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Effects of Video Self-Modeling on Prosocial Behaviors among Children Diagnosed with Autism Spectrum Disorder: A Meta-Analysis of single-case research

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Abstract

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MA, Capella University, 2010

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

The prevalence of autism spectrum disorders (ASD) in children has significantly increased since it was first identified in the 1930s. This increase has been attributed to the changes in the reporting practices within the 5th edition of the *Diagnostic and Statistical Manual*. To address this increase, many treatments have emerged, including video self-modeling (VSM). VSM has demonstrated efficacy as an intervention in treating a variety of ASD symptoms, ranging from communication deficits to maladaptive behaviors. VSM uses edited video clips that allow a child to watch him or herself successfully performing the targeted skill. To classify VSM as evidence-based practice, research is generally recognized as the most valid source of evidence for determining efficacy especially when synthesized across multiple, high-quality, experimental studies. The present meta-analysis focused on the available literature to determine the efficacy of VSM as an intervention to increase prosocial behaviors in children diagnosed with ASD. The theoretical foundation of VSM and this meta-analysis are based on Bandura's theories: social learning theory and observational learning theory. The meta-analysis used Cohen's *d* and percentage of nonoverlapping data (PND) as metrics of effect size. According to Cohen's *d* results (Intervention $d = 1.0$; Maintenance $d = 1.5$), VSM was found to be an effective intervention for children and adolescents diagnosed with ASD. While analysis of PND failed to provide equally robust findings this can be accounted for by variability of baseline data is some studies. Positive social change implications include support for increasing VSM use with children with ASD should increase individuals' self-efficacy and independence.

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Dedication

I dedicate this dissertation to my father who inspired me to pursue my doctoral degree but didn't get to see me graduate. His guidance helped me find the strength to finish this degree.

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I would like to express my deep appreciation to my dissertation chair, Dr. Steven Little for his unwavering support, guidance, and commitment to this project. A more supportive and considerate chair I could not have asked for. His willingness to offer so much of his time and expertise is the major reason I was able to reach this personal and professional milestone. My sincere thanks go also to my dissertation committee. You have all been incredibly flexible and generous with your time and energy during my dissertation journey.

And finally, special and profound thanks to my sister, brother, and mother. My sister constantly offered invaluable support, encouragement, and a listening ear every time I was ready to give up. My brother, who helped me with most technological problems (there were many), and my mother constantly reminded me and demonstrated that she is always here, if for nothing else than to just make me a meal. I'm forever grateful.

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Chapter 1: Introduction to the Study

Introduction

In recent decades, considerable literature has emerged on interventions to address language and communication, motor skills, social/behavioral skills, and functioning skills in individuals diagnosed with autism spectrum disorder (ASD). ASD is a not fully understood neurodevelopmental disorder that has a wide range of severity and symptoms, from mute and intellectually limited on one extreme to socially awkward at the other. ASD is diagnosed using behavioral assessments of social, communicative, and repetitive symptoms (Boyd et al., 2015). ASD can cause significant social, communication, emotional, and behavioral challenges. Some individuals diagnosed with ASD may need a great amount of assistance with their daily living activities, others less.

ASD is one of the fastest growing developmental disabilities in the United States and the number of children diagnosed with ASD has grown at a high rate (Boyd et al., 2015). In 2000 and 2002, the rate of autism was approximately one in 150 children. Two years later it was one in 125 and in 2008 the number grew to one in 88 children. The newest data from 2014 suggested that one in 68 children are diagnosed with ASD (Center for Disease Control and Prevention [CDC], 2014). The frequency of ASD diagnosis has been increasing for decades, but researchers cannot agree on whether the trend is a result of increased awareness, an expanding definition of the spectrum, an actual increase in incidence, or a combination of all three factors (Neggers, 2014). Consequently, a considerable body of research on ASD consistently indicates the need for intervention that focuses on prosocial development. With technology advancements, video self-

modeling (VSM) was developed, demonstrating significant results in improving all levels of prosocial development.

Statement of the Problem

A main purpose of this study was to delineate the problems and limitations of current literature on VSM. There is a need for a meta-analysis of single-subject studies on the effectiveness of VSM with a broad clinical population. In the last decade, literature on VSM has increased significantly and yet the most recent meta-analytic research investigating the efficacy of VSM was 13 years ago. Bellini and Akullian (2007) conducted a meta-analysis in 2007 where they examined and determined that video modeling and video self-modeling interventions meet the criteria for evidence-based practice. Most of the studies conducted in this area addressed single-subject intervention research of children diagnosed with ASD. Current literature on VSM indicates the need for evaluation of the study procedure to label it as evidence based. To establish an intervention as evidence-based practice, the entire literature on the subject must be considered. To substantiate VSM as an evidence-based practice, researchers must conduct a meta-analysis, systematically reviewing and summarizing all the video modeling research within a specific duration of time. As noted previously, the last meta-analysis conducted on video modeling was 13 years ago by Bellini and Akullian, which suggests a great need for more up to date systematic analysis of previous research studies on VSM and its effects on prosocial behaviors in children diagnosed with ASD.

In recent decades, considerable literature has emerged on interventions to address language and communication, motor skills, social/behavioral skills, and functioning skills

in individuals diagnosed with ASD. A wide range of interventions for children diagnosed with ASD has been researched; some are evidence-based while others lack the data necessary to establish their efficacy. VSM is a fairly new intervention in the area of autism that has demonstrated efficacy as an evidence-based practice (Bellini & Akullian, 2007). VSM as an intervention has been applied to address a variety of deficits across a broad range of settings, variables, and participants (Bellini & Akullian, 2007). VSM is versatile and easily implemented procedure; it can prove to be effective in modifying a multitude of behaviors ranging from social initiation to academic performance, and modifying maladaptive behaviors (Wert & Neisworth, 2003).

Nature of the Study

The purpose of this study was to conduct a meta-analysis of published literature on video self-modeling with children diagnosed with autism. Meta-analysis in synthesizing single-case designs studies can result in more objective evaluation of multiple studies (van den Noorgate & Onghena, 2003). In this quantitative study, I implemented a meta-analysis to assess multiple dependent variables isolated in occurrence with the qualifying studies. The dependent variables include but are not limited to. the following: number of unprompted social behaviors, number of social initiations, percentage of appropriate behaviors, and percentage of correct operational and social responses.

The effect size is a statistical measure used to quantify the relationship between two variables (Parker et al., 2009). In other words, it helps researchers understand the magnitude of differences found in studies. An effect size indicates the strength of an

effect or a relationship or change across all studies as well as across the subtests of the studies. It also determines whether a functional relationship exists between an intervention and behavior. Previous studies of VSM have reported effect sizes in determining the efficacy of the intervention. I used meta-analysis to review and collect the effect sizes from single-subject case studies that have used VSM in clinical populations. Single-subject design can be used to identify evidence-based practices by replication of studies and accumulation of results (Horner et al., 2005). For this study single-subject research was analyzed explaining the effects size using standardized mean difference between the control treatment groups also known as statistical calculation of Cohen's *d* (Cohen, 1992). Two effect sizes were calculated in this meta-analysis: baseline was calculated to both intervention phase as well as follow-up phase. Grouping and analyzing these studies allowed for the same method of effect size calculation, which in turn allowed a direct comparison of the efficacy of studies.

Purpose of the Study

The purpose of this quantitative study, specifically a meta-analysis, was to address the gap in literature by consolidating a large body of the existing literature and reporting up-to-date evidence to support VSM as effective intervention. By using a single subject design meta-analysis study, I systematically assessed previous research studies on the effects of VSM on prosocial behaviors of children diagnosed with ASD to derive conclusions about the body of research. A meta-analysis approach provides a quantitative approach to address the question of efficacy.

Research Questions

RQ1: What are the relative effects of studies examining video self-modeling on the prosocial behaviors of children diagnosed with ASD?

RQ2: Does the use of video self-modeling improve prosocial behaviors of students with ASD meet the standards for evidence-based practice?

Hypotheses

$H_0 1_1$: Video self-modeling will improve prosocial behaviors in children diagnosed with ASD from baseline to treatment by an effect size greater than .3.

$H_a 1_1$: Video self-modeling will not improve prosocial behaviors in children diagnosed with ASD from baseline to treatment by an effect size greater than .3.

$H_0 1_2$: Video self-modeling will maintain an improvement in prosocial behaviors in children diagnosed with ASD from baseline to follow-up stage with an effect size of .3 or greater.

$H_a 1_2$: Video self-modeling will not maintain an improvement in prosocial behaviors with an effect size of .3 from baseline to follow-up in children diagnosed with ASD.

Theoretical Foundation

Modeling or observational learning is not a new concept in learning theories; it has been studied for decades by researchers. Perhaps the most recognizable and extensive research in this field was conducted by Bandura as part of his work on social learning theory (Bellini & Akullian, 2007). Bandura (1977) emphasized the importance of observing and modeling the behavior, attitudes, and emotional reactions of others for

learning to occur. In observational learning there are four processes that facilitate learning: attending and accurately perceiving a model, capacity to retain modeled behavior and store it in memory, ability to reproducing the modeled behavior at a later time, and the most important aspect of observational learning involves motivation to imitate the behavior (Bandura, 1986). It is believed that most human behavior is learned observationally through modeling (Bandura, 1977). From observing others in the environment, one forms an idea of how new behaviors are performed, and on later occasions this observation serves as a guide for the new behavior (Bellini & Akullian, 2007). Social learning theory suggests that the environment and people observed within that environment help construct one's beliefs and behaviors. The other important factor of learning theory is the concept of self-reflection and the individual thinking, which influences self-efficacy (Bandura, 1977). Self-efficacy refers to a person's belief in his or her ability to produce a desired result (Schwarzer & Scholz, 1997). Self-efficacy belief determines how individual feels, thinks, motivates themselves, and behaves. Bandura (1997) suggested that individuals could acquire self-efficacy through external support and encouragement and through the observation of their own success.

Over the past 2 decades, technological innovations allowed researchers to further facilitate observational learning to include the use of video to teach various behaviors (Sherer et al., 2001). A VSM intervention is a specific application of video modeling that allows the individual to imitate targeted behavior by watching her or himself successfully perform a behavior (Dowrick, 1999). VSM addresses Bandura's belief that children are most likely to attend to a model like themselves in some way. Models starring in the

video are successful in gaining attention from the viewers and absorbing much of the viewed material without requiring reinforcements to do so (Bandura, 1977). Many studies have investigated the effectiveness of VSM for children and many of the studies have focused on increasing social behaviors, language skills, and functional skills (Acar & Diken, 2012; Bellini et al., 2007; Buggey, 1995, 2005, 2007; Matson et al., 2007; Wang & Spillane, 2009).

Literature suggests that certain features of autism, such as overselective attention, a restricted field of focus, preference for visual stimuli, and avoidance of face-to-face attention may be taken advantage of using VSM (Corbett & Abdullah, 2005). Asarnow et al. (1987), DeMyer et al. (1974), Freeman et al. (1985), Lincoln et al. (1988), and Shah and Frith (1983) suggested that children with autism show strengths in processing visual information rather than verbal information, therefore they should benefit from visually cued instructions. Additionally, VSM allows the child to learn through social models without face-to-face interaction.

Qualifying Evidence-Based Intervention

The absence of statistical analysis quantifying the magnitude of change that allows one to make comparison between studies is a huge limitation of the current VSM literature. Evidence-based practice is vital and required for the delivery of effective treatment in educational as well as clinical settings. To qualify as an evidence-based practice, a thorough evaluation of published research studies that identified interventions to maximize the chance of benefit, minimize the risk of harm, and deliver treatment at an acceptable cost is required (Horner et al., 2005). Evidence-based practice encourages the

use of safe and effective treatments as opposed to poorly studied and potentially harmful options. Implementation of evidence-based treatment is essential to effectively changing targeted behaviors or skills in children with autism (Horner et al. 2005). While VSM has strong evidence as an intervention for use with children with ASD, further research is needed on the appropriateness of using this method in broad clinical populations.

Definition of Terms

Autism spectrum disorder (ASD): Refers to a neurodevelopmental disorder characterized by impairments in early childhood in reciprocal social interactions, restricted repertoire of behaviors and interests, and communication (Corbett & Abdullah, 2005).

Behavior: Refers to an observable response to internal or external stimuli.

Cohen's d: Refers to a statistical calculation used to compare and interpret effect size of intervention between two means (Cohen, 1992).

Effect size: Refers to a quantitative measure of the difference between two groups. Effect size benchmarks guidelines: small (0.2), medium (0.5), and large (0.8) (Cohen, 1992).

Efficacy: Refers to the extent to which an intervention could produce beneficial effect(s).

Meta-Analysis: Refers to a methodology that systematically combines scientific research studies from several selected studies of the same subject design to develop a single conclusion that has greater statistical power (Davis et al., 2014).

Prosocial Behavior: Refers to "a broad range of actions intended to benefit one or more people other than oneself-behaviors such as helping, comforting, sharing and cooperation" (Batson & Powell, 2003, p. 463).

Self-Efficacy: Refers to an individual's beliefs in their ability to produce specific performance by executing necessary behaviors.

Standard deviation (SD): Refers to a measure of how spread out the set of data is. Low *SD* indicates that date is closely clustered around the mean, while high *SD* indicates that data is dispersed over a wider range of values. It is used when distribution of data is approximately normal resembling a bell curve. *SD* is commonly used to understand whether a specific data point is standard and expected or unusual and unexpected (Ost et al., 2017).

Video modeling: Refers to a form of observational learning in which desired behavior is learned by watching a video demonstration and then imitating the behavior of the model (Corbett & Abdullah, 2005).

Video self-modeling (VSM): Refers to a form of observational learning in which individuals view themselves performing a behavior successfully on a video, and then imitate the targeted behavior (Hitchcock et al., 2003).

Scope and Delimitations

The scope of this study involved examining outcomes of published research studies and provide a synthesis on the technique of VSM as an intervention with school-age children diagnosed with ASD. I specifically examines the efficacy of VSM by computing baseline, intervention, and maintenance effects of VSM on prosocial

behaviors. The focus of this meta-analytic study was exclusively on the use of VSM with the ASD student population. It did not include studies that used VSM with adults or participants diagnosed with other neurodevelopmental disorders or psychiatric conditions. Children with autism were chosen as the target population because ASD is a growing concern today. Clinicians, educators, and parents often express concerns about how to best treat children with autism.

Limitations

The outcome of this meta-analysis depends on the studies included. The summary provided in this meta-analysis of the literature is only as reliable as the methods used to estimate the effect in each of the primary studies. In other words, conducting this meta-analysis does not overcome problems that were inherent in the design and execution of the primary studies. Another limitation is that this study does not correct biases because of selective publication, whereby research studies that report drastic effects are more likely to be identified and subsequently pooled in meta-analysis studies than studies that reported smaller effect sizes.

Significance of the Study

With the prevalence of ASD increasing in recent years and now affecting one in 68 children (CDC, 2014), it is vital to find the most effective intervention to improve skills acquisition in this population. In recent decades, considerable literature has emerged on interventions to address various deficits associated with ASD including language and communication, motor skills, behavioral, and functioning skills. Some interventions are evidence-based while others lack the data necessary to prove their

efficacy. VSM has been used successfully to address a variety of deficits across a broad range of settings, variables, and participants (Bellini & Akullian, 2007). VSM has been shown to be an affective intervention for children with ASD regarding efficacy in improving social skills, maladaptive behaviors, and communicative skills.

The outcome of this meta-analysis provides a synthesis of existing research studies on VSM intervention for children and adolescents with ASD. It can contribute to the current body of literature by adding to the limited information available related to the use of VSM in the treatment of children with ASD. This study is unique because it comprehensively reviews single-subject design research on VSM interventions published from 1999 to 2018.

Significance to Social Change

The results of this study contribute to positive social change by providing an updated synthesis of the research literature on the application of VSM, specifically in a school-based setting. It also provides meaningful data to support the development of VSM as an efficacious intervention that can address a variety of social and behavioral skills.

Summary and Transition

Chapter 1 provides a clear and detailed outline of the study, including a brief description of ASD, statement of the research problems, the nature of the problems, the hypothesis with research questions, the purposes of the study with the theoretical framework, qualifying evidence-based interventions, the significance of the study and social change implication, and limitations of the study. I discussed VSM as a promising

intervention across several domains, including social and communicative skills, behavioral problems, and academic skills. Chapter 1 also included the statistical approach to this study and the need to establish VSM as an evidence-based practice.

Chapter 2 presents a literature review encompassing the development and implementation of VSM, history and theoretical framework of the use of VSM, and effectiveness of VSM as an intervention for children diagnosed with ASD. Chapter 2 reviews Bandura's social learning theory and observational learning theory as the fundamental theoretical framework influencing VSM.

Chapter 2: Literature Review

Introduction

The following chapter addresses few goals. First, a description of ASD is provided. Second, an overview of literature involving video-based modeling and its use as an intervention for children diagnosed with ASD. Finally, an in-depth review of VSM as an intervention to address social deficits, a common characteristic found in children diagnosed with ASD. Additionally, I explored the efficacy of currently available evidence-based treatments and VSM for children diagnosed with ASD.

Literature Search Strategy

A systematic search through five computerized databases (ERIC, Psychology: A Sage Full-text Collection, Google Scholar, PsycArticles, Walden Online Library, and PsychINFO) was conducted. The following keywords were used: *autism, autism spectrum disorder, video self-modeling, video self-modeling and autism, video self-modeling and social skills, increased prosocial development, social behavior, social development, social initiation, single subject design,* and *video self-modeling and social initiation*. To demonstrate the entirety of research studies conducted using VSM as an intervention, this study included studies published from 1999 to 2018. The literature review contains more than the standard 5-year search to fully illustrate the breadth of variables investigated in previous studies to evaluate VSM as an evidence-based treatment thoroughly.

Autism Spectrum Disorder

Kanner (1943) is considered as the original investigator in the area of autism. In 1943, he conducted a study consisting of 11 children with characteristics that he described as difficulty with social interactions, challenges in adapting to changes in routines, sensitivity to external stimuli, specifically sounds, propensity to repeat words of other speakers, challenges in spontaneous activity, and delays and deficits in communication and behavior (Blacher & Christensen, 2011). Kanner (1943) was the first person to use the word autism to describe children who had little or no interest in socializing with others. Since then, there has been little change in the behaviors described as typical in individuals diagnosed with autism. However, significant progress was made in how to best intervene early and provide appropriate instructional needs to children with autism.

ASDs represent a group of complex neurodevelopmental disorders that impair the acquisition of some of the most important life skills (Allen et al., 2008). Core clinical features include difficulties in social communication and reciprocal interactions, repetitive stereotypic behaviors, and a range of cognitive deficits (Allen et al., 2008). In some instances, individuals with ASD may engage in aberrant behaviors such as aggression, self-injurious behaviors, and many other different forms of disruptive behaviors (Baron-Cohen, 2008; Frith, 2008). ASD is typically evident and diagnosed in early childhood and is often accompanied by major lifelong impairments.

According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5; American Psychiatric Association, 2013), ASD criteria requires

demonstration of impairments in two domains. The first is persistent communication, which includes impairments in social-emotional reciprocity, nonverbal communicative behaviors that are typically used in social interactions, and impairments in understanding as well as maintaining social relationships. The second domain is social interaction and restricted patterns of behavior, of which at least two should be present and displayed by the individual including stereotyped/repetitive motor movements, adherence to routines, idiosyncratic interests, or hyperreactivity to sensory input (American Psychiatric Association, 2013). These symptoms can be current or historical to be considered for ASD diagnoses.

According to latest statistics provided by CDC (2014), ASD is at an all-time high affecting approximately one in every 68 children. In addition, ASD is four times more prevalent among boys (one in 42) than among girls (one in 189); however, the clear cause is not fully understood. There was a 30% increase in the number of children diagnosed with ASD from 2012 to 2014 (CDC, 2014). The increase is hypothesized to be multifactorial including greater awareness among public and professionals, improved recognition and detection, and wider diagnostic criteria (Allen et al., 2008). Overall, it is hypothesized that broadening criterion for ASD are a significant contributor to increased prevalence figures (Fombonne, 2003).

Some literature suggests that ASD may be a result of neuroanatomical abnormalities and lack of global integration due to brain enlargement (Stanfield et al., 2008). Neuroimaging studies show that the brain develops differently in individuals with ASD and age-specific changes in the brain growth occur that highlight the developmental

nature of the disorder (DiCicco-Bloom et al., 2006). The brains of children with ASD younger than 2 years of age show overgrowth of brain cells. Subsequently, too many brain cells do not make for good neural connections. Following the 2-year mark, the brain growth rate is like a typically developing child, suggesting that the abnormal brain enlargement begins after birth and before the age of 2 (DiCicco-Bloom et al., 2006). Specific regions of the brain enlargement are frontal and temporal cortices (Carper et al., 2002). These two regions of the brain are responsible for higher-order cognitive, language, social, and emotional functions; each of which is typically impaired in individuals with ASD. For instance, people with ASD are often unable to infer what another person is thinking or may respond perseveratively once they learn a particular rule or behavior. Within the first few years of life, children with ASD may show some signs of abnormalities in social attention and failure to show the normal trajectory of speech and nonverbal communication development, which are frontal lobe functions (Courchesne & Pierce, 2005). Although, some research studies of the brain suggest neurological components, definite etiology of ASD is still unknown.

Although over the years, several etiologies have been proposed, beginning in the 1940s when Kenner identified ASD as a distinct neurological condition and named it early infantile autism because it usually appeared in the early childhood. Although Kanner (1943) described children's inability to relate to others as innate, he primarily focused on the dysfunctional mother-child relationship. Kanner noted that mothers who were observed to be cold and lacked a sufficient amount of affection for their infants caused the infant to withdraw. He was attributed with coining the term refrigerator

mother to describe the mother of an autistic child. Bettelheim (1950) later became highly influential figure in further promoting the refrigerator mother theory. He professed that autism was an emotional disorder that some children developed because of psychological harm caused by their mothers. This notion was prevalent until the scientific advances allowed the researchers to begin working on different etiological concepts. Since Kanner's theory, researchers have been studying causes of ASD outside of the arena of family dynamics for several years; the cause of ASD is still unknown. When searching for the cause of autism, many studies have focused on environmental toxins while others have focused on genetic factors.

Most neurodevelopmental research has focused on finding genetic causes, with more need for further exploration of environmental factors (Chaste & Leboyer, 2012). Studies suggest that some forms of autism have a genetic component. However, heritability factors cannot adequately explain all reported cases or the significant increase in the incidence of ASD over the past few decades. Specifically, twin studies suggest that common environmental factors account for 55% of the risk for developing autism while genetic susceptibility explains only 37% (Shaw et al., 2014). Because twins typically share the same early postnatal environment, and obvious symptoms of autism typically develop around the end of the first year of life, it is suspected that some of the environmental factors may be contributing to autism.

The first modern trend in the study of ASD etiology is environmental toxins. The toxins hypothesis proponents have found support for some toxins as etiological foundations for ASD development (Chaste & Leboyer, 2012). However, not all toxin

studies have been supported. This is clearly the case for the most controversial study linking the mumps, measles, rubella (MMR) vaccine to ASD (Wakefield et al., 1998). Following Wakefield's (1998) study, research gleaned a negative correlation between MMR vaccines and ASD (Chen et al., 2004). A positive correlation was found in epidemiological studies between ASD and mercury exposure. According to Austin (2008), children of mothers who were exposed to mercury during gestation or who themselves were exposed to mercury during the first 17 months of life showed greater levels of mercury in the bloodstream than the control group. Therefore, suggesting that exposure to high levels of mercury is linked to ASD. Mercury poisoning is relatively rare in developed countries; however, it most definitely does not account for a significant number of ASD cases.

Evidence supporting a single etiology of ASD has not yet been achieved. The debate about origins of autism, and the degree to which genetic and environmental factors, and their relationship, construct the range and heterogeneity of developmental, cognitive, and behavioral characteristics presented in children diagnosed with ASD.

Lack of meaningful social interactions is one of the fundamental difficulties in ASD. Many children diagnosed with ASD lack the ability to make social connections and form meaningful peer relationships. Bledsoe et al. (2003) further suggested that many children struggle with engaging in play activities, social reciprocity, and joint attention tasks. Due to these impairments or limitations, some children with autism do not acquire skills in the natural environment as do typically developmental children. The typically developing child learns social skills by watching the world around him/herself, while

children with ASD typically do no not pick up these skills by casually observing their surroundings.

Perry and Condillac (2003) suggested that intervention with children with ASD should consist of strategies that will enrich social understanding, social relating, and play skills. Children with ASD may develop antisocial behaviors in the effort to engage in social interaction with peers; therefore, it is vital to provide them with supports to scaffold the development of acceptable social interactions and behaviors to avoid further stigmatization from peers (DiSalvo & Oswald, 2002). Inadequate social skills interfere with development by increasing problem behaviors, which result from a lack of appropriate skills for social interaction; increase the potential for problematic behaviors in later life; and decrease the learning opportunities found in successful peer relationships (Kennedy & Shukla, 1995; Pollard, 1998). Children diagnosed with ASD are at higher risk of experiencing these consequences due to their inability to understand social nuances involved in initiating joint activities and their impaired ability to interpret social initiations by their peers (DiSalvo & Oswald, 2002).

Social skills entail the ability to relate to others in a jointly productive manner, and the capability to adjust social behaviors to a different context (DiSalvo & Oswald, 2002). Therefore, a social skill is any skill that aids in positive interaction with others. The deficit in social relations is a core characteristic of ASD (American Psychiatric Association, 2013). Impairments in social skills can negatively affect emotional, social, and cognitive development (Bellini & Akullian, 2007). Children diagnosed with ASD do not necessarily have a complete inability to engage in social reciprocity, but their skills in

that domain are poor regarding flexibility and spontaneity. Due to these deficits, children with ASD require consistent support and emphasis on teaching social skills. Therefore, teachers, therapists, and parents rely on specific interventions to promote learning of social and communicative behaviors.

Theoretical Foundation

Social Learning Theory

Children with autism have significant impairments in imitation skills (Ingersoll & Schreibman, 2006). Imitation skills are vital for learning many other skills, such as communication, play, and social skills. Modeling is an effective way to teach children with autism to imitate these skills (Bandura, 1977). Modeling is a major component of Bandura's social learning theory suggesting that individuals learn within a social context, which is facilitated through observational learning (Bandura, 1977). Bandura (1977) theorized that social learning results from the constant reciprocal interaction between behavioral, cognitive, and environmental influences. Social learning theory simply suggests that learning can occur through observing someone else's behaviors. This provides the foundation for Bandura's modeling process. Bandura theorized that there are four basic components that mediate and facilitate the observational learning process: attention, retention, reproduction, and motivation. Attention refers to the supposition that for a behavior to be imitated it must grab the child's attention. People observe many behaviors throughout the day and many of those behaviors are not noteworthy; therefore, attention is vital in whether a behavior has an influence in others imitating it. The second component of observational learning is retention, which refers to how well the behavior is

remembered. An individual may notice the behavior, but it is not always remembered, which prevents later imitation. Therefore, it is necessary that a memory of the behavior be formed in order to be executed by the observer. The third component of observational learning theory is reproduction of the observed behavior. A child observes many behaviors throughout the day but may not be able to imitate the behaviors due to physical limitations. The final component of observational learning theory is motivation, which refers to the reward and punishment that follows a behavior. If the perceived reward outweighs the perceived cost, then the behaviors is likely to be imitated by the observer (Bandura, 1977).

Research in social learning began in 1961 when Bandura, Ross, and Ross demonstrated that children behaved in a more aggressive manner towards a toy after observing same age peer model aggressive behaviors towards that same toy. In this experiment, children watched a short film illustrating an adult behaving aggressively towards a "Bobo" doll. The second group of children watched a video of the adults behaving in a nonaggressive manner, while a control group of children did not watch a video and saw no model. Afterward, each group of participants was placed in a setting that contained the same doll. The results of the study showed that modeled behaviors on the video had a direct impact on the children's behavior, with children reproducing the behaviors observed on the video. Children who watched the aggressive behaviors tended to behave aggressively while children who watched nonaggressive videos tended to behave nonaggressively.

All children learn through modeling and imitation. In his later work, Bandura (1977) showed that watching another individual receive a reward for a specific behavior increases the likelihood of that behavior being performed in the future. With the development of video technology, use of video as means of observing models arose as a promising replacement to live in vivo modeling (Charlop-Christy et al., 2000). For instance, Charlop-Christy et al. (2000) conducted a study comparing the usefulness of video modeling with in vivo modeling for teaching developmental skills to five children ages 7 to 11 years who were diagnosed with ASD. The results of this study concluded that students who consistently used video modeling in comparison with in vivo modeling showed greater attainment of skills with video modeling than in vivo modeling. Additionally, researchers found that VSM can be used in a variety of settings with minimum disruptive features compared to other interventions such as one-to-one aid instructions or the child being pulled out of the classroom into a specific area for extra to be taught the skills. Charlop-Christy and colleagues also found that participants in the video modeling condition were better in generalizing the skills learned than in vivo modeling. According to Bandura's research, self-modeling is considered to be the most powerful modeling method because it is the most similar to the target individual. Self-modeling is effective because it is dependent on the ability of the child to self-recognize. The other important factor of learning theory is the concept of self-reflection and the individual thinking, which influences self-efficacy (Bandura, 1977). Self-efficacy refers to a person's belief in his or her ability to produce a desired result (Schwarzer & Scholz, 1997). The process of creating and using self-efficacy beliefs is quite logical. Individuals

produce behaviors, interpret the results of their actions, and then use their interpretations to generate beliefs about their competencies. Effective performance in any domain is not merely a function of the one knowing how to do a task, but also requires that the person has the confidence and belief that they can do it (Bandura, 1977). Therefore, successful performance and acquisition of new skills require teaching that achieves both goals. While modeling theory explains how new skills are learned through observation, self-efficacy theory clarifies why modeling interventions, particularly VSM, has the potential to increase the likelihood that what is learned is put into practice. Bandura suggested that an individual's success depends on external as well as internal stimuli.

Frith and Happe (1994) explained the theory of mind as one's ability to understand accurately and identify emotions, thoughts, feelings, and intentions of others. The idea is that a person with a theory of mind should be able to identify these mental states within themselves and others and use such information to make predictions regarding other's behaviors (Korkmaz, 2011). Social interactions depend on one's ability to interpret accurately emotions such as compassion, empathy, and deception. This theory of mind and the ability to accurately assess such emotions is typically impaired or inaccurate in children with ASD. Combining the inability to read emotions with decrease in theory of mind, may contribute to child's ability to accurately identify why a person reacts in a specific manner in a social setting. Additionally, decrease in theory of mind may lead to child diagnosed with autism to miss read social cues and further alienate their peers. Therefore, intervention such as VSM may be an effective method to target and

improve social skills, functional skills, and maladaptive behaviors (Bellini & Akullian, 2007; Bellini et al., 2007).

VSM and Attention

VSM is a well-validated and documented intervention in the behavioral science (Dorwick & Jesdale, 1991) that has been developed to facilitate observational learning. It allows the person to observe an ideal model of one's own behavior on video to increase or decrease the likelihood of reoccurrence of that behavior in the future. The person views him or herself successfully demonstrating a targeted behavior or skill and then imitates that behavior (Bellini & Akullian, 2007). VSM is suspected to be effective for children diagnosed with ASD because it has been speculated that features of autism, such as over-selective attention (Charlop-Christy & Deneshvar, 2005; Lovaas et al., 1997) a restricted field focus (Casey et al., 1993), preference for visual stimuli (Kinney et al., 2003), and avoidance of face-to-face attention (Charlop-Christy et al., 2000) may be capitalized on while using VSM (Corbett & Abdullah, 2005). Literature suggests that children with ASD benefit from visually cued instructions (Quill, 1997) and process visual information better than verbal information (Lincold et al., 1988). In the process, extraneous visual and auditory stimuli are removed, and the child can view and focus on video presented to them. VSM intervention requires that the child be exposed repeatedly to the video in order to establish and maintain the behavior in memory. Consequently, retention is facilitated through repetition of the targeted behavior or skill as the child watches the video.

VSM

Technology has long been used in the classrooms to reinforce learned information and skills, but its success was hindered by limitations of editing abilities of technology. The technological advancements during the past 2 decades have allowed researchers to extend the concept of modeling to include the use of video to teach a wide variety of skills including social behaviors such as conversation. Considering recent progress and easy access of cell phones, video technology is perhaps one of the most readily available for parents and educators. Cell phones are not only economically feasible and portable; most people can operate cell phones with ease and little instruction, making it the technology of choice for many educators and parents. VSM is cognitive-behavioral intervention with an impressive body of research available that demonstrates its effectiveness in addressing behaviors within multiple areas including academic performance, emotional behaviors, functional skills, communication, and social skills.

Two types of video modeling (VM) are used to teach a variety of skills including daily living skills, appropriate social behaviors, communication, and language skills, and play skills to children diagnosed with ASD. VM involves the child watching other models perform a targeted behavior on the video while VSM involves a child watching him/herself successfully perform targeted behavior or skill on the video. Bandura (1986) suggested that to pay attention and learn from a model, the observer needed to feel a degree or similarity. Both VM and VSM require that child views the video and then practices performing the behavior or skill. Based on Bandura's self-efficacy concept, VSM is more likely to motivate behavioral change due to the related notion that self-

modeling provides the essential elements of self-efficacy. Of vital importance of VSM is that an individual sees oneself performing a skill or a behavior and reinforces their belief in their capability as a result, which creates affective changes, consequently increasing one's motivation to engage and successfully perform a task. Children on the autism spectrum especially enjoy watching themselves on monitors for variety of reasons including their desire to avoid face-to-face attention (Charlop-Christy et al., 2000). Montgomerie et al. (2014) suggested that individuals tend to pay attention to self-imaging video when there is a fundamental value in the demonstrated behavior. The most crucial part of VSM is in the individual watching themselves successfully executing the targeted behavior.

VSM is not a new concept; however, it is a relatively new intervention in the area of autism that has demonstrated efficacy as an evidence-based practice (Bellini & Akullian, 2007). It is an extension of VM and involves the practice of using oneself, rather than another person, as a model, to observe desirable behavior or skill (Buggey, 2007; Buggey & Ogle, 2012; Dowrick, 1999). VSM as an intervention has been applied to address a variety of deficits across a broad range of settings, variables, and participants (Bellini & Akullian, 2007). VSM is versatile and easily implemented procedure; it can prove to be effective in modifying a multitude of behaviors ranging from social initiation to academic performance, and modifying maladaptive behaviors (Wert & Neisworth, 2003). This approach is considered relatively unobtrusive technique to teach desirable behaviors. One challenge of this intervention is the process of editing the video and

producing an uninterrupted video clip of only targeted behavior or skill executed errorless.

VSM Process

In VSM, the subject is the star of the video. VSM process consists of videotaping the child performing desired skill or a behavior, editing the video in a way to promote the desired behavior or skill, and presenting the video to the child for multiple viewing over a period of time. Upon repeated exposure of the edited video, the child replicates the desired behavior or skills (Bellini & Akullian, 20077).

Two types of modeling that have been found to promote positive learning outcome are *positive self-review* and *feedforward* modeling. Feedforward demonstrates a person performing a new skill or behavior within child's scope and ability, then the positive self-review through video may increase the fluency and fluency of a skill the child can already perform. Consequently, this promotes self-efficacy and positive feelings towards the targeted behavior or skill, leading to improved ability.

Implementation of VSM

VSM involves using oneself as the model. The child views him or herself performing the targeted skill or behavior (Bellini & Akullian, 2007) on a prerecorded video. The VSM feedforward process shows the child successfully and accurately performing the targeted skill at an advanced level. For example, a child's single words might be recorded and then grouped together, giving the appearance that the child is using short sentences. Then, the child is able to watch him or herself functioning in daily life using this advanced skill.

Creer and Miklich (1970) conducted the first study using VSM to decrease maladaptive behaviors with children who engaged in aggressive behaviors. Their study included one subject, a 5-year-old male who displayed aggressive behaviors. In a role-play session, the participant was recorded engaging in appropriate and maladaptive behaviors such as aggression. During intervention the participant watched the video of himself engaging in appropriate behaviors for 5 minutes a day for 2 weeks. The results showed a significant decrease in maladaptive behaviors. After the intervention, the participant viewed the video of himself engaging in the maladaptive behaviors and his problem behaviors increased back to baseline level. The video of the child engaging in appropriate behaviors was shown to him again for 2 weeks, and marked improvement was noticed and maintained for over 6 months.

McCoy, (2007) suggested that VSM has significant benefits on aiding in the development of skills in children with ASD. Sherer et al. (2001) studied VSM vs. VM and also found both interventions to be beneficial in increasing targeted skills; however, the authors theorized that VSM might be more suitable for teaching compliance type of behaviors while VM may be more fitting for teaching functioning skills. An additional study conducted by Marcus and Wilder (2009) founded that VSM was a more efficient intervention for teaching skills to children with ASD.

For VSM to be successful with children with ASD, self-recognition and attention span play a crucial role. Self-recognition refers to the child's ability to recognize him/herself in the video, while attention span is concerned with the child attending to the video (Buggey & Hoomes, 2011). If the child does not recognize him/herself or does not

attend to the video, achieving treatment effectiveness is doubtful. For attention span, the child is expected to be able to attend to the video for approximately 1 to 2 minutes (Nikopoulos et al., 2009). When the child meets these prerequisite skills, the possibility to achieve skills or new behaviors via VSM is great.

Bellini and Akullian (2007) performed a meta-analysis and studied the efficacy of VM and VSM for a total of 73 children and adolescents with ASD, ranging between 3 and 20 years of age. The meta-analysis consisted of 23 single subject research design studies from 1980 to 2005. The researchers looked at three categories of dependent variables including behavioral functioning, functional skills, and social-communication skills. The authors used eight criteria for selecting studies: (1) participants were identified as having ASD, (2) outcomes targeted behavioral, social-communication, or functional skills, (3) the study assessed the efficacy of video modeling or VSM, (4) the study used a single-subject research design, (5) the studies were published in peer review journal, (6) the studies contained graphic data, (7) the studies included three or more probes, and (8) the studies published were written in English language. The researcher's review concluded that VSM and VM both meet the criteria for being an evidence-based practice as defined by Horner et al. (2005). They also concluded that the VSM intervention has other benefits and appeals to those individuals with limited time to plan and implement an intervention. For example, teachers with limited planning time find this intervention practical and easy to implement.

Delano (2007) also conducted a review of literature relating to VS with children with autism and concluded that VM interventions were related to positive progress in

several domains including social communication skills, functional skills, perspective taking skills, and maladaptive behaviors. The positive outcomes of the studies reviewed indicate that video modeling interventions are promising tools for those working with children with ASD or those providing care to them. Gelbar et al. (2012) indicated that VSM could be considered as evidence-based practice for children with ASD across four domains including, social skills, task instruction, behavior, and communication.

VSM has been implemented successfully as a social skill intervention with children diagnosed with higher functioning ASD (e.g., Buggey et al., 2011; Buggey, 2012; Victor et al., 2011). For instance, Litras et al. (2010) utilized VSM to teach social skills and behaviors to a 3-year-old child diagnosed with autism who had limited social skills. The authors targeted three social skills: greeting, inviting to play, and contingent responding using VSM and the structure of social stories with reinforcement schedule. Results showed an increase in all three targeted social skills. Nikopoulos and Keenan (2004) also examined the effects of video modeling on social initiation and play skills with three children ages between 7 and 9 years who were diagnosed with ASD. All three boys scored in the mild to moderate range on *Childhood Autism Rating Scale*. Children were exposed to a video model, which depicted a typically developing child initiating a social interaction with the researcher. Social interaction was defined as the child approaching the examiner, producing a vocal or gestural behavior and leading the researcher to a toy. The video was than viewed by a child and the child was expected to produce similar behaviors. The results of the study indicated that video presentation

improved social initiation and reciprocal play for all three children. Additionally, these skills were maintained at 1 and 3-month follow-ups for all children.

Buggey et al. (2011) utilized a multiple baseline across participants design to show the effectiveness of VSM for facilitating the social initiations of four preschool children during playground time. Participants ranged between 3 and 4 years of age. The participants in this study were subjects in a buddy system study, which included pairing children with disabilities with peers without disabilities. The study focused on social simulations dealing with helping and sharing and was implemented with all children in a specific classroom. The four children selected for the present study did not display any change while all other participants showed significant improvement in social initiation. Due to lack of their response to buddy system study, these four participants were selected for VSM study. The participants viewed a video 1hour before recess for 2 weeks and then maintenance of targeted skill was assessed. The video showed each participant interacting socially with a peer while playing with the participant's preferred playground equipment. The results indicated that two of four participants increased the frequency of social interaction. One participant's results were concluded to be questionable while the fourth participant did not show changes in targeted skill.

Methodology of the Proposed Study

The lack of statistical analysis quantifying the degree of change that allows one to make comparison between studies is a limitation of the current VSM literature. Conclusive statements regarding the differential effectiveness of VSM across implementation variables, participant characteristics, and targeted outcomes have not

been clearly established. Meta-analysis allows for comparison of the results across multiple studies with similar features and compare the effect to studies with different features to provide further clarification regarding subjects and contextual factors that may and may not produce socially significant results (Scruggs & Matropieri, 1998). The goals of meta-analysis study are to describe distribution, including its mean, establish a confidence interval around the mean, test that the mean differs from zero, explore the relationship between the study features and the effect size, and test homogeneity of the studies (Wilson, 2010). Meta-analysis is a statistical method for synthesizing quantitative data and developing an overall summary from multiple studies into one research study (Doi et al., 2011). The process is essentially founded in the predetermined exclusion and inclusion criteria of each study that is reviewed. The reliability and validity of the meta-analysis study is contingent on the studies reviewed and sources of assessment.

The purpose of this meta-analysis was to compute a summary effect. Konstantopoulos (2011) suggested that summary effect is significant to the overall study because it synthesizes the individual studies by considering the weights of the studies, p-value, and sample sizes. Cohen's *d* is the most commonly used measure in meta-analysis to calculate effects size and identify variations across the studies. Effect size is the foundation of any meta-analytic study. The calculation of an effect size indicates the efficacy of the intervention reviewed (Campbell & Herzinger, 2010). Ultimately, the effect size indicates the strength of a relationship or change across all studies and whether a functional relationship exists between an intervention and behavior.

Summary

I began chapter 2 with discussing a brief history of autism, most common etiological theories, and drastic increase in prevalence. In chapter 2 I also reviewed research studies using the intervention of VSM for children with a variety of ages and disabilities. Most of the studies I reviewed concluded positive results using VSM as an intervention to address academic skills, social behaviors, communication, daily living skills, and behavioral functioning (Bellini et al., 2007, Buggey, 2005, Buggey et al. 2011).

The technological advances made it possible for researchers to broaden the concept of modeling to the use of video to teach a wide range of skills (Sherer et al., 2001). Current research suggests that VSM can be a resourceful intervention that has a great impact on social communication skills, functional skills, and academic skills of children diagnosed with ASD (Bandura, 1977; Buggey et al. 2011). VSM intervention can be an effective intervention for a variety of reasons including time and cost efficient due to immediate results. Videos are portable and can be used for maintenance of behaviors during school breaks, such as summer vacation. By using a small screen, the child is required to pay attention to a small spatial area and to hear the only imperative language; the child is more able to direct their attention and focus to relevant stimuli (Schmidt & Raacke, 2013).

While there is research in the use of VSM as an intervention with students who are diagnosed with ASD, research continues to question its efficacy as evidence-based practice. Nikopoulos and Keenan (2004) examined social initiation and play behavior in

children diagnosed with ASD, reporting a significant increase in all categories. Similarly, Rogers and Vismara (2008) conducted a study wherein effects of early autism and VSM were studied and concluded that VSM is an evidence-based intervention for children diagnosed with ASD.

Chapter 2 concluded with a brief synapsis of the methodology in this research project. I discussed the reasons why the meta-analysis approach is appropriate for this study. Meta-analysis allows for an opportunity to review all inclusionary single-subject design studies in a comprehensive approach. Chapter 3 contains an in-depth discussion of the methodology applied in this research study.

Chapter 3: Research Method

Introduction

This chapter presents the methods involved in conducting a meta-analytic research study designed to evaluate the efficacy of VSM intervention to improve the prosocial behaviors of children diagnosed with ASD. If efficacy is determined, the fundamental question of whether VSM constitutes as an evidence-based practice can be validated. This chapter provides information regarding participants, procedures, measures, and data analysis techniques associated with the study. Other goals of this chapter include rationalizing and justifying the research design, chosen methodology, threats to validity, and inclusion-exclusion criteria. This study was designed to answer two research questions.

Research Questions and Hypothesis

RQ1: What are the relative effects of studies examining video self-modeling on the prosocial behaviors of children diagnosed with ASD?

RQ2: Does the use of video self-modeling improve prosocial behaviors of students with ASD meet the standards for evidence-based practice?

Based upon these research questions, the following hypotheses about VSM used with children diagnosed with ASD are:

$H_0 1_1$: Video self-modeling will improve prosocial behaviors in children diagnosed with ASD from baseline to treatment by an effect size greater than .3.

$H_a 1_1$: Video self-modeling will not improve prosocial behaviors in children diagnosed with ASD from baseline to treatment by an effect size greater than .3.

$H_0 1_2$: Video self-modeling will maintain an improvement in prosocial behaviors in children diagnosed with ASD from baseline to follow-up stage with an effect size of .3 or greater.

$H_a 1_2$: Video self-modeling will not maintain an improvement in prosocial behaviors with an effect size of .3 from baseline to follow-up in children diagnosed with ASD.

Research Design

A meta-analytic approach was selected for this study to investigate the efficacy of VSM on prosocial behaviors of children diagnosed with ASD. The goal of this study was to determine if enough evidence exists to support VSM as an evidence-based intervention. It is crucial for researchers to systematically synthesize literature within an evidence-based framework so that basic and applied research can be translated to applied practice to better assist clinicians in the design and implementation of efficacious interventions and supports to children with ASD (Zhang & Wheeler, 2011). This meta-analytic study provides a systematic and detailed analysis of individual single-subject design studies to determine the efficacy of VSM intervention. Single-subject research is a scientific methodology used to describe basic principles of behavior and to establish evidence-based practices by identifying functional relationships between independent and dependent variables (Horner et al., 2005). Single-subject methodology is typically criticized for small sample sizes and the ability to be generalized to a larger population. Therefore, synthesis of single-subject studies is one way to address generalization obstacles since the methods help establish whether a specific intervention is consistently

effective in the change of the targeted behavior or skill (Zhang & Wheeler, 2011). The compilation of findings from a large sample of single-subject studies can produce significant results to strengthen the conclusion about the intervention. Additionally, findings can identify variables contributing to the effectiveness of the intervention, thus allowing researchers to modify the intervention more specifically to the unique characteristics of individuals.

Although literature suggests that VSM is an effective intervention for the ASD population, no systematic group studies have been conducted evaluating its effectiveness. Rather, it is more commonly studied via single-subject design studies. One way to evaluate the effectiveness of VSM is using meta-analysis which allows for the simultaneous examination of the results from multiple studies that use the intervention. Therefore, a meta-analysis of single-subject studies on VSM intervention could provide additional support for it as an evidence-based practice for clinicians working with the ASD population. This study is a quantitative meta-analysis in which I calculated and examined effect size across the multiple studies.

Glass (1976) first defined meta-analysis as a statistical analysis of a large collection of results from individual studies for the purpose of integrating the findings. Aggregating the results of single-case studies gives cumulative strength to findings of multiple studies into one outcome. Subsequently strengthening individual studies that may otherwise be perceived as having limitations of size and scope. To summarize the effects of VSM as an intervention for children with ASD, it is necessary that inclusion and exclusion criteria be outlined. For this meta-analysis specifically, criteria are defined

concerning the type of study, participant characteristics, and outcome measures of the studies identified for review. I screened, evaluated, and included a detailed review of the studies to determine relevance for inclusion. Characteristics were coded, dated, abstracted, and analyzed. Results were reported and interpreted. It is important to note the importance of reviewing all available studies for this research; however, it cannot be established with 100% certainty despite my efforts and ability to access various databases.

Methodology

For the purpose of this study, the emphasis remained on children with ASD both male and female ranging from 3 to 15 years of age. Studies selected for this meta-analysis clearly indicated that the child met the DSM criteria for ASD diagnosis or empirical evidence is documented determining functional level using well established instruments such as the *Child Autism Rating Scale* (*CARS*) or the *Gilliam Autism Rating Scale* (*GARS*; Karren, 2016). Both tools are considered reliable assessment measures for substantiating the diagnostic process of ASD.

Search Strategies

For this meta-analysis I located studies by electronically searching EBSCO, Educational Resources Information Center (ERIC), ProQuest, ProQuest Dissertations & Theses Global, PsycINFO, and PsycARTICLES databases for studies published between 1990 and 2018. The search also included dissertations and thesis that focused specifically on VSM and met other inclusion criteria. Only peer-reviewed journals, dissertations, and theses written in the English language were reviewed for the purpose of this study. The

search included the following in the following search parameters: *video-based interventions, video modeling,* and *video self-modeling.* In addition to those keywords, the terms *single-subject design* and *single-case design* were used as limiters.

Inclusion and Exclusion Criteria

After conducting a search of the literature, I read and evaluated each article based on the criteria for inclusion in the review and meta-analysis. A systemic review of the studies was evaluated and identified predetermined inclusion criteria to ensure that the studies samples accurately reflect the literature on VSM intervention. Additional inclusionary studies were subjected to extraction of characteristic data, including participants' gender, age, and mental age (if reported). For a study to be included in this meta-analysis, there were several conditions that were met. For instance, all the studies had to be written in English and published in a peer-reviewed journal or as a dissertation or thesis. Wilson and Lipsey (2001) outlined standardized several points of interest that are relevant to this research study:

- Single subject design
- Data from original sources
- Participants must have a diagnosis of some level of ASD with a social deficit
- No reported evidence of comorbidity with the participants reported in the studies
- VSM is used as an intervention to improve prosocial behavior
- Clear operational definition of all studies and variables using empirical methods for analysis

- Statistical data are reported in order to calculate standard deviation, baseline, and intervention means to allow conversion to *d* statistic.

Kratochwill et al. (2010) also outlined standards to determine if the article specifies sufficient information to evaluate design quality as follows:

- Independent and dependent variables are operationally defined
- Treatment integrity is assessed
- Independent variables must be scientifically manipulated, with the researcher determining when and how the independent variables change
- The study must provide an estimate of intervention effect or include enough data so that an effect size can be calculated.

Each study identified for initial screening was reviewed to determine if it met the above-mentioned predetermined inclusion and exclusion criteria.

Effect Size Measurement

Effect-sizes are the foundation that reinforces any meta-analysis study (citation). It is a simple way to quantify the effectiveness or efficacy of an intervention under investigation in the meta-analysis sample (Campbell & Herzinger, 2010). Effect-size can be either positive or negative and it can refer to either a standardized measure or to an unstandardized measure. Additionally, effect-size calculation can also determine whether a functional relationship exists between an intervention and behavior. In other words, effect-size measurement indicates experimental treatment comparative to the degree of effect and is unaffected by sample size (Assen et al., 2005). In single-case design studies, effect sizes are standardized expressions of the extent of behavioral change between the

phases (Parker et al., 2009) and Cohen's *d* is probably the most common statistical calculation to measure the size of the experimental effect.

For an effective size analysis, two similar measures commonly used are Cohen's *d* and Hedges' *g*. Cohen's *d* and Hedges' *g* are interpreted in a similar manner. The calculated difference in the formula is the process by which the standard deviation is developed yet both are effective and scale free (Peng & Chen, 2014). Both measures are valid and reliable to calculate effect size between research articles, but for the purpose of this meta-analysis, Cohen's *d* and percentage of nonoverlapping data were applied.

Cohen's *d*

There are a few advantages of using Cohen's *d* effect-size measurement. The first advantage is that it is scale-free so that effect-size results can be compared to known benchmarks. Second, Cohen (1992) developed benchmarks suggesting .20 as a small effect size, .50 medium, and .80 or larger as a large effect size. Cohen's *d* is a measure of the distance between two means, divided by the standard deviation. Finally, the popularity and reliability have advocated Cohen's *d* as the gold standard, additionally once calculated the comparison is immediate.

I used the following Cohen's *d* formula to calculate effect size when all the pertinent data is reported including but limited to standard deviation.

$$d = \frac{M_1 - M_2}{SD_{pooled}}$$

For example, if 20 represents the mean of Group 1 and 24 represents the mean of Group 2 with a pooled standard deviation of 4.53, when the above formula is applied the calculated size effect will equal to 0.88, which is considered large according to Cohen's statistical standards.

$$d = \frac{20 - 24}{4.53} = 0.88$$

Contrary, if the study did not report the standard deviation, additional calculations were required to complete Cohen's *d* formula and calculate effect size. Standard deviation is a measure of variation between values in a set of data and it is calculated by the square root of the data variance (Cohen, 1992). The lower the standard deviation, the closer the data points tend to be to the mean (Wilson & Lipsey, 2001). Equally, a higher standard deviation indicates a wider range of values. It is important to note that this meta-analysis included calculated two effect sizes from each study when possible. Baseline to intervention phases was calculated first, which represents the period in which data collected on the dependent variable without any intervention in place and period in which independent variable or intervention is introduced. The second effect size that was calculated is the baseline to follow-up phases, which provides evidence of the maintenance of the effect. For the purpose of this study the following mathematical equations were utilized to calculate data variance and standard deviation when not reported.

Variance Formula

$$S^2 = \frac{\sum(X - \bar{X})^2}{n-1}$$

Standard Deviation Formula

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

Percentage of Nonoverlapping Data

Percentage of nonoverlapping data (PND) effect size was used as supplemental method to make decision regarding collected data. PND is one of the oldest methods used for synthesizing single-subject studies (Scruggs et al. 1987). An important criterion to determine whether a treatment is effective is the percentage of overlapping data points between treatment and baseline conditions. Treatment is considered effective if data points during intervention phase do not overlap with baseline phase. PND is calculated by counting the number of data points in treatment phase that exceed the highest baseline data point and dividing this number by the total number of data points in treatment condition (Scruggs et al. 1987). PND scores range from 0 to 100%. PND scores higher than 90% reflect a highly effective treatment, scores between 50%-70% reflect questionably effectiveness of the treatment, and scores less than 50% reflect unreliable treatment. In Mathematical language, the formula is the following:

$$\text{PND} = \frac{\text{Number of Intervention data exceeding the highest baseline data point}}{\text{Total number of data points in the intervention phase}} \text{ X } 100$$

Threats to Validity

The strength of a meta-analysis lies in its ability to combine the results from various small research studies that may have been underpowered to detect a statistically significant difference in effect of an intervention (Finger & Rand, 2003). The validity of meta-analysis relies on the quality of the studies included, and an evaluation of quality is a necessary part of the process. Internal validity shows the degree to which observed changes in a dependent variable can be attributed to changes in an independent variable. Therefore, internal validity is a matter of degree rather than one of presence or absence (Finger & Rand, 2003). For this study, threats to internal validity included potential problems with the studies evaluated, which may not be obvious in the published study. Such issues must be identified and reported in meta-analysis qualitatively. Results of flawed studies cannot be utilized in the final interpretation of the results (Card, 2012). Similarly, external validity is important to consider when conducting a meta-analysis study, as it applies to the generalizability of the research findings. In other words, external validity shows to what extent the findings of an experiment can be generalized across various populations, settings, and periods of time. Additionally, external validity is concerned with the relevance of the research question and inclusion and exclusion criteria used to select studies to answer research questions.

This meta-analysis considered two main threats to validity: publication bias and the study quality of inclusionary studies. Additionally, methods to minimize the potential threats to validity will be discussed in the following sections.

Publication Bias

Publication bias arises when results of published research are systematically different from results of unpublished studies. Some literature suggested studies that produce relatively high effect sizes are published more often than studies that report lower effect-size (Dickersin, 2005). Publication bias is a potential concern when the studies published in the literature are scientifically unrepresentative of the population of the completed research studies. It is important to note this concern because while a meta-analysis would produce a mathematically accurate synthesis of the studies included, if the studies included are a biased sample of all relevant studies, then the mean effect calculated in the meta-analysis will reflect this bias (Song et al., 2013).

In this meta-analysis, I took a few steps to reduce the potential publication bias. The first approach is to perform a truly comprehensive search of the literature to minimize bias. The second step involved acquiring grey literature or literature that is unpublished or not controlled by commercial publishers. Although this can be an exhaustive and time-consuming process, it was an important step to complete to minimize publication bias. A search was done to include theses and dissertations and if necessary, contacting the original authors of the research studies for clarifying purposes. While caution was taken when reviewing unpublished studies, this does not guarantee complete elimination of publication bias. Although caution was taken, publication bias is a complex threat to the validity of any meta-analysis, and these steps may not have completely addressed this concern.

Quality of Primary Studies

Quality evaluation of primary studies to assess the reliability of study results is a critical part of meta-analyses. The main factor influencing the quality of meta-analysis is the quality of the studies that are included in the meta-analysis itself. This process refers to the internal validity of a study and is assessing the risk of bias (Dreier, 2013). Likely biases arise from the selection of participants, data collection, analysis of data and selective reporting of study results. The results of the meta-analysis were determined by two components: primary research studies which have qualified as inclusionary studies and the management of those studies in the process of meta-analysis (Khan et al., 2010). The quality of data reporting in this meta-analysis is a major concern, due to an overwhelming number of studies, dissertations, and theses available. Fergusson et al. (2000) suggest that failing to describe follow-up data in a manner that aligns with baseline data could potentially pose problems. Similarly challenging, missing data that involves mediating variables or moderators poses limitations as well as questionable results for meta-analysis (Tritchler, 2010). The three strategies I applied in this meta-analysis to address this type of threat to validity include first, establishing quality thresholds for inclusion in the meta-analysis on the basis that only primary studies that have specific quality aspects could contribute valid answers to the research questions (Westwood et al., 2011). This approach allowed me to exclude all the primary studies that are not rigorous and include only the most rigorous studies in this study. For example, this step allowed for the exclusion of primary studies that did not report empirical data clearly or was not designed as single-subject. The second step I applied

was assigning strength to the studies by quality score. This approach allowed me to see the studies with stronger inclusionary criteria, which make greater contributions to effect-size of estimates (Fergusson et al., 2000). The final step that I used to promote strength and quality to the research was identifying the quality and discrepancies of the empirical data reported. For instance, examining the discrepancies in effect sizes in relationship to particular procedural protocol. This process emphasized the quality of the primary studies, because it ensured that the research was fundamentally rooted in a synthesis of existing primary studies.

In this meta-analysis I examined single-subject design studies in which each participant acts as its control for comparison. In single-subject design studies, it is a standard practice to present results as graphs that visually show the trend of data points measured in different conditions. To accurately read the precise values of the data points from each figure in every study, the 36 graphs presented in 10 studies were individually scanned using graphing software called Ungraph. The scanned image was uploaded in the software, and lines were digitalized to extract the data points accurately. This system was chosen instead of depending on visual assumption or judgment to ensure accuracy. Two columns of data were created: the x-axis indicating the number of sessions and the y-axis showing data points of the variable being measured. This was done across all conditions, including baseline, intervention, and maintenance. I then imported raw data into Excel, and calculated *M* and SD.

Ethical Concerns

Participants were not contacted during the data retrieval or data processing; therefore, harm was not present to any participant or processing of information in identifying markers during the data collection process. The appendices provide a list of the studies I included in this analysis. All raw data was documented in a password-protected document and stored on a password protected laptop (MacBook Pro) and a Flash drive (Kingston DataTraveler 64GB). Any identifying markers were extracted before the completion of the storage process.

Summary

In this study I used a quantitative meta-analysis approach to calculate statistical summary of multiple individual studies to report on a larger scale (Wilson & Lipsey, 2001). The goal of meta-analysis was to synthesize research results to determine an overall effect estimate for a population of studies. This study combined the results of research on prosocial behavior increases associated with VSM and children with ASD. While research in this area is ongoing, there have been some narratives, and meta-analytic reviews regarding the efficacy of video self-modeling, the most recent meta-analysis was reported 13 years ago. The Bellini and Akullian (2007) meta-analysis reported strong evidence supporting VM and VSM as an effective intervention strategy. The authors reported that both VM strategies significantly improve social-communication skills, functional skills, and behavioral functioning in children with autism. Concluding results of the study, Bellini and Akullian (2007) indicated that VM and VSM promote

skill acquisition. Additionally, Bellini and Akullian (2007) concluded that VM and VSM interventions meet evidence-based practice criteria.

Wilson and Lipsey (2001) suggested that exhaustive and comprehensive research requires using a number of databases. The initial evaluation of articles, theses, and dissertations determined the suitability, and further in-depth assessment validating the studies for inclusionary criteria. All articles were obtained and presented in a full-text format concluding with a methodological review. Research data of qualitative nature or theoretical based rather than quantitative empirical were considered inappropriate for this type of study and therefore discarded from the inclusion criteria (Wilson & Lipsey, 2001). Statistical analysis included group mean, data variance, standard deviation, and effect size addressing the efficacy question of video-self modeling. I used SPSS software and Excel program for statistical analysis as well as validation of manual calculation. Initial effect size calculations and coding included data extracted from an Excel spreadsheet, which I further explained in Chapter 4. Additionally, Chapter 4 includes a descriptive summary of the data analysis and statistical tables. As stated above, no actual human participants were used, or any attempt to make contact with study participants involved in the inclusionary criteria of this study, therefore, eliminating participants risk and ethical concerns.

Chapter 4: Results

Introduction

This chapter provides a description of the analysis of the data for the current study. In this chapter, the results from the study retrieval will be provided, followed by a description of overall study characteristics. The demographic information of the sample in the studies selected for analysis will be described. Single-subject case study effect sizes for results of VSM interventions will be stated. The results of the analyses based on the research question(s) of this dissertation (i.e., *What are the relative effects of studies examining video self-modeling on the prosocial behaviors of children diagnosed with ASD? And does the use of video self-modeling improve prosocial behaviors of students with ASD meet the standards for evidence-based practice*?) are presented. This chapter will also offer a discussion of the results from the study retrieval process and is followed by a description of the studies included in this meta-analysis.

Retrieval of Studies

Inclusion/Exclusion

An initial literature search yielded 244 titles. I screened these studies to determine appropriateness of the studies to include in this meta-analysis based on the following established inclusion criteria: (a) the independent variable evaluated was a video-based intervention using self-as-model, and the dependent variable was a prosocial skill (i.e., socially desirable behavior), such as sharing, cooperating, showing affection, verbally or gesturally initiating interactions with others, etc. Studies examining academic outcomes were excluded; (b) participant(s) were identified as

having a diagnosis of ASD and be between ages of 3-15. In some instances, the study may have included a combination of participants with ASD and other developmental disabilities. In these cases, data were analyzed only for the participants with ASD; (c) a single-subject research design that demonstrates experimental control, such as multiple-baseline or reversal with baseline data was employed; (d) clearly operationally defined independent and dependent variables; (e) statistical data necessary to calculate standard deviation, baseline, and intervention means to allow conversion to *d* statistic was available; (f) the study was published in the English language; and (g) the publication described a research study and was not a theoretical or opinion piece. Reviewed studies that did not meet these criteria were excluded. A total of 16 studies met inclusion criteria. One of the primary reasons for exclusion was use of an independent variable that does not include VSM. Other excluded studies did not use a single-case research design or participants were not diagnosed with ASD or had other comorbid conditions. Additionally, many studies were excluded due to lack of statistical data necessary to calculate the effect size.

Classification

A coding system based on the criteria outlined by Horner et al. (2005) was applied in analyzing the 16 studies. I analyzed each study across following categories: (a) participant characteristics, including number of subjects, diagnosis, and age; (b) description of intervention; (c) independent variable and how it was applied in the study; (d) research design; (e) description of targeted skills and dependent variables; (f) intervention effectiveness; (g) social validity; and (h) concluding results of the study. To

ensure that all the studies met above criteria and coding systems, the writer read all the studies three times on separate occasions.

Demographic and Descriptive Data

Study Characteristics

Sixteen studies were included in this meta-analysis. These studies comprised 12 research articles from peer-reviewed journals in addition to four doctoral dissertations. The studies were published between 1990 and 2018. A total of 43 participants with ASD from 16 studies were included in the meta-analysis. In each study, the minimum number of participants was one; the maximum number of participants was four. Two of 43 were in studies that had only one participant. Three had two participants. Eight had three participants and three studies included four participants. The level for the age variable included preschool, elementary, and secondary school. The participants were further categorized based on the specific diagnosis of ASD as reported in the study. All the studies included in this meta-analysis used a variation of a single-subject multiple-baseline across participants design to document effects. All 16 studies used only self as the model in the study. Thirteen of the studies were conducted in a school setting alone, one in home and school, two in home setting alone, and one study was conducted in a university speech and hearing center. Inter-observer reliability was reported in all studies.

Participant Characteristics

Specific participant characteristics that were analyzed included the participant's age and primary diagnosis. The sample of studies used a VSM intervention to 43

participants (see Table 1). The mean number of participants was 2.7 per study. The mean age of the participants in the studies was 6.6 with a range of 3 to 15 years. All participants were labeled as either early childhood or school age.

Ethnicity or racial grouping was not available for 31 participants. Out of 16 studies (with 43 participants) there were only 12 participants (four studies) whose race or ethnicity was reported. Nine of those 12 participants were Caucasian and three were Hispanic.

In terms of gender, there were 32 males, five females, and six were not specified. All 43 participants were diagnosed with ASD and no reported cooccurring psychiatric conditions. Examination of the participant characteristics can be visually simplified by looking at Table 1 below.

Table 1

Summary of Participants Included in Analysis

Participants	*N*
Participants	43
Mean age in years	6.63
Males	32
Females	5
Gender not specified	6
Race/Ethnicity	
Not specified	31
Caucasian	9
Hispanic	3
Disability	
Autism Spectrum Disorder (ASD)	43

Quality Indicator

The quality indicator typically found in single-subject designs using ABA is social validity (Horner et al., 2005). Social validity is an indicator of the social importance and acceptability of the intervention as it directly impacts intervention fidelity. Social validity draws attention to whether the intervention strategies used, and the outcomes achieved are acceptable, relevant, and valuable to practitioners who apply it or recipients of the intervention. In studies included in this meta-analysis, judgments were made about the effects of the intervention based on the statistical significance and magnitude of effect. Throughout the 16 studies, social validity was discussed as having been addressed by all the studies. Sixteen of those studies reported that social validity was viewed positively.

Analysis

Approaches most used in current literature to analyze single-subject research design were Cohen's *d* (1988) and PND (Scruggs et al., 1987). Both types of analyses were applied in this meta-analysis to quantify the degree of intervention effectiveness. Cohen's *d* is an effect-size estimate designed to specifically characterize results in a meaningful way by indicating the magnitude of a treatment effect (Cohen, 1992). Cohen's *d* measures the standardized difference between two means. This involves dividing the mean difference between two groups by a standard deviation. A *d* of .5, for example, refers differences between the group equivalent to .5 of a standard deviation. A *d* of .2, .5, and .8 are considered to be small, medium, and large effects, respectively (Cohen, 1988). A large effect size indicates that a research finding has practical

significance, while a small effect size suggests limited practical application. Additionally, if the difference between two groups' means is less than .2 standard deviations, the difference is trivial even if its statistically significant. Therefore, the larger the effect size the stronger the relationship between two variables.

In aggregating the 16 studies while looking at data from baseline to intervention and baseline to maintenance with at least three data points per phase, VSM was found to be an effective intervention for children and adolescents diagnosed with ASD. VSM's effect of learning progress was positive and statistically significant. A total of 16 effect sizes were calculated using Cohen's *d* for baseline to intervention phase and baseline to maintenance phase. This meta-analysis yielded the following Cohen's d effect sizes means scores: baseline to intervention condition $M = 1.0$, range 0.09 to 2.17; maintenance condition $M = 1.5$, range 0.02 to 7.37. Both means are considered large effect sizes, which indicates that not only is there a statistical significance showing that an effect exists, but there's also a practical significance suggesting that the effect is large enough to be meaningful as an application. See Table 2 for mean scores and range. Table 4 and 5 provide a detailed overview of the 16 studies included in this synthesis.

PND

PND provides a measure of intervention effectiveness and a method for systematically synthesizing single-subject research studies (Scruggs et al., 1987). The PND is calculated by dividing the number of intervention data points that exceed the most extreme baseline data point by the total number of intervention phase data points (Scruggs et al., 1987). Scruggs and Mastropieri (2001) provided detailed procedures and

caution of calculating and interpreting PND scores when used to synthesize single-subject research studies. One concern with PND is that the data obtained from single-subject research is nonindependent, which violates underlying assumption that data are independent. A second concern with PND is that some single-subject studies provide very few data points, which may not show reliable change or may inflate the effect size. Scruggs and Mastropieri's suggested following interpretation guidelines scores above 90% represent very effective intervention score, 70% to 90% represent effective intervention, 50% to 70% are questionable scores, and scores below 50% are ineffective. Another concern is the presence of outliers in baseline phase, which can distort the magnitude of effect estimated by PND. Therefore, PND ignores all baseline data except for one data point, and because of its extremity, it is likely the most unreliable data point. A fourth concern is that it cannot detect changes in trends and cannot consider trends observed in the baseline condition. A final concern with PND is when a trend is evident in the baseline condition and treatment has no effect but simply allows a pre-existing trend to continue. Due to these drawbacks of PND, high levels of errors can be produced. For this reason, a second analysis such as Cohen's *d* is beneficial.

I calculated the PND for each participant that was included in this meta-analysis and calculated the mean of the individual PND effect sizes as an overall measure of the efficacy of the VSM as an intervention. PND scores were calculated for each participant across all dependent variables in all 16 studies. Mean PND scores (*M* PND) were calculated for each study and aggregated for the entire data set. The overall mean PND score for the studies indicates that VSM is a questionable intervention strategy for

treating prosocial behaviors in children and adolescents diagnosed with ASD (n = 16, PND M = 63%, Median = 79%, Mode = 100%). See Table 3 for mean, median, and mode data and Tables 6 and 7 for detailed PND per participant in each study. It is important to note that most of the studies analyzed in this meta-analysis reported very effective intervention (> 90%) and effective intervention (70% to 90%) PND scores, while several studies reported questionable or ineffective scores. In addition, some studies reported significant difference in PND between group participants and dependent variables. Such outliers can depress the mean PND.

Table 2

Total Study Cohen's *d Descriptive Statistics*

Descriptive Statistics	Intervention Phase Cohen's *d*	Maintenance Phase Cohen's *d*
Mean (*M*)	1.0	1.5
SD	0.64	1.7
Range	0.09 – 2.17	0.02 – 7.37

Table 3

Total Study Percentage of Nonoverlapping Data (PND)

PND Mean (*M*)	PND Median	PND Mode
63%	79%	100%

Table 4

Video Self-Modeling Interventions Studies

Study	Participants	Setting	Dependent Variable	Intervention *M*	Maintenance *M*	Intervention Cohen's *d*	Maintenance Cohen's *d*
Andrade (2018)	3 children, 5 and 6 years	School	Frequency of unprompted verbal initiation and responding.	Initiation-1.0 Response-0.7 Duration-0.5	Initiation-0.1 Response-0.5 Duration-0.4	Initiation 0.33 Response 0.22 Duration 0.16	Initiation 0.02 Response 0.16 Duration 0.13
Bellini, Akullian, & Hopf (2007)	2 children, 4 and 5 years	School	Unprompted social engagement.	2.13	3.70	1.1	1.8
Boudreau & Harvey (2013).	3 children, 4 to 7 years	School	Social initiation	1.13	NA	0.4	NA
Buggey (2005)	2 children, 9 and 11 years	school	Number of social initiations	4.34	5.3	2.17	2.63
Buggey, Toombs, Gardener, & Cervetti (1999)	3 children, 8 and 11 years	Home	Percentage of appropriate verbal responses	2.29	1.77	0.7	0.59

Buggey, Hoomes, Sherberger & Williams (2011)	4 children, 3.5 and 4 years	School	Social initiation	1.45	1.79	0.36	0.45
Deitchman, Reeve, Reeve, & Progar (2010)	3 children, 5 to 7 years	School	Social Initiation	3.4	3.1	1.2	1.6
Kabashi & Epstein (2017)	1 child, 5 years	School	Approaching peer, greeting, initiation with a peer, and interacting with a peer.	Approaching 1 Greeting 1 Invitation to play 0.5 Invite to play peer to peer 5.7	Approaching 1 Greeting 1 Invitation to play 1.0 Invite to play peer to peer 8.8	Approaching 3.6 Greeting 2.98 Invitation to play 1.4 Invite to play peer to peer 1.61	Approaching NA Greeting NA Invitation to play 2.7 Invite to play peer to peer 1.05
Lemmon & Green (2015)	1child, 4 years	School	Inviting others to play, engaging in positive communication and sustaining interaction with peers.	Invite to play 1.3 Positive communication 7.8 Sustained interaction 6.8	Invite to play 2.3 Positive communication 19.2 Sustained interaction 20.6	Invite to play-1.6 Positive communication 1.28 Sustained interaction 1.14	Invite to play 7.37 Positive communication 2.89 Sustained interaction 3.1
	2 children,	School	Increase amount of time	3.66	4.97	1.82	2.5

Victor, Little & Akin-Little (2011)	8 and 10 years		spent engaging in social interactions				
Wert & Neisworth (2003)	4 children, 4.5 to 5.5 years	School and Home	Number of spontaneous Requesting	2.41	NA	0.60	NA
Williamson et al. (2013)	3 children, 12 to 14 years	School	Self-initiated, unprompted greetings	0.27	0.52	0.09	0.17

Table 5

Video Self-Modeling Interventions Dissertations

Study	Participants	Setting	Dependent Variable	Intervention *M*	Maintenance *M*	Intervention Cohen's *d*	Maintenance Cohen's *d*
Murdock (2012)	4 children, 6 to 9 years	University Speech & Hearing Center	Verbal initiation to peers.	0.5	1.4	0.12	0.26
Lantz (2005)	2 children, 7 and 11 years	Home	Making requests, taking turns with others during interaction, asking questions, and commenting	Requesting 3.8 Turn Taking 2.6	Requesting 2.1 Turn Taking 1.9	Requesting 1.88 Turn Taking 1.27	Requesting 1.03 Turn taking 0.98
Baras (2018)	3 children, 4 to5 years	School	Positive social interaction with peers	2.6	3.8	0.85	1.26
Akulian (2009)	3 children, 3 to 5 years	School	Unprompted social participation	Social participation 0.7 Parallel play 1.3	Social participation 1.2 Parallel play 1.7	Social participation 0.22 Parallel play 0.43	Social participation 0.38 Parallel play 0.55

Table 6

PND for Each Participant by Study

Study		Intervention PDN %	
Andrade (2018)		Initiation	Response
	Participant 1	33%	33%
	Participant 2	0%	0%
	Participant 3	0%	100%
Bellini, Akullian, & Hopf (2007)	Participant 1	80%	
	Participant 2	80%	
Boudreau & Harvey (2013).	Participant 1	100%	
	Participant 2	83%	
	Participant 3	100%	
Buggey (2005)	Participant 1	100%	
	Participant 2	100%	
Buggey, Toombs, Gardener, & Cervetti (1999)	Participant 1	100%	
	Participant 2.	100%	
	Participant 3	67%	
Buggey, Hoomes, Sherberger & Williams (2011)	Participant 1	58%	
	Participant 2	91%	
	Participant 3	0%	
	Participant 4	78%	
Deitchman, Reeve, Reeve, & Progar (2010)	Participant 1	88%	
	Participant 2	100%	
	Participant 3	100%	
Kabashi & Epstein (2017)	Approaching		83%
	Greeting		75%
	Invite to play		50%
	Invite to play peer to peer		75%
Lemmon & Green (2015)	Invite to Play		42%
	Positive Communication		42%
	Sustained Interaction		14%
Victor, Little & Akin-Little (2011)	Participant 1	100%	
	Participant 2	100%	

Wert & Neisworth (2003)	Participant 1	100%
	Participant 2	100%
	Participant 3	100%
	Participant 4	50%
Williamson, Casey, Robertson & Buggey (2013)	Participant 1	20%
	Participant 2	0%
	Participant 3	0%

Table 7

PND for Each Participant by Study

Study		Intervention PDN	
Murdock (2012)	Participant 1	0%	
	Participant 2	0%	
	Participant 3	40%	
	Participant 4	0%	
Lantz (2005)		Requesting	Turn Taking
	Participant 1	100%	100%
	Participant 2	100%	67%
Baras (2018)	Participant 1	100%	
	Participant 2	100%	
	Participant 3	100%	
Akulian (2009)		Social Participation	Parallel Play
	Participant 1	50%	100%
	Participant 2	0%.	0%
	Participant 3	29%	0%

Summary

In this meta-analysis I synthesized research results from previous studies on the same topic to determine an overall effect estimate for the population included. By aggregating results from multiple studies, meta-analysis increases the statistical power to obtain more conclusive results. Based on the results I was able to determine if VSM is an

effective intervention strategy for addressing prosocial behaviors in children and adolescents diagnosed with ASD. The secondary goal was to explore whether VSM should be established as an evidence-based practice for addressing prosocial behaviors in children and adolescents diagnosed with ASD. I applied two statistical analyses in synthesizing single-subject research studies, Cohen's *d* and PND. Both approaches are frequently used in published meta-analyses of single-subject design studies conducted in intervention research with individuals diagnosed with ASD (Wang et al., 2011).

The results of Cohen's *d* effect size (Intervention $M = 1.0$; Maintenance $M = 1.5$) indicated that VSM is an effective intervention strategy for addressing prosocial behaviors in children and adolescents diagnosed with ASD. According to Cohen's established benchmarks $d = 1.0$ and $d = 1.5$ are considered a large effect size. This means that participants mean during intervention phase was well above the mean of the baseline phase. Additionally, participants mean during maintenance phase was also well above the mean of the baseline phase. Therefore, the results suggested that VSM fosters skill acquisition that is maintained over time and transferred across settings and persons.

While Cohen's *d* showed a large mean effect size, PND results of this meta-analysis indicated questionable effect (PND $M = 63\%$) of the effectiveness of VSM in improving prosocial behaviors in children and adolescents diagnosed with ASD. When determining whether a treatment is effective the percentage of overlapping data between intervention and baseline is calculated and if performance during an intervention phase does not overlap with performance during baseline phase the treatment is considered effective. Although, majority of the studies in this meta-analysis reported high PND

scores, there were several studies with outliers present in the baseline phase, which distorted the magnitude of effect estimates provided by PND. There could have been clear positive effect in treatment phase but, with outlier in baseline phase, the PND would have shown a value of zero, suggesting no effect. Therefore, when interpreting PND scores, it is important to keep in mind the outlier studies depressed PND due to variability in baseline phase.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this study was to fill the need for a meta-analysis of single-subject studies that evaluate the effectiveness of video self-modeling of prosocial behaviors in children and adolescents diagnosed with an autism spectrum disorder. The secondary purpose was to contribute to current literature surrounding the efficacy of VSM as an evidence-based practice for improving prosocial behaviors in children and adolescents diagnosed with ASD. Many studies have been published demonstrating the efficacy of VSM with wide variety of populations, skill deficits, and age (Acar & Diken, 2012; Bellini et al., 2007; Buggey, 1995, 2005, 2007; Matson et al., 2007; Wang & Spillane, 2009). Sherer et al. (2001) indicated that VSM was most effective for individuals who enjoyed watching themselves on video, and who showed prior interest in visual learning, such as watching videos or using pictures as support strategies. Other factors that make VSM an effective intervention include attention and the ability to attend to the model and motivation to watch oneself on the video. It is important to note that there is a study that failed to show VSM as an effective intervention for preschool age participants (e.g., Buggey, 2011). Variables that may impact and limit this age group include the severity of child's disability, the ability to self-recognize, and ability to attend to the video. Therefore, while VSM has been validated as an effective intervention for promoting prosocial behaviors, its efficacy may vary as a function of age.

In this chapter I provide a detailed overview of the findings of the meta-analysis. The remaining portion of the chapter covers potential implications for practitioners as

well as social change effects. Lastly, I discuss the study's limitations and how future research could address these limitations for further clarity on the subject and provide concluding comments.

A critical goal of this study was to fill a need for a meta-analysis of single-subject design studies on the effectiveness of VSM as an intervention for improving prosocial behaviors in children and adolescents diagnosed with ASD. While a meta-analysis on this subject exists in the literature (e.g., Bellini & Akullian, 2007), the last analysis was done more than a decade ago. New studies have emerged after the previous meta-analysis, therefore, necessitating an update. In addition, a previous meta-analysis examined the effects of video modeling and VSM as interventions for multiple skills including prosocial behaviors, functional skills, academic performance, and maladaptive behaviors. In contrast, I focused solely on the effects of VSM on prosocial behaviors without additional interventions such as reinforcement. Finally, this meta-analysis relied heavily on stringent inclusion criteria to ensure the effectiveness of VSM when discussing prosocial behaviors and under which circumstances VSM is effective or ineffective. The studies that met inclusion criteria included participants that ranged in age from 3 to 15 years of age and were only diagnosed with ASD without any co-occurring psychiatric disorders. Studies included in this meta-analysis were conducted in various settings, including school, home, and clinic. Diverse settings are essential to ensure that VSM can be effective when generalized across people and environments.

Interpretation of Findings

Two research questions were addressed in in this study: (a) what are the relative effects of studies examining video self-modeling on the prosocial behaviors of children diagnosed with ASD; and (b) does the use of video self-modeling improve prosocial behaviors of students with ASD meet the standards for evidence-based practice? Both questions aimed to further clarify the degree of effectiveness of VSM related to prosocial behaviors.

Collectively, the studies included in this meta-analysis suggested that VSM is a potentially versatile and effective intervention approach for teaching precocial behaviors to children and adolescents with ASD. The results of this study are consistent with a previous meta-analysis (Bellini & Akullian, 2007) that concluded that VSM is an effective intervention strategy for teaching communication, social, behavioral, and functional skills to children and adolescents diagnosed with ASD.

The results were synthesized across 16 studies, including a total of 43 participants diagnosed with ASD. The data were analyzed using Cohen's *d* effect size and PND. The first question focused on the effectiveness of VSM on prosocial behaviors in children and adolescents diagnosed with ASD. For the null hypothesis to be rejected, an improvement from baseline to treatment and baseline to maintenance needed to have an effect size greater than .3 (Cohen's *d*). The findings showed a positive increase from baseline to intervention (ES M =1.0, SD = 0.64) as well as baseline to maintenance (ES M =1.5, SD = 1.7). The Cohen's *d* effect size results were large, suggesting that VSM is highly effective for addressing prosocial behaviors in children and adolescents diagnosed with

ASD. In addition, these results indicated that skills are maintained over time. According to these data, both hypotheses were supported: VSM improves prosocial behaviors in children with ASD during intervention and is maintained over time.

In addition to calculating Cohen's *d* effect size, PNDs were examined in this study. Mean PND scores (*M* PND) were calculated for each study and aggregated for the entire data set. Overall mean PND score for the studies are not as supportive of the efficacy of VSM as suggested by Cohen's *d* (PND *M* = 63%, Median = 79%, Mode = 100%). PND results should be interpreted with caution due to some common limitations encountered in several studies included in this analysis. First, PND is designed to detect the changes in level across the experimental phases, and it does not account for the change in trend and variability in the data. Second, this method does not directly measure the magnitude of treatment effect between the baseline and intervention conditions. Third, when the baseline data are not stable, there is more likely to be overlap with the intervention condition, leading to a lower PND score. Finally, PND may be depressed based on a single data point in the baseline, which could be an outlier. For instance, if one data point in baseline reaches the ceiling of the possible score range for the dependent variable, the result could suggest no effect. At the same time, an increase in the intervention phase is visually noticeable (Lenz, 2013). Multiple studies in this meta-analysis encountered one or more of these limitations, which can depress the mean PND. Due to these limitations, PND effect size measurement was used as additional results interpretation.

The second question aimed to determine whether VSM meets the standards for evidence-based practice per guidelines outlined by Horner et al. (2005). Applying the guidelines they proposed, the results of this study suggest that VSM meets the criteria for designation as an evidence-based practice for addressing prosocial behaviors in children and adolescents diagnosed with ASD. Out of 16 studies, 12 are peer-reviewed publications and four are doctoral dissertations, which exceeds the five studies recommended to classify a practice as evidence-based; it does represent a small sample size (n = 43) for a thorough meta-analysis. Although the sample size is small, this study focused on only video self-modeling intervention without any other intervention strategies. Bellini and Akullian (2007) suggested that further research is needed to differentiate between VM and VSM to determine which method is more effective, thus becoming an evidence-based practice. Additionally, I focused on children and adolescents diagnosed only with ASD; all other studies that included participants with a comorbid diagnosis were excluded—limiting these variables allowed for more focused analysis to determine the most effective intervention outcomes.

Limitations of the Study

While this study indicated that VSM can be used as an effective strategy to teach children and adolescents prosocial behaviors, few limitations in this analysis are evident. These limitations can be used to guide future research.

The first limitation includes social validity and treatment fidelity. Of 16 studies included in this analysis, only several studies reported intervention fidelity and social validity measures. Treatment fidelity is essential to ensure that intervention implemented

is consistently and reliably as this directly impacts the outcome of the intervention (Smith et al., 2007). Failure to include intervention fidelity data leaves room for questioning and speculating whether the effects reported from the study result from poor intervention application or ineffective intervention (Horner, 2001). Intervention fidelity is critical in research validity, and it is the foundation for implementing evidence-based practices. Social validity encompasses the social significance of the intervention, social acceptability of the procedures, and social importance of the intervention's effects (Fawcett, 1991). This concept emphasizes the social relevance of the problem as well as the acceptability of the intervention. In VSM studies, social validity is essential because it involves using technology. Many people find technology intimidating and lack the skills or equipment necessary to record and edit videos. Therefore, social validity measure would allow for demonstration of the level of difficulty of implementing VSM.

Another limitation of this study was the inclusion of generalization effects. All the studies provided follow-up data but very few included generalization effects. Generalization of skills is vital when teaching new skills to children because it increases the probability that the student will be successful at displaying taught skills independently across different people and other settings (Wong et al., 2007). Teaching generalization is important because children and adolescents diagnosed with ASD have difficulty independently transferring a strategy used in one context to a similar context or relating new stimuli to past experiences (Wong et al., 2007). Therefore, it needs to be taught explicitly.

Recommendations for Future Research

This meta-analysis provided valuable information on the effectiveness of VSM for children and adolescents diagnosed with ASD. There are several avenues for future research that should be considered. First, as indicated by this study, VSM can improve prosocial behaviors in children and adolescents. However, most studies relied on baseline, intervention, and maintenance scores but neglected to collect generalization data. It's important to note that the studies with maintenance scores only included two to three data points. Future research should measure maintenance over a more extended period. Perhaps future research should focus on more systematic procedural implementation inclusion criteria to better clarify which schedule of watching videos is the most effective. For instance, a participant who watched a video that was five-minute-long for five days per week for three weeks may have better results than a participant who watched a three-minute-long video for three days per week for three weeks. Additionally, studies should include the consistent length of time of treatment per phase.

Another area to improve is participant characteristics such as communication level, the severity of autism, and IQ level. These factors could lead to additional constructive information that can contribute to the literature on VSM and easily determine the most effective intervention outcomes for children and adolescents diagnosed with ASD. Recommendations also include reporting on intervention fidelity as well as social validity as literature on VSM evolves.

The final recommendation for future research is to apply current advancements in technology such as virtual avatars and face-swapping to create videos that will target a

skill of choice. These programs are sophisticated and can generate nearly indistinguishable videos from real ones. Using avatars can be a powerful tool to teach prosocial skills to children with ASD as it allows complete user control of the avatar's performance. This method can be beneficial for individuals who struggle with specific skills and may not perform such skills so that a fluid video can be made. Additionally, these programs are easy to use and could be helpful for practitioners who lack skills or confidence to attempt using VSM as an intervention.

Implications for Practice

The results of this study suggest several implications for future practice. The outcome offers additional and concise information that contributes to the existing literature on VSM. The first implication is directly associated with identifying an effective evidence-based practice for children and adolescents diagnosed with ASD. An overwhelming amount of research studies exists documenting positive outcomes and advantages of VSM when used with this population, and its status as an evidence-based practice validates. As the results of this study show, VSM is a promising intervention that can improve prosocial behaviors in children and adolescents with ASD. Therefore, it should be readily considered as a treatment option.

The second implication for practice is VSM's high individual nature and ability to meet the unique needs of children and adolescents with ASD. With overwhelming technology readily available to parents, students, teachers, and clinicians, including cellphones, iPads, other recording devices and editing software, VSM is easy to learn and implement. Although practitioners must have the skills necessary to record and edit a

video, it is an easy and user-friendly process that can be learned even with an instructional training video. Commonly documented reason for lack of using VSM surrounds perceived technology requirements and skills necessary to implement this intervention. So, it is clear that a better understanding of these processes is needed. A solution can be to provide training for those interested in using the intervention. Schools can offer trainings to their employees and parents who are interested in learning this strategy.

Finally, this long-overdue meta-analysis draws on and dramatically extends the previous meta-analysis of single-subject design studies on the effectiveness of VSM in children and adolescents diagnosed with ASD. This study purposefully restricted many variables to address several limitations and recommendations for future research identified in the previous meta-analysis to contribute to discussion surrounding VSM as an evidence-based practice. Limitations include studies only using VSM without any other intervention strategies, limited population to participants ages 3 to 15 and diagnosed with ASD. In addition, this study included updated studies ranging from 1990 to 2018. Given the size and breadth of the research studies in this area, there was a need to synthesize evidence from single-case design studies. This study is critical because it supports establishing VSM as evidence-based practice, allowing practitioners to implement an effective intervention.

Implications for Social Change

Social change focuses on the ways changes transform cultural norms, concepts, and rules, which inevitably impact society for the long haul. Autism has gone through a

significant shift scientifically and sociologically since its original identification days in early 20th century. Research on autism continues to grow daily and more progress is made in developing family support services, educational programs, and therapeutic interventions, all in hopes to better understand, treat, and subsequently provide the best quality of life possible to children diagnosed with ASD.

Difficulty with social skills is a hallmark of ASD, although how these challenges manifest differs from child to child and depends on the child's functioning level. Studies suggest that this population has fewer friends, less satisfying relationships, and more feelings of loneliness than their typically developing peers. Therefore, effective teaching strategies for social behaviors are crucial for children and adolescents diagnosed with ASD. VSM is one of few social skills trainings that is empirically supported, and research continues to show consistent evidence of its effectiveness. Skills gained through VSM are typically maintained over time and can be generalized across people and other settings.

The social change goal of this study was to provide practitioners, educators, and parents with an empirically supported treatment option for addressing prosocial behaviors in children and adolescents diagnosed with ASD. This study showed that VSM is an effective intervention and can be included as a part of any comprehensive intervention program for children with ASD. Teaching social skills to youth with ASD sets them up for success in educational settings and various other environments. Well-developed social skills can help children and adolescents with ASD develop strong and positive friendship connections, healthy relationships with family members, improve academic performance,

and set them up for success in work environments with coworkers and other community members.

Conclusion

ASD is a neurodevelopmental disorder that presents many challenges, not only to the diagnosed individual and their families, but to teachers, therapists, and institutions concerned with providing effective educational interventions that can foster independent functioning in those diagnosed with ASD. With an increased number of children being diagnosed with ASD, more than ever before there is a great need for interventions that are effective and evidence-based, user-friendly, cost effective, and accessible. Interventions need to be readily available in schools, homes, and communities and be able to meet unique individual needs of children and adolescents diagnosed with ASD. VSM is well researched intervention strategy that meets guidelines of an evidence-based practice for children and adolescents diagnosed with ASD. VSM intervention has been shown to be effective with children and adolescents who enjoy watching themselves and learning through visual modalities.

Impairment in social functioning is a central feature of ASD. Social skill deficits make it difficult for the individual to develop and keep meaningful and fulfilling personal relationships. Many social skill difficulties can be mitigated with an effective educational program that focuses on these weaknesses. Therefore, it is vital to implement meaningful and practical strategies to support student's social development to ensure that they are prepared to participate in social events. VSM has shown to be an effective intervention for a variety of skills, including social behaviors. This meta-analysis evaluated the

effectiveness of VSM in treating prosocial behaviors in children and adolescents diagnosed with ASD. The effect sizes were determined for results of VSM, and overall, the results were favorable. Results also suggest strong positive long-term outcomes for prosocial skills.

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