the generalization phase for a 42% improvement overall in push-up performance.

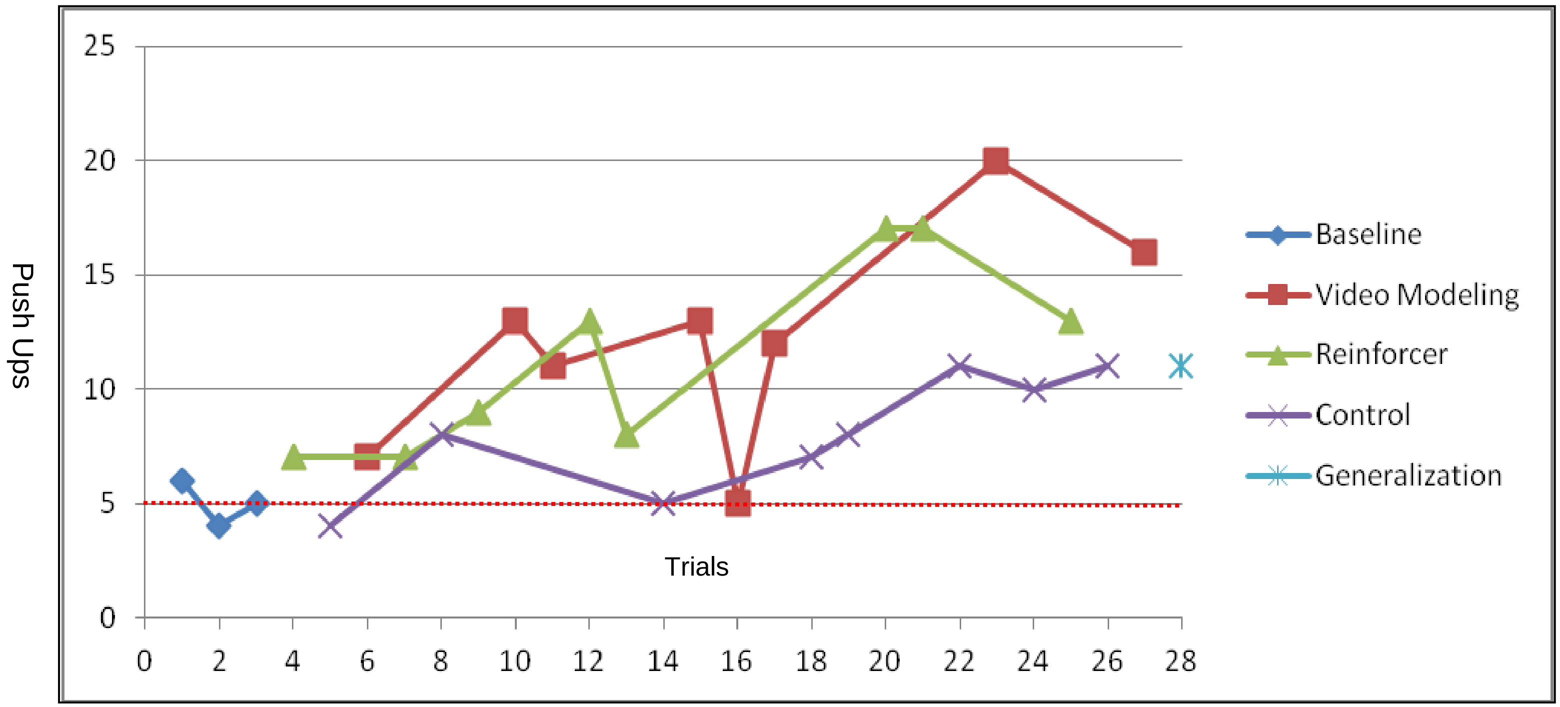

Figure 3. Graphic display of Participant 3's performance during 3 Baseline Trials, 24 randomly assigned Treatments, and 1 Generalization Phase of this investigation. The dotted line represents the Healthy Fitness Zone specific to participant's age $\geq$ 5.

Participant Four

Participant Four's (P4) mother recommended that he perform push-ups in his bedroom as this was a place where the participant spent most of his time and was most comfortable in his room. Treatment sessions occurred at 4:15 p.m. on Tuesday, Thursday, and Fridays, 5:30 p.m. on Mondays and 6:15 p.m. on Wednesdays. The Monday and Wednesday sessions were scheduled for later times in order to accommodate his private speech and occupational therapy sessions. This participant was a 9-year-old male, in fourth grade, criteria and was diagnosed with an Autism Spectrum Disorder and speech impairment. This participant performed full push-ups, based on the *FITNESSGRAM* criteria. The preferred primary reinforcer for this participant was Lays potato chips which was not on the primary reinforcer menu provided but instead suggested by the participant's mother as this participant's favorite primary reinforcer.

This participant is the older of two children and received private speech therapy and occupational therapy two days per week during the investigation. P4's mother reported that approximately half way through the investigation the private occupational therapist began using video modeling to help P4 learn the sequence of washing hands and to catch a ball that is bounced and caught to self. P4's mother shared with the private occupational therapist that the participant was part of this investigation and she has noticed marked improvement in performance and focus when video modeling was used.

Performance during baseline phase. During the baseline phase, P4 performed full push-ups, based on *FITNESSGRAM* criteria, without receiving any of the treatment conditions. On Trials 1 and 2, the participant performed 6 push-ups each time. For Trial 3, the participant performed 5 push-ups. The average number of correct form push-ups for baseline was 6 push-ups for this participant. The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during video modeling treatment. During Treatment 1, the participant had the opportunity to watch a cross-aged peer perform push-ups and was then asked to perform push-ups after watching the cross-aged peer video model. P4's performance for the video modeling treatment ranged from a low of 8 push-ups to a high of 13 push-ups.

In addition to recording the number of push-ups performed during each trial, the investigator also documented comments made by the participant, when appropriate, regarding his feeling toward the treatment condition for a specific day or how he was generally feeling. P4 was extremely focused when watching the video model and would verbally label the steps to complete the task as he watched them on the video. During Trial 6 of the video modeling treatment, P4 achieved his highest number of push-ups and when he finished 13 push-ups he commented "Can I stop now that was good." The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during the primary reinforcer treatment. During Treatment 2, the participant had the opportunity to earn a predetermined primary reinforcer at the completion of push-ups if the participant matched or improved his performance from the previous primary reinforcer trial. P4's primary reinforcer was Lays potato chips. If the participant matched or improved his performance from the previous primary reinforcer trial he was given one snack sized package of Lays potato chips. This participant's performance for the primary reinforcer treatment ranged from a low of 6 push-ups to a high of 13 push-ups with the participant earning the primary reinforcer for 6 of 8 trials. The primary reinforcer was highly motivating for this participant and each day prior to starting the trial he would ask "Is it chip day?" and when he completed trials he would comment "Is that enough for chips?" The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during the control treatment. During Treatment 3, the participant was asked to perform push-ups with no video model or opportunity to earn a primary reinforcer. The performance of push-ups for P4 during the control treatment ranged from a low of 6 to a high of 16. The eighth and final trial of the control treatment was when Participant 4 performed the most number of push-ups in the investigation with 16. On completing the trial, the participant stopped and said "that's good." The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during generalization phase. One exercise session was conducted 3 days after the last treatment phase. During this session, the participant performed push-ups with no video model or primary reinforcer just as in the baseline phase. The participant performed push-ups in the cafeteria prior to the start of his adapted physical education class. P4 performed 11 push-ups during the generalization session. The adapted physical educator (APE) of Participant 4 observed while P4 performed push-ups and after he finished push-ups the APE reported to the investigator that she had never seen P4 perform push-ups so well and wished she could show a video to the general physical education teachers as he had never done push-ups like that in general physical education. Based on visual inspection of the data, P4's push-up performance increased from the baseline phase, indicating improvement from 6 push-ups performed during baseline to 11 push-ups performed during the generalization phase for a 55% improvement overall in push-up performance.

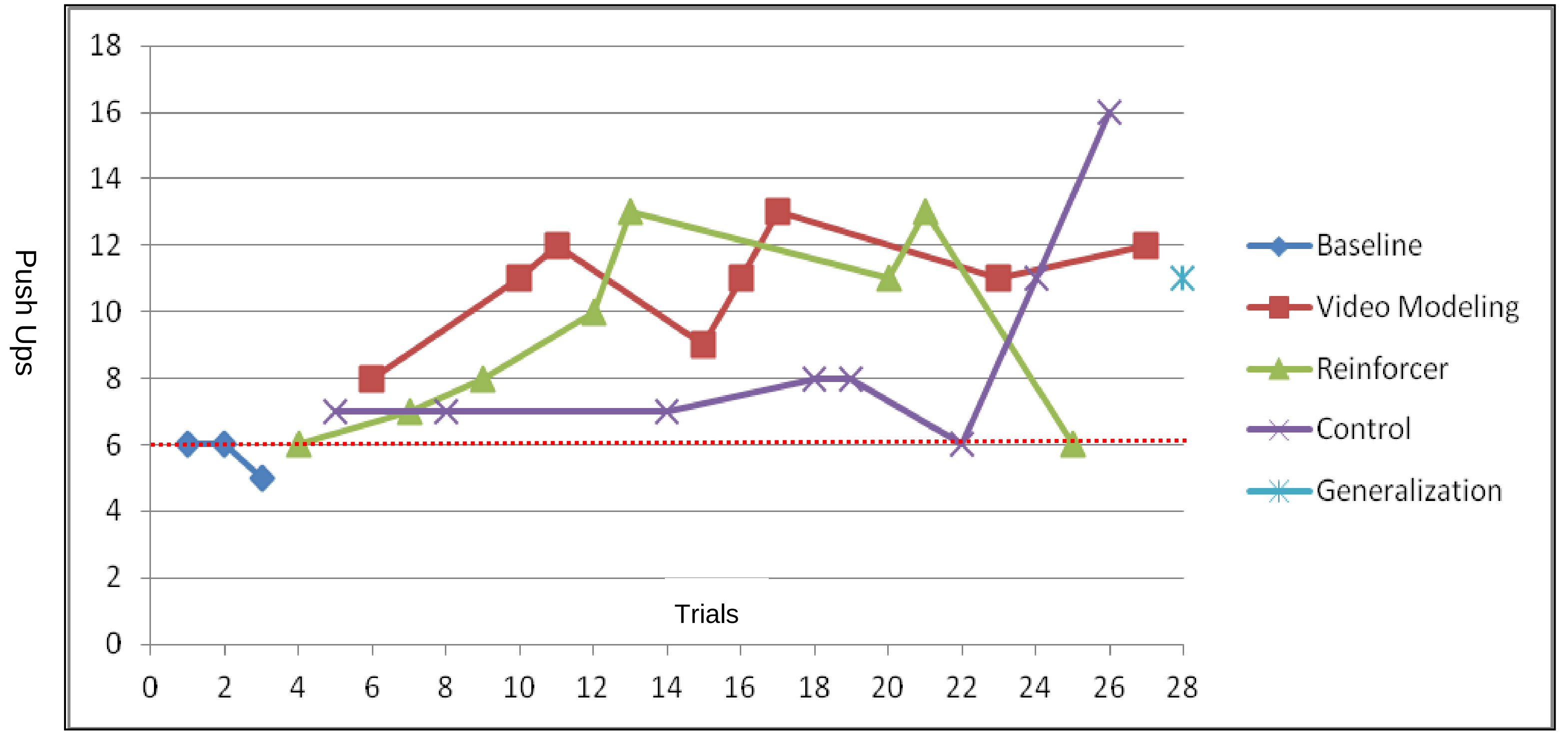

Figure 4. Graphic display of Participant 4's performance during 3 Baseline Trials, 24 randomly assigned Treatments, and 1 Generalization Phase of this investigation. The dotted line represents the Healthy Fitness Zone specific to participant's age $\geq$ 6.

Participant Five

Participant Five (P5) performed push-ups in the upstairs game room at his home and the treatment sessions occurred at 6:30 p.m. on Monday, Tuesday and Thursdays, 4:15 p.m. on Wednesdays and 3:45 p.m. on Fridays. The variation of times for P5's sessions was to accommodate the various community-based activities in which he participated. This participant was a 10-year-old male, in fifth grade, and was diagnosed with an Autism Spectrum Disorder and a speech impairment. P5 performed full push-ups, based on the *FITNESSGRAM* criteria. Participant 5's preferred primary reinforcer selected from the primary reinforcer menu provided was popcorn. This participant was an only child and participated in numerous extracurricular activities that included Cub Scouts, karate, piano lessons and a motor activity program at a local university.

Performance during baseline phase. During the baseline phase, P5 performed full push-ups, based on *FITNESSGRAM* criteria, without receiving any of the treatment conditions. On Trial 1, the participant performed 4 push-ups. For Trials 2 and 3, the participant performed 6 and 5 push-ups, respectively. The average number of correct form push-ups for baseline was 5 push-ups for this participant. The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during video modeling treatment. During Treatment 1, the participant had the opportunity to watch a cross-aged peer perform push-ups and was then asked to perform push-ups after watching the cross-aged peer video model. This participant's performance for the video modeling treatment ranged from a low of 4 push-ups to a high of 17 push-ups.

In addition to recording the number of push-ups performed during each trial, the investigator also documented comments made, when appropriate, by the participant regarding his feeling toward the treatment condition for a specific day or how he was generally feeling. P5 was extremely focused when watching the video model and each trial was maintained or improved from the previous video modeling trial.

The largest increase in performance was demonstrated between Trials 1 and 2 where the participant improved from 4 push-ups to 10 push-ups. P5 performed his highest number of push-ups in this investigation during the video modeling treatment with 17 push-ups. When he finished performing 17 push-ups, P5 jumped up and shouted to his mother downstairs "Mommy, that's the most, I did it, I'm awesome."

In addition to being focused on the video itself, P5 was very focused on the cross-aged peer in the video and would often make comments to the investigator that included "Who is that?," "He look likes me," "I like videos; I can do push-ups like him," and "I can do this, how about I do a lot today like the boy in the video." The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during the primary reinforcer treatment. During Treatment 2, the participant had the opportunity to earn a predetermined primary reinforcer at the completion of push-ups if the participant matched or improved his performance from the previous primary reinforcer trial. P5's primary reinforcer was popcorn and if the participant matched or improved his performance from the previous primary reinforcer trial he was given one snack sized package of popcorn. This participant's performance for the primary reinforcer treatment ranged from a low of 6 push-ups to a high of 12 push-ups with the participant earning the primary reinforcer for 7 of 8 trials. During Treatment 2, P5 consistently asked the investigator, "How many do I have to do right to get popcorn?" The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during the control treatment. During Treatment 3, the participant was asked to perform push-ups with no video model or opportunity to earn a primary reinforcer. The performance of push-ups for P5 during the control treatment ranged from a low of 5 to a high of 15. The eighth and final trial of the control treatment was when P5 performed the most number of push-ups for this treatment with 15 push-ups. Before the trial started, P5 stated "We are almost done with this and I'm going to do good for nothing, it's all OK." The total number of push-ups per trial, as well as, the total number of seconds it took the participant to perform push-ups are provided in Appendix F.

Performance during generalization phase. One exercise session was conducted 3 days after the last treatment phase. During this session the participant performed push-ups with no video model or primary reinforcer just as in the baseline phase. The participant performed push-ups in the cafeteria prior to the start of his physical education class. P5 performed 11 push-ups for the generalization session. On entering the participant's classroom, he stood up and announced to his teacher, "This is my friend, Ms. Pam (investigator) and she taught me how to do push-ups." Based on visual inspection of the data, P5's push-up performance increased from the baseline phase, indicating improvement from 6 push-ups performed during baseline to 11 push-ups performed during the generalization phase for a 55% improvement overall in push-up performance.

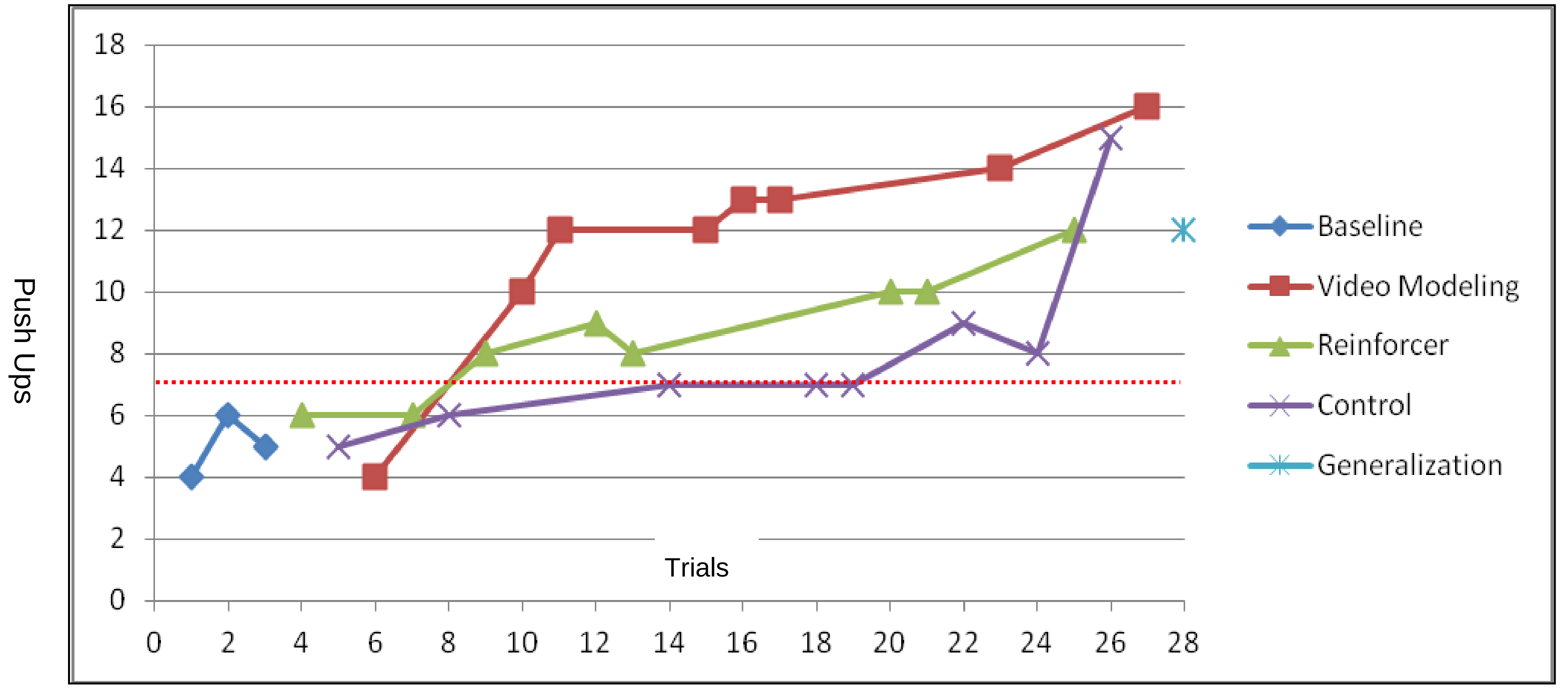

Figure 5. Graphic display of Participant 5's performance during 3 Baseline Trials, 24 randomly assigned Treatments, and 1 Generalization Phase of this investigation. The dotted line represents the Healthy Fitness Zone specific to participant's age $\geq$ 7.

Information on Group Performance

Data in this investigation were analyzed through visual inspection of graphic data and statistics. Data were visually inspected to determine if any of the three treatment conditions used in this investigation appeared to be more effective than another in improving the push-up performance of elementary aged males with Autism Spectrum Disorders.

Based on visual inspection of the data across all participants, it was determined that each participant improved performance from the baseline. Further, when provided the opportunity to perform the push-ups under one of three treatment conditions, all participants improved performance during all treatment conditions but the most significant improvements occurred under Treatment 1 (video modeling) and Treatment 2 (primary reinforcer).

The use of statistics which are applicable to large group investigations may sometimes be inappropriate to evaluate single case investigations in which data were collected over time and therefore may detract from the question of behavior change (Richards, Taylor, & Ramasamy, 2013). However, the group data collected in this investigation were statistically analyzed to determine if significant differences were present. The Friedman's analysis of variance by ranks was used in this investigation to determine if there were significant differences between the three treatment conditions (Sheskin, 2003). Results from the Friedman's analysis of variance by ranks indicated there was statistically significant differences between one or more of the treatment conditions in this investigation with results reported as χ^2 (2) = 28.392, p = .001. In order to determine which conditions differed, a Wilcoxon Signed Ranks post-hoc test was performed. After a Bonferroni adjustment, results from this test indicated a significant difference between video modeling (Treatment 1) with a rank of 2.48 and control (Treatment 3) with a rank of 1.35. Results also indicated and significant difference between primary reinforcer (Treatment 2) with a rank of 2.18 and control (Treatment 3) with a rank of 1.35.

Summary

Based on visual inspection of the data across all participants, it was determined that each participant improved push-up performance from the baseline performance during the majority of trials during the treatment phase. When provided the opportunity to perform the push-ups under one of three treatment conditions, all participants improved performance during all treatment conditions but the most significant improvements occurred under Treatment 1 (video modeling) and Treatment 2 (primary reinforcer). Based on visual inspection of the data, 2 out of 5 participants performed their best push-ups under both Treatment 1 (video modeling) and Treatment 2 (primary reinforcer) and 3 out of 5 participants performed their best push-ups under Treatment 1 (video modeling). Based on statistical treatment of the data, differences between Treatment 1 (video modeling) and Treatment 2 (primary reinforcer) on push-up performance was not statistically significant; however, both Treatment 1 (video modeling) and Treatment 2 (primary reinforcer) were statistically significant when compared to Treatment 3 (control).

CHAPTER V

SUMMARY, DISCUSSION, CONCLUSION, AND RECOMMNEDATIONS FOR FUTURE STUDIES

The purpose of this investigation was to determine the effect of video modeling and primary reinforcers on the push-up performance of elementary aged males with Autism Spectrum Disorders (ASD). The push-up performance was measured under three different treatment conditions which were: (a) Video Modeling, (b) Primary Reinforcers, and (c) No Video Modeling or Primary Reinforcers (Control). The influence of the treatment conditions on the push-up performance were compared to determine which treatment was most effective in improving the push-up performance of 5 elementary aged males with Autism Spectrum Disorders. Information in this chapter related to the purpose of this investigation is provided in the following four sections: (a) Summary, (b) Discussion, (c) Conclusion, and (d) Recommendations for Future Studies.

Summary

In this section, a summary of the methods and results of this investigation are provided to facilitate further discussion later in this chapter regarding the use of evidence-based practices, specifically video modeling and primary reinforcers, and their influence on the push-up performance of elementary aged males with Autism Spectrum Disorders. Participants in this investigation were 5 elementary-aged males between 8 to

10 years of age, in 3rd, 4th and 5th grade who were enrolled in a North Texas school district. Each of the male participants was identified with an Autism Spectrum Disorder with a secondary speech disability but without a secondary intellectual disability.

All participants received academic instruction in the general education classroom with support from special education when needed. Support from special education included a special education teacher, paraprofessional, or one-on-one facilitator assisting during academic instruction to facilitate learning and address behavior. In addition to receiving instruction in the general education classroom, all 5 participants participated in general physical education with their age appropriate peers. Three of the 5 participants attended general physical education classes with no support from special education personnel and 2 participants attended general physical education with a paraprofessional or facilitator.

Each of participants completed three baseline sessions prior to the initiation of the treatment phase to determine each participant's potential ability to perform a push-up based on the *FITNESSGRAM* criteria. The *FITNESSGRAM* criteria for the push-up performance was chosen as this is the state mandated fitness assessment that all students, including those with disabilities, are required to take in the state of Texas. On completion of the baseline phase, each of the participants completed 24 treatment sessions (i.e., 8 video modeling treatments, 8 primary reinforcer treatments, and 8 no video modeling or primary reinforcer treatments) that involved performing push-ups, based on *FITNESSGRAM* criteria, under the three randomly assigned treatment conditions. Data were collected on consecutive weekdays for a 6-week period.

A randomized alternating-treatment design was used in this investigation (Richards, Taylor, & Ramasamy, 2013) and from the data collected, repeated measurements of the dependent variable (i.e., number of push-ups performed) were analyzed. Each treatment condition consisted of eight sessions that began with a random selection of the treatment. The data from this study were analyzed through visual inspection of graphic data. Additionally, a Friedman's analysis of variance by ranks was used to determine if there was a statistically significant difference in the push-up performance among the three treatments by the participants using the .05 level of significance (Richards, Taylor, & Ramasamy, 2013).

Based on visual inspection of the data, it is possible to determine which treatments were most effective for individual participants. Participant 1 and Participant 4 both demonstrated improved push-up performance in both the video modeling and the primary reinforcer treatment conditions while Participants 2, 3, and 5 demonstrated the most improved push-up performance during the video modeling treatment.

Based on results of the analysis, it was concluded that both video modeling and primary reinforcers were equally effective in improving push-up performance when compared to the control treatment. Differences in the number of push-ups performed between the video modeling treatment and primary reinforcer treatment were not statistically significant but both were significantly higher than the control condition.

Discussion

The theoretical framework that guided this investigation was based on Bandura's Social Learning Theory, specifically the element of observational learning that is the key component of the Social Learning Theory. Video modeling and the implementation of its techniques, as well as, the use of reinforcement techniques are deeply rooted in Bandura's social learning theory whose underlying concept supports that human behavior is primarily learned by observing and modeling others (Bandura, 1977). Within the social learning theory, observational learning refers to the cognitive and behavioral change that occurs as a result of observing others engaged in similar actions (Bandura, 1986).

In order for observational learning to occur four distinct processes need to take place and those processes are; (a) attentional, (b) retentional, (c) production, and (d) motivational processes. Based on the results from the current investigation all 5 participants improved push-up performance when video modeling and primary reinforcers were the treatment conditions, indicating that both these treatments influenced the four processes of observational learning, particularly the production and motivational processes.

During the video modeling treatment, participants demonstrated they could focus on a specific task (i.e., performing the push-ups) and were active participants in the initial attentional process. The attentional process refers to the student's ability to be able to focus on and observe a task, even if only for a few seconds. In addition, each participant demonstrated the ability to further take in the information and turn it into something symbolic, the retentional process. Success with the retentional process was evident when each of the 5 participants demonstrated the ability to watch the video model and then attempted to perform the push-ups that were just observed.

When examining the final two processes of observational learning, results from this investigation further support that all 5 participants demonstrated the ability to understand and execute both the production and motivational processes. All 5 participants demonstrated the ability to accurately reproduce the observed or modeled behavior (i.e., the video model) and 3 of the 5 participants performed their best during the video modeling treatment.

The motivational process of observational learning refers to learning that occurs in the presence of reinforcement and suggests that individuals are more likely to exhibit modeled behavior if it results in valued outcomes (Bandura, 1986). Valued outcomes in the context of the current investigation include primary reinforcers. All 5 participants demonstrated improved performance during the primary reinforcer treatment with 2 of the 5 participants performing the push-ups better when the treatment condition involved earning a desired primary reinforcer. Further, for students with Autism Spectrum Disorders, whose preferred learning is often visually cued instruction (Corbett & Abdullah, 2005), the video modeling treatment may have served as a reinforcer itself and been another factor in the overall results of all 5 participants improving push-up performance when video modeling was the treatment.

With more children than ever being diagnosed with Autism Spectrum Disorders, it has become necessary to use evidence-based practices in all educational areas, including physical education, when teaching students with Autism Spectrum Disorders (National Professional Development Center on Autism Spectrum Disorders, 2014). While the use of evidence-based practices, specifically video modeling and primary reinforcers, has been widely documented in other educational areas, the use of these evidence-based practices in physical education, specifically physical fitness and upper body strength, for students with Autism has been limited (Alstot, 2012; Lang et al., 2010).

Students with Autism Spectrum Disorders are required to participate in the state-wide *FITNESSGRAM*, however, their characteristic motor and strength deficiencies often limit their performance on such state mandated tests (Thelen, 2013). Upper body strength and endurance for children and youth is important as it plays a role in good posture and successful performance in many daily activities (Meredith & Welk, 2010). The need to improve upper body strength and endurance, through the use of other instructional methods, becomes important for students with Autism Spectrum Disorders.

Because of limited research in the area of upper body strength and students with Autism Spectrum Disorders and the importance of all children having good upper body strength, the investigator in this study chose to examine the use of evidence-based practices, specifically video modeling and primary reinforcers, and their effect on push-up performance of elementary aged males with Autism Spectrum Disorders. The following headings are used to discuss specific results in relation to the purpose of the study: (a) Autism Spectrum Disorders and Physical Fitness, (b) Use of Video Modeling as an

Instructional Approach for Students with Autism Spectrum Disorders, and (c) Use of Reinforcement for Students with Autism Spectrum Disorders

Autism Spectrum Disorders and Physical Fitness

Much of the research related to Autism Spectrum Disorders and physical fitness focuses on activity patterns and increasing levels of physical activity in individuals with ASD with limited research in the area of physical fitness, particularly upper body strength, for students with Autism Spectrum Disorders (Lang et al., 2010; Pan & Frey, 2006; Todd & Reid, 2006). In one investigation, Kern, et al. (2010), examined the correlation between muscular strength, by measuring grip strength, and the severity of autism. These researchers suggested that children whose autism is more severe have lower grip strength than those with a higher level of functioning. In addition, it was suggested that muscular strength in children with Autism Spectrum Disorders was also influenced by deficits in motor coordination, impairments in motor development, poor sensory-motor functioning and hypotonia.

Results from the current investigation are similar to a study conducted by Lochbaum and Crews (2003) who investigated the use of reinforcement, verbal prompts, and modeling of target behaviors to improve aerobic fitness in individuals with Autism Spectrum Disorders (by riding a stationary bike) and muscular strength (by lifting weights using Nautilus equipment). Based on the results of this investigation, there was improved aerobic fitness and muscular strength for all participants, in the investigation, when additional instructional strategies (i.e., verbal prompts, and reinforcement) and teaching procedures (i.e., modeled target behaviors, in-vivo modeling) were used.

Using participants similar to the present investigation, Hardan, et al. (2003) used individuals with autism, without an intellectual disability, and then assessed grip strength using a hand dynamometer. It was concluded in this investigation that grip strength was weaker in individuals with autism and it was indicated many motor abnormalities associated with autism was influenced by brain structures involved in motor movement including the cerebellum and frontal lobe.

While Kern, et al. (2010) and Hardan, et al. (2003) did not incorporate the use of additional instructional strategies or teaching procedures to influence physical fitness, specifically upper body strength in individuals with Autism Spectrum Disorders; these investigators concluded that individuals with Autism Spectrum Disorders often exhibit below average physical fitness, specifically in the area of upper body strength. In these investigations, the factors that decreased physical fitness skills in individuals with Autism Spectrum Disorders included the level or severity of the Autism Spectrum Disorder, deficits in motor coordination and motor movement, impairment in motor development, and poor sensory-motor functioning.

With students with Autism Spectrum Disorders being required to participate in state mandated fitness assessments, this increases the need for both general and adapted physical educators to use additional instructional strategies or teaching procedures to potentially improve performance on state mandated fitness assessments. The *FITNESSGRAM* identifies standards of performance, a number that should be achieved, for each age group in two general areas: (a) Healthy Fitness Zone (HFZ) and (b) Needs Improvement Zone. Based on results from this investigation, only 2 of the 5 participants initially demonstrated Healthy Fitness Zone push-up performance during the baseline phase. However, when video modeling and primary reinforcers were provided, all 5 participants consistently performed the push-ups in the Healthy Fitness Zone or above the Healthy Fitness Zone for their respective age groups.

Use of Video Modeling as an Instructional Approach for Students with Autism Spectrum Disorders

Video modeling is an evidence-based instructional approach that has been well validated in the behavioral sciences as a successful method to be used when teaching learners with Autism Spectrum Disorders (Bellini & Akullian, 2005; Corbett & Abdullah, 2005; Sigafoos, O'Reilly, & de la Cruz, 2007). While well validated in the behavioral sciences and used to teach and target a variety of behaviors in areas that include language, communication, social behavior, play, self-help skills and academics, research with the use of video-modeling in relation to physical fitness skills in individuals with Autism Spectrum Disorders is limited.

Individuals with Autism Spectrum Disorders often benefit from visually cued instruction and demonstrate strengths in processing visual information. The use of video modeling lends itself as a successful practice to utilize when teaching individuals with Autism Spectrum Disorders and supports the theoretical framework that guided this investigation (Corbett & Abdullah, 2005). The use of video modeling allows the learner to be an active participant in all four processes of observational learning (i.e., attentional, retentional, production, and motivational).

Charlop-Christy, Le, and Freeman (2000) and Gena, Couloura, and Kymissis (2005) examined the use of in-vivo modeling (modeling of a skill by a person to a targeted audience) and video modeling and their effect on learning developmental skills specifically, cooperative play, social play, and independent play. Based on results from the Charlop-Christy, et al. investigation (2000), it was suggested that video modeling led to quicker acquisition of skills than in-vivo modeling and behaviors generalized after presentations of video modeling but not after in-vivo modeling. Further, Gena, et al. (2005) suggested that both video modeling and in-vivo modeling, when used in conjunction with reinforcement contingencies (i.e., tokens and verbal praise), were both effective in teaching appropriate affective responding in the context of play activities for three preschoolers with autism in the home setting. Both studies supported the data collected in the current investigation where 3 of the 5 participants' performed better under the video modeling treatment and 2 of the 5 participants performed best with video modeling and primary reinforcers combined.

Further, D'Ateno, Mangiapanello, and Taylor (2003) and Taylor, Levin, and Jasper (1999) examined the use of video modeling in teaching complex play sequences to a preschool aged child and increasing play related statements with siblings in the home setting. The researchers in both investigations suggested that the use of video modeling was an effective intervention in promoting long sequences of play behavior, increasing play skills, and teaching scripted play related statements to the child with an Autism Spectrum Disorder to his typically developing sibling.

In summary, results from the studies above related to video modeling support results obtained in the current investigation with all 5 participants improving push-up performance when video modeling was provided. In addition, results from the current investigation suggested that video modeling, without primary reinforcers included, could be used as an effective tool in improving performance in the physical education setting and the use of video modeling could decrease the need for providing primary reinforcers. Individuals with Autism Spectrum Disorders benefit from visually cued instruction and the use of video modeling allows individuals with Autism Spectrum Disorders to use their preferred mode of learning (Corbett &Abdullah, 2005; Quill, 1997).

Use of Reinforcement for Students with Autism Spectrum Disorders

The use of reinforcement, (i.e., primary reinforcers, secondary reinforcers, token economies, and peers as reinforcers), has been well documented in behavior analysis, general education, and special education for many years (Alstot, 2012). However, much like video modeling, there is limited research in the effectiveness of reinforcement in the physical education setting and research conducted has not been specific to Autism Spectrum Disorders alone but has included individuals with other disabilities and those in general education (Alstot, 2012). Reinforcement has also been identified as an evidence-based practice and the use of reinforcement, specifically primary reinforcers, was an interest in this investigation.

Researchers examined the use of primary reinforcers, along with goal setting, verbal cues, and self-monitoring, in individuals with ASD and moderate to profound disabilities and their impact on increasing cycling behavior and sustained physical activity (i.e., snowshoeing, walking, or jogging). Results from both these studies suggested that when primary reinforcers were provided, either by the researchers or self-provided, cycling behavior improved and increases in sustained physical activity were observed (Todd & Reid, 2006; Todd, Reid, & Butler, 2010).

Results from these studies support the current investigation where 2 of the 5 participants performed best with a combination of primary reinforcers and video modeling and all 5 participants performed better when primary reinforcers were provided as opposed to the control treatment. Further, results from these investigations and the current investigation support the motivational process of observational learning, the theoretical framework that guided this research, in that individuals are more likely to exhibit modeled behavior if it results in valued outcomes (Bandura, 1986).

Alstot (2012) and Houston-Wilson et al. (1997), examined the effect of peer-administered token reinforcement in a general physical education class and the use of trained peer-tutors as models for motor performance in an integrated physical education class (i.e., students with developmental disabilities paired with students without disabilities). In both of these studies, the researchers suggested that peers who provided reinforcement or served as models for motor skill performance improved or increased performance of the participants in these investigations.

These results support findings from the current investigation where a peer video model was used to demonstrate the appropriate push-up performance may also have served as a reinforcer for participants in the current investigation. In addition, the use of primary reinforcers improved performance for all 5 participants when compared to the control treatment.

Further, results from the current investigation demonstrated that primary reinforcers can be effective in improving the push-up performance of elementary aged males with Autism Spectrum Disorders. The need to conduct additional investigations to understand the influence of reinforcement on students with Autism Spectrum Disorders in the physical education setting should still remain a priority (Alstot, 2012).

Conclusion

The results from this investigation suggested that using video modeling and primary reinforcers to improve physical fitness skills (i.e., strength performance) in physical education to males with Autism Spectrum Disorders may be viable options that can be effectively used in a variety of settings. Further, the use of video modeling and primary reinforcers, by both adapted and general physical educators, should be considered when testing students with ASD and their performance on state mandated tests such as the *FITNESSGRAM.* There were some limitations of this investigation: (a) Participants were not representative of a larger population due to the unique characteristics of Autism

Spectrum Disorders, (b) Participants' ability to perform the specified task in the home setting, and (c) Participants' degree of effort when performing the specified task in the home setting.

Recommendations for Future Studies

Based on the current findings and the limitations of this investigation, the following recommendations are suggested for future researchers:

1. Replicate this investigation using a larger number of participants to allow for parametric tests to determine if differences exist among treatments.

2. Replicate this investigation in the school setting during the participants' physical education or adapted physical education class which is a more natural environment to perform push-ups.

3. Replicate this study using video modeling, in-vivo modeling, and a control to determine which type of modeling improves push-up performance.

4. Replicate this study using primary reinforcers, secondary reinforcers, and control groups to determine which type of reinforcement improves push-up performance.

5. Replicate this investigation using different measures of physical fitness or fundamental gross motor and object control skills.

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APPENDIX A

Parental/Guardian and Participant Consent Form

TEXAS WOMAN'S UNIVERSITY
CONSENT TO PARTICIPATE IN RESEARCH

Title: Effect of Video Modeling and Primary Reinforcers on the Performance of Push-Ups by Elementary Aged Male Students with Autism Spectrum Disorders

Investigator: Pamela Trocki-Ables………………..Ptrocki@hotmail.com 940/367-0426
Advisor: Ron French, Ed.D…………………...Rfrench@twu.edu 940/898-2582

Explanation and Purpose of the Research

You are being asked for your son's participation in a research study for Ms. Pamela Trocki-Ables doctoral dissertation at Texas Woman's University. The purpose of this research is to determine the effect of video modeling and primary reinforcers on push-up performance by elementary aged males with an Autism Spectrum Disorder. Your son has been asked to participate in this study because he has been identified as a male in 3rd, 4th or 5th grade with an Autism Spectrum disorder.

Description of Procedures

As a participant in this study your son will be asked to perform push-ups based on the *FITNESSGRAM* criteria or a modified push-up criteria similar to the *FITNESSGRAM* under 3 alternating treatment conditions. The 3 treatment conditions are: Treatment 1 - Video Modeling, Treatment 2 – Primary Reinforcers, and Treatment 3 – No video model or primary reinforcer - control. The *FITNESSGRAM* is a state mandated assessment for all students, including those with disabilities, in grades 3 to 12 in physical education classes in the state of Texas. The *FITNESSGRAM* includes a variety of health-related physical fitness tests designed to assess cardiovascular fitness, muscular strength, muscular endurance and body composition.

Data will be collected one time per day, 5 days a week over a 6-week period and will consist of an expected 27 total sessions. The investigator will schedule 3 baseline sessions prior to starting the treatment phase to determine the participant's ability to perform a push-up based on the criteria of the *FITNESSGRAM.* If a participant is unsuccessful based on *FITNESSGRAM* criteria, the participant will be evaluated based on a modified push-up. The 3 baseline sessions will last approximately 10 minutes each. After baseline data are collected, the investigator will schedule 24 sessions to perform the designated activity (push-ups) under the 3 treatment conditions at times that do not conflict with other academic endeavors. Data will be collected in a one-on-one setting in a room or designated area within your son's home environment with each treatment session lasting no longer than 15 minutes each. The total time commitment for the 3 baseline sessions and 24 treatment sessions is six and a half (6.5) hours. The investigator will make every effort possible to schedule sessions for your son at a consistent time each day and in the same location.

The objective for each treatment condition is for your son to complete as many 90° push-ups as possible in one-minute. Under Treatment 1 (Video Modeling), the participant will watch a video of a peer model performing the *FITNESSGRAM* push-up or a modified push-up one time prior to being asked to perform push-ups. Under Treatment 2 (Primary Reinforcer), the participant will be asked to perform push-ups and if criteria are met a predetermined, preferred primary reinforcer will be provided. Under Treatment 3 (No video model or primary reinforcer – control), the participant will be taken to the designated area/room and asked to perform as many push-ups as possible in one-minute with no video model or primary reinforcer provided.

Potential Risks

The researcher will ask your son to perform push-ups daily for a maximum of one-minute under 3 different treatment conditions. A possible risk in this study is physical discomfort or fatigue associated with performing push-ups. In order to prevent physical discomfort or fatigue your son will perform a series of stretches prior to each session to reduce any physical discomfort or fatigue. In addition, at no time will your son be forced in any way to continue and is free to withdraw at any time.

Anxiety is a potential risk in this investigation. In order to prevent or minimize anxiety, the researcher will provide instructions to all participants at the beginning of each session. Positive verbal praise will be provided after the participant completes the push-up session.

Additional potential risks associated with this study include coercion and loss of instructional time. In order to reduce any coercion, the researcher will meet together with each parent/guardian to review the investigation parameters and confirm voluntary participation. The researcher will schedule the 3 baseline sessions and 24 treatment sessions at times that do not conflict with other academic endeavors.

A final potential risk in this study is loss of confidentiality. Confidentiality will be protected to the extent that is allowed by law. Electronic communication will not be incorporated in this study. The researcher will assign your son an identification number and that number will be used for all remaining data collected. Electronic data will be stored on the investigator's private laptop computer that is password protected and data will not be accessed on a public or employee computer. The results of the study may be reported in scientific magazines or journals but your son's name or any other identifying information will not be included.

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 they 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.

Participation and Benefits

Your son's involvement in this study is completely voluntary and you may withdraw your son from the study at any time. There are no direct benefits as a result of participation in this study, however, generalizable benefits of this study are a contribution to knowledge in the use of evidence-based practices (i.e., video modeling and primary reinforcers) specifically related to motor skill performance for individuals with Autism Spectrum Disorders. If you would like to know the results of this study we will mail them to you.*

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:

____

____

____

APPENDIX B

Texas Woman's University IRB Approval Letter

TWU
TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

Institutional Review Board
Office of Research and Sponsored Programs
P.O. Box 425619, Denton, TX 76204-5619
940-898-3378 FAX 940-898-4416
e-mail: IRB@twu.edu

July 24, 2013

Dear Ms. Trocki-Ables:

Re: Effect of Video Modeling and Primary Reinforcers on the Performance of Push-Ups by Elementary-Aged Male Students with Autism Spectrum Disorders (Protocol #: 17390)

The above referenced study has been reviewed by the TWU Institutional Review Board (IRB) and appears to meet our requirements for the protection of individuals' rights.

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.

This approval is valid one year from July 12, 2013. 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 unanticipated incidents. If you have any questions, please contact the TWU IRB.

Sincerely,

Rhonda R Buckley

Dr. Rhonda Buckley, Chair
Institutional Review Board - Denton

cc. Dr. Charlotte Sanborn, Department of Kinesiology
Dr. Ron French, Department of Kinesiology
Graduate School

APPENDIX C

Reinforcement Menu

Primary Reinforcers

Apples	Popcorn
Grapes	Fruit-flavored drink
Raisins	Diet soft drink
Crackers	Skittles
Low-fat cookies	Sugarless gum
M & M's	Jelly beans

If your son has a sensitivity or allergy to any of the items listed above, or you do not wish your son to have any of these items please mark out that item on the list. If your son's preferred primary reinforcers are not listed above please indicate in the area provided below the primary reinforcers that are preferred by your son.

____

____

____

APPENDIX D

Treatment Schedule

Treatment Schedule
Treatment 1: Video model
Treatment 2: Primary reinforcer
Treatment 3: No video model or primary reinforcer (control)

Week 1
Baseline
Baseline
Baseline
Treatment 2
Treatment 3

Week 2
Treatment 1
Treatment 2
Treatment 3
Treatment 2
Treatment 1

Week 3
Treatment 1
Treatment 2
Treatment 2
Treatment 3
Treatment 1

Week 4
Treatment 1
Treatment 1
Treatment 3
Treatment 3
Treatment 2

Week 5
Treatment 2
Treatment 3
Treatment 1
Treatment 3
Treatment 2

Week 6
Treatment 3
Treatment 1
Make-up day
Make-up day
Make-up day

APPENDIX E

Push-up Performance Criteria

Full Push-up Performance Criteria (Meredith & Welk, 2010)

1. Participant pushed up until arms were straight.
2. Participant legs and back were kept straight.
3. Participant lowered the body until the elbows bent at 90°.
4. Maintained a steady rhythm, not stopping to rest.

Modified Push-up Performance Criteria

1. Participant pushed up until arms were straight
2. Participant bent legs at knees with knees in contact with the floor and back kept straight.
3. Participant lowered the body until elbows bent at 90°.
4. Maintained a steady rhythm, not stopping to rest.

APPENDIX F

Data for Push-ups (Number Performed and in Total Seconds)

Table 1A.
Participant 1 Baseline Data

Trial	Number of Push-ups	Total Seconds
1	8	29
2	6	26
3	6	25

Table 1B.
Participant 1 Treatment 1 Data

Trial	Number of Push-ups	Total Seconds
1	10*	31
2	12*	38
3	13*	40
4	13*	43
5	6	23
6	15*	51
7	4	15
8	12	38

* Indicates same or improved performance from the baseline and previous video modeling treatment

Table 1C.
Participant 1 Treatment 2 Data

Trial	Number of Push-ups	Total Seconds
1	8*	29
2	10*	30
3	11*	34
4	9	32
5	13*	41
6	13*	42
7	10	36
8	15*	47

* Indicates reinforcement was given to the participant

Table 1D.
Participant 1 Treatment 3 Data

Trial	Number of Push-ups	Total Seconds
1	5	21
2	9*	29
3	14*	49
4	6	24
5	8	28
6	9	35
7	6	21
8	7	24

* Indicates same or improved performance from the previous control treatment

Table 2A.
Participant 2 Baseline Data

Trial	Number of Push-ups	Total Seconds
1	4	15
2	4	14
3	4	16

Table 2B.
Participant 2 Treatment 1 Data

Trial	Number of Push-ups	Total Seconds
1	6*	20
2	7*	28
3	8*	29
4	9*	30
5	10*	36
6	11*	41
7	13*	44
8	13	43

* Indicates same or improved performance from baseline and previous video modeling session

Table 2C.
Participant 2 Treatment 2 Data

Trial	Number of Push-ups	Total Seconds
1	6*	20
2	8*	29
3	7	27
4	10*	33
5	6	27
6	12*	41
7	12*	40
8	14*	44

* Indicates reinforcement was given to the participant

Table 2D.
Participant 2 Treatment 3 Data

Trial	Number of Push-ups	Total Seconds
1	4	16
2	5*	23
3	5	26
4	7*	26
5	8*	28
6	8	28
7	7	26
8	7	25

* Indicates same or improved performance from the previous control treatment

Table 3A.
Participant 3 Baseline Data

Trial	Number of Push-ups	Total Seconds
1	6	21
2	4	13
3	5	16

Table 3B.
Participant 3 Treatment 1 Data

Trial	Number of Push-ups	Total Seconds
1	7*	24
2	13*	42
3	11	36
4	13*	43
5	5	25
6	12*	41
7	20*	61
8	16	50

* Indicates same or improved performance from the baseline and previous video modeling treatment

Table 3C.
Participant 3 Treatment 2 Data

Trial	Number of Push-ups	Total Seconds
1	7*	22
2	7*	21
3	9*	29
4	13*	40
5	8	27
6	17*	53
7	17*	54
8	13	42

* Indicates reinforcement was given to the participant

Table 3D.
Participant 3 Treatment 3 Data

Trial	Number of Push-ups	Total Seconds
1	4	16
2	8*	26
3	5	20
4	7	28
5	8	31
6	11*	36
7	10	34
8	11	40

* Indicates same or improved performance from the previous control treatment

Table 4A.
Participant 4 Baseline Data

Trial	Number of Push-ups	Total Seconds
1	6	15
2	6	17
3	5	16

Table 4B.
Participant 4 Treatment 1 Data

Trial	Number of Push-ups	Total Seconds
1	8*	22
2	11*	38
3	12*	41
4	9	30
5	11	30
6	13*	47
7	11	36
8	12	45

* Indicates same or improved performance from the baseline and previous video modeling treatment

Table 4C.
Participant 4 Treatment 2 Data

Trial	Number of Push-ups	Total Seconds
1	6*	17
2	7*	21
3	8*	27
4	10*	35
5	13*	41
6	11	39
7	13*	46
8	6	26

* Indicates reinforcement was given to the participant

Table 4D.
Participant 4 Treatment 3 Data

Trial	Number of Push-ups	Total Seconds
1	7	19
2	7	26
3	7	27
4	8*	28
5	8	28
6	8	31
7	6	24
8	16*	55

* Indicates same or improved performance from the previous control treatment

Table 5A.
Participant 5 Baseline Data

Trial	Number of Push-ups	Total Seconds
1	4	14
2	6	19
3	5	16

Table 5B.
Participant 5 Treatment 1 Data

Trial	Number of Push-ups	Total Seconds
1	4	20
2	10*	34
3	12*	37
4	12	38
5	13*	42
6	13	43
7	14*	47
8	16*	53

* Indicates same or improved performance from the baseline and previous video modeling treatment

Table 5C.
Participant 5 Treatment 2 Data

Trial	Number of Push-ups	Total Seconds
1	6*	21
2	6*	22
3	8*	26
4	9*	30
5	8	28
6	10*	34
7	10*	36
8	12*	39

* Indicates reinforcement was given to the participant

Table 5D.
Participant 5 Treatment 3 Data

Trial	Number of Push-ups	Total Seconds
1	5	16
2	6*	21
3	7*	26
4	7	28
5	7	27
6	9*	30
7	8	28
8	15*	47

* Indicates same or improved performance from the previous control treatment