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Treatment Efficacy of Parent-Led ABA for Children With Autism and Their Parents

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Abstract

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MS, National University, 2010

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Autism spectrum disorder is a complex and heterogenous, neurodevelopmental disorder. Applied behavior analysis (ABA) is a common treatment modality for children with autism with marked improvements demonstrated in communication, social, and adaptive functioning. The most common implementation of ABA is a practitioner-led model, whereby a paraprofessional directly implements treatment with the oversight of a Board Certified Behavior Analyst®. Parent mediated treatments are another model proving to be efficacious for children with autism and their parents. While this model is applied in therapeutic treatments such as speech pathology, early intervention, and other behavioral approaches (e.g., ESDM, PRT), parent mediated treatment has not been widely applied in the field of ABA. For this reason, this study, with a foundation in behavioral theory and Bandura's unifying theory of behavior change, investigated the effectiveness of a parent mediated approach knowns as parent-led ABA. To evaluate this, an archival analysis was conducted for children with autism who received parent-led ABA and practitioner-led ABA as a comparison. Results of this analysis revealed parent-led ABA to be no different in treatment outcome to practitioner delivered treatment. Specifically, while both parent-led ABA and practitioner-led ABA demonstrated a significant change in outcome on both the Vineland-3 (ps < .05) and the VB-MAPP (p < .05), there were no significant group differences observed (ps > .05). This produces positive social change as parents are taught to implement an efficacious treatment for their child, which can have a daily and lifelong impact for these families by positively impacting parenting skills, increasing parent's self-efficacy, and ultimately making a lasting impact in their child's life.

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Dedication

I dedicate this to my husband and my two daughters, who have relentlessly supported me through my program and pursuits. Not only that, but they encouraged me when I felt defeated and shared in my joy. I am forever grateful for your love.

Acknowledgments

First and foremost, I want to extend my gratitude to my boss and mentor, Dr. Doreen Samelson. You have encouraged me in my Ph.D. pursuits even before starting and have provided significant guidance and support every step along the way. Thank you for believing in me and pushing me to be the best clinician I can possibly be.

Also, I want to thank my committee members who have paced with me throughout the dissertation process and have encouraged me in my research and my writing! Thank you!

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Chapter 1: Introduction to the Study

Introduction

Autism spectrum disorder (ASD) is a heterogenous neurodevelopmental disorder marked by impairment in social-emotional reciprocity and the presence of restrictive and repetitive behaviors (American Psychiatric Association, 2013). Autism was first identified as a childhood disorder in 1943 by Leo Kanner, whereby he qualitatively described 11 children with similar behavioral presentations with a lack of interest in social engagement, appearing to be in their own world. In 1987, Ivar Lovaas conducted a landmark study with children with autism utilizing early intensive behavioral intervention (or intensive applied behavior analysis), demonstrating significant gains for these participants. Since that time, many researchers have replicated these results (Eikeseth et al., 2007; Makrygianni et al., 2018; Sallows & Graupner, 2005; Virués-Ortega, 2010). Applied behavior analysis (ABA) is now identified as an evidenced-based treatment for children with ASD. ABA treatment increases communication skills, social skills, and adaptive skills, as well as decreases problem behaviors associated with this disorder (Makrygianni et al., 2018). Since the early 2000s, all 50 of the United States have passed laws mandating insurance companies cover ABA treatment for individuals with ASD. With the passing of these laws, the primary method of implementation of ABA is through the direct care of a paraprofessional with treatment planning, supervision, and oversight conducted by a Board Certified Behavior Analyst® (BCBA®).

Lovaas' (1987) original study extensively trained parents as part of the program ensuring children would receive ABA treatment during all their waking hours. A number

of researchers since then (Anan et al., 2008; Bibby et al., 2002; Kuravackel et al., 2018; Sallows & Graupner, 2005; Sheinkopf & Siegel, 1998) have also included parents as direct care providers for their child's treatment or individuals who directly implemented most or all of their child's treatment with the support of a master's level or higher behavioral specialist (e.g., psychologist, BCBA®, etc.). The research supporting parent mediated (or parent directed, parent implemented) ABA treatment is positive, with good results in increased communication and social skills, decreases in problem behavior, as well as increased parental self-efficacy (Anan et al., 2008; Bibby et al., 2002; Koegel et al., 2002; Sallows & Graupner, 2005; Sheinkopf et al., 1998; Smith et al., 2000; Sofronoff et al., 2004; Sofronoff & Farbotko, 2002; Symon, 2005). Despite these outcomes and the heavy inclusion of parents in Lovaas' seminal work, the methodology of parent mediated ABA is not expansive. Parent-led ABA, a parent mediated approach to applied behavior analysis, places parents and families at the forefront of their child's treatment, teaching them to implement strategies that will give their child new skills as well as address problem behavior. Parent mediated treatments for autism and other developmental disabilities is used widely with therapy models such as speech and language pathology (Brown & Woods, 2016; DeVeney et al., 2017) and early intervention (Bradshaw et al., 2017; Landa, 2018). These therapeutic methodologies consistently produce positive outcomes, and in many cases better outcome than clinician directed treatment. Nevertheless, despite the empirical basis for parent mediated ABA the implementation of this model is not widely applied. Therefore, the purpose of the current

study was to evaluate if parent-led ABA is an efficacious treatment method for children with autism and their parents.

Background

Since Lovaas' (1987) seminal work demonstrating children with autism can make significant gains in intellectual functioning with ABA treatment, many researchers have gone on to demonstrate a similar result (Bibby et al., 2002; Eikeseth et al., 2002; McEachin et al., 1993). Additionally, researchers have demonstrated a strong effect in treatment outcomes for young children receiving ABA treatment through meta-analyses (Eldevik et al., 2009; Makrygianni et al., 2018; Virués-Ortega, 2010). The most recent meta-analyses by Makrygianni et al. (2018) revealed strong effect sizes in the improvement of intellectual functioning and communication skills and moderate effect sizes in improving adaptive behavior and social skills.

With the establishment of ABA as an efficacious treatment for remediating skill deficits associated with autism, in 2011 the State of California passed a law mandating that insurance companies cover this treatment for people with autism (S.B. 946, 2011). The passing of this law meant people of all ages with a diagnosis of autism were eligible for behavioral health treatment, with many families at that time seeking ABA for their child(ren) (Croen et al., 2017). The ABA model of treatment most often utilized is conducted in a 3-tier model, whereby a paraprofessional implements the treatment with the identified client, with the supervision, oversight, and treatment planning by a BCBA and a delegated mid-level supervisor with a bachelor's or master's degree as outlined by The Council of Autism Service Providers, Second Edition (2020).

The 3-tier model of treatment has strong empirical support and is an evidenced-based treatment model for this population of individuals (Eikeseth et al., 2007; McEachin et al., 1993; Sallows & Graupner, 2005). However, with one model of ABA treatment predominantly used, this significantly limits family's choices regarding their child's treatment. Another option that is not widely applied, and is also efficacious treatment for children with autism, is parent mediated ABA (National Autism Center, 2015). Parent mediated ABA is a model where a BCBA, as well as a delegated supervisor with a bachelor's or master's degree, work directly with the parent(s) to teach principles of applied behavior analysis as it relates to their child's treatment. Subsequently, parents are taught how to utilize these principles with their child within their natural environment teaching them skills, as well as address problem behavior in a developmentally appropriate manner.

Sofronoff and Farbotko (2002) evaluated the efficacy of parent mediated behavioral treatment for children with Asperger's syndrome. In this study, parents were taught to implement social skills training with their children. Not only did social skills significantly improve for the children with Asperger's but parent's parental self-efficacy also improved significantly. Similarly, in 2004 Sofronoff et al. replicated the 2002 study, this time including behavior reduction strategies in addition to the social skills training. As a result of the parent mediated treatment, significant improvement was made in social skills, as well as problem behavior reduction, with parents also reporting increased self-efficacy. Anan et al. (2008) produced similar significant results across outcome measures for young children with autism in their parent mediated ABA treatment program. Many

more researchers have produced studies evaluating parent mediated behavioral approaches to treatment for children with ASD have been conducted with very promising and significant results for both the child with ASD and their parents (Koegel et al., 2002; Kuravackel et al., 2018; Rogers et al., 2019; Symon, 2005), and these will be elucidated further in Chapter 2.

Problem Statement

The purpose of this study was to evaluate if parent-led ABA is an efficacious treatment model for children with autism and their parents. Parent mediated methods in speech and language pathology and behavioral treatments have a strong literature foundation (Brown & Woods, 2016; DeVeney et al., 2017; Oono et al., 2013; Rogers et al., 2019); however, specific parent mediated applied behavior analysis treatment, like the parent-led ABA model, have not been as widely researched as other behavioral models such as Pivotal Response Treatment (Bryson et al., 2007; Schreibman & Koegel, 1996) and the Early Start Denver Model (Fuller et al., 2020). In addition to this, while there is evidence demonstrating the effectiveness of parent mediated ABA treatment (Anan et al., 2008), and parent training has been identified as an evidenced based treatment for ASD (Ferguson et al., 2019; National Autism Center, 2015) it is not a widely applied model within the field of applied behavior analysis.

Additionally, while ABA is very effective at increasing skills of young children with autism, as well as decreasing problem behaviors associated with autism (Makrygianni et al., 2018), intellectual functioning and age at start of treatment have consistently shown to be a factor impacting treatment outcomes (Tiura et al., 2017).

Thus, for children who enter into ABA treatment over the age of 7 years old (Granpeesheh et al., 2009) or who have a cognitive delay, parent mediated treatments, such as parent-led ABA may be a more efficacious treatment for these children and their families as parents are more well equipped to manage the behavioral and communications challenges associated with ASD. There is a need for a broad base application of parent mediated ABA, as well as current research as scholars do not know if parent-led ABA treatment is as efficacious as practitioner-led ABA treatment for children with autism and whether or not parent-led ABA treatment leads to greater parental self-efficacy for parents of children with autism than practitioner delivered ABA treatment.

Purpose of the Study

The purpose of the current study was to evaluate if parent-led ABA is an efficacious treatment method for children with autism and their parents. To do this, treatment outcomes were evaluated for both children with autism and their parents, additionally, a comparison was made between parent-led ABA and practitioner-led ABA (3-tier ABA) and pretreatment stress and confidence scores for parents of children with autism were explored.

Research Questions and Hypotheses

RQ1: What are the differences between parent-led ABA treatment and practitioner-led ABA treatment in adaptive functioning in children with autism as measured by the Vineland Adaptive Behavior Scales, Third Edition (Sparrow et al., 2016).

$H_0$1: Parent-led ABA treatment will not have significantly different post treatment results from practitioner-led ABA treatment on the Vineland Adaptive Behavior Scales, Third Edition.

$H_1$1: Parent-led ABA treatment will have significantly different post treatment results from practitioner-led on the Vineland Adaptive Behavior Scales, Third Edition.

RQ2: What are the differences between parent-led ABA treatment and practitioner-led ABA treatment in socially significant skills as measured by the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP) (Sundberg, 2008).

$H_0$2: Parent-led ABA treatment will not have a significant change in VB-MAPP results from pre-treatment to post treatment assessment.

$H_1$2: Parent-led ABA treatment will have a significant change in VB-MAPP results from pre-treatment to post treatment assessment.

RQ3: How does parenting confidence impact parenting stress for parents of children with autism as measured by the Parental Stress Scale and Parent Confidence Scale?

$H_0$3: Parents of children with autism's parenting stress is not impacted by their parenting confidence.

$H_1$3: Parents of children with autism's parenting stress is significantly impacted by their parenting confidence.

Theoretical Framework

Behavioral theory postulates learning occurs by environmental factors through the process of conditioning. Formalized in 1913 with John Watson's seminal article,

"Psychology as the behaviorist views it," this theory introduced an objective approach to psychology, whereby behavior is "predicted and controlled" (Watson, 1913). Behavioral theory expanded in the 1930s with B.F. Skinner's addition of operant conditioning, asserting that human behavior is learned through consequences, a process of reinforcement or punishment (Skinner, 1938). Applied behavior analysis (ABA) uses the principles of operant conditioning to teach new skills and decrease problem behavior. The primary aim of this study was to evaluate the efficacy of parent-led ABA for children with autism. Consequently, the framework of behavioral theory was appropriate to the purposes of this study.

Additionally, Albert Bandura's unifying theory of behavior change was included. In 1977, Albert Bandura posited the unifying theory of behavior change, specifically evaluating the role of self-efficacy and its role in behavior change. Olin et al. (2010), in their study evaluating family-based services and improving parent empowerment in children's mental health, utilized this theoretical framework. The current study evaluated behavior change for both children with autism spectrum disorder (ASD) and their parents while also assessing the positive impact of parent confidence in implementing ABA on the child's outcome in treatment, thus, making the inclusion of Bandura's theory fitting. Parent-led ABA centers parents in their child's treatment, guiding them to learn behavioral change processes for their child while being agents of change for their family. Important to implementing ABA procedures, is the parent's belief in their ability to learn these skills and in the value of the treatment for their child's benefit.

Nature of the Study

The nature of this study was a quasi-experimental, nested design, utilizing archival data to evaluate the research hypotheses. This methodology was utilized as this study compared two groups, practitioner-led ABA and parent-led ABA, independently and then also compared the groups in treatment outcomes for children with autism. Additionally, a non-experimental analysis of parental stress and parenting confidence were evaluated prior to treatment start.

Definitions

Autism spectrum disorder: A complex, pervasive, neurodevelopmental disorder characterized by marked impairment in areas of social-emotional understanding and the presence of restrictive interests and repetitive behaviors that are present from early childhood (American Psychiatric Association, 2013)

Self-efficacy: Is a cognitive process mediating behavior change that impacts a person's belief in their ability to effect change in a skill or behavior (Bandura, 1977).

Parental self-efficacy: This refers to a parents' belief to parent their child(ren) effectively and confidently (Sofronoff & Farbotko, 2002).

Parent-led ABA: This is a parent mediated approach to applied behavior analysis treatment for children with autism spectrum disorder, supported by a BCBA and a BCaBA® or master's level clinician. In this treatment model, parents are taught to implement behavioral procedures with their child for the purposes of increasing skills for both parent and child, as well as decreasing child problem behaviors.

Practitioner-led ABA: This treatment model is characterized by the direct implementation of ABA treatment by a paraprofessional, commonly a Registered Behavior Technician (RBT®) for children with ASD. This model is supported by a BCBA and a BCaBA or master's level clinician that is focused on increasing skills and decreasing problem behaviors.

Assumptions

There were a few assumptions associated with this study. The first assumption of this study was that all participants with ASD were diagnosed by a trained clinician (e.g., psychologist) in accordance with the DSM-5 diagnostic criteria (American Psychiatric Association, 2013). As all participants were referrals from an insurance agency under California State Law SB 946 (2011), all participants needed to have an ASD diagnosis to qualify for ABA services; however, accessing the diagnostic information for each client was beyond the scope of this study. Another assumption of this study was that all children included in this study who received parent-led ABA, had the parent-led ABA protocols and curriculum implemented in the manner they were intended. The final assumption of this study was all children who received practitioner-led ABA had the associated protocols and curriculum implemented in the manner they were intended. These assumptions were essential to this study as it was an archival analysis of data, thus, the only data available for analysis is that which was provided post treatment by the agency whose data were utilized for the purposes of this study.

Scope and Delimitations

The scope of this study was to contribute to the literature regarding parent mediated ABA treatment for children ages 3 to 7 years with ASD. Specifically, the scope of this study was to assess the efficacy of parent-led ABA treatment (a parent mediated approach to ABA), thus contributing to models of ABA available for families to choose from when starting treatment. Additionally, this study was meant to provide BCBA's additional research supporting the implementation of this model of ABA as it is not widely applied in the field.

Limitations

A limitation to this study was participants were not randomly assigned into two groups, as families decide at the outset of treatment what specific type of ABA treatment they will receive; thus, results were not as robust as an experimental random group assignment would be. Additionally, the data available needed to be recoded as the data were not initially separated into the two separate treatment groups, practitioner-led ABA and parent-led ABA. A final limitation was while pretreatment scores were available for parents included in this archival analysis, posttreatment outcome data were not evaluated as there was a dearth of data for this included population.

Significance

The study contributed to filling the gap in the literature as there is a paucity of recent studies evaluating the effectiveness of parent mediated ABA. Despite the literature indicating positive outcome of parent mediated treatment, the field has not expanded to this model. Additionally, other common treatments of ASD, such as speech and language

pathology and early intervention, have transitioned to parent mediated models with significant treatment gains demonstrated (Bradshaw et al., 2017b; Brown & Woods, 2016; DeVeney et al., 2017; Rogers et al., 2019; Sokmum et al., 2017). This research sought to provide practitioners of ABA continued support for parent mediated implementation, as well as contribute to the current literature regarding parent mediated ABA practice. This research can also positively impact social change as parents are taught to implement an efficacious treatment for their child with autism, which can have a daily and lifelong impact for these families as autism is a lifelong development disability presenting with many challenges (Miller et al., 2012).

Summary

This chapter provided a brief introduction to the purpose of this study, including the historical foundation of autism and applied behavior analysis. A background of ABA was then reviewed, followed by a concise research foundation to parent mediated behavioral treatments. Following these sections was a review of the problem statement and purpose of this study, with a review of the associated research questions and hypotheses. Next, the theoretical foundation for this study was outlined with a short description of both behavioral theory and Bandura's (1977) unifying theory of behavior change regarding self-efficacy. The nature of the study, definitions, assumptions, and scope were then reviewed, concluding with an overview of the limitations and significance of the proposed study.

Chapter 2 will provide a robust literature review regarding the theoretical foundation of this study, followed by the history of autism, the prevalence and

heterogeneity of this developmental disorder, the parental stress of parents of children with autism, and a review of applied behavior analyses and parent mediated treatments. Next, Chapter 3 will outline the methodology of the study, including the statistical procedures utilized. Chapters 4 and 5 will provide a detailed examination of the results of the data analysis and a discussion regarding the implications of the study and recommendations for further research.

Chapter 2: Literature Review

Introduction

Autism spectrum disorder (ASD) is a heterogenous neurodevelopmental disorder marked by impairment in social-emotional reciprocity and the presence of restrictive and repetitive behaviors (American Psychiatric Association, 2013). Autism was first identified as a childhood disorder in 1943 by Leo Kanner, whereby he qualitatively described 11 children with similar behavioral presentations with a lack of interest in social engagement, appearing to be in their own world. In 1987, Ivar Lovaas conducted a landmark study with children with autism utilizing early intensive behavioral intervention (or intensive applied behavior analysis), demonstrating significant gains for these participants. Since that time, many studies have replicated these results (Eikeseth et al., 2007; Makrygianni et al., 2018; Sallows & Graupner, 2005; Virués-Ortega, 2010). Applied behavior analysis (ABA) is now identified as an evidenced-based treatment for young children with ASD. ABA treatment increases communication skills, social skills, and adaptive skills, as well as decreases problem behaviors associated with this disorder (Makrygianni et al., 2018). Since the early 2000s, all 50 of the United States have passed laws mandating insurance companies cover ABA treatment for individuals with ASD. With the passing of these laws, the primary method of implementation of ABA is through the direct care of a paraprofessional with treatment planning, supervision, and oversight conducted by a BCBA®.

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studies conducted since then (Anan et al., 2008; Bibby et al., 2002; Kuravackel et al., 2018; Sallows & Graupner, 2005; Sheinkopf & Siegel, 1998) also included parents as direct care providers for their child's treatment or being the ones who directly implement most or all of their child's treatment with the support of a master's level or higher behavioral specialist (e.g., psychologist, BCBA®, etc.). The research supporting parent mediated (or parent directed, parent implemented, etc.) ABA treatment is positive, with good results in communication skills, social skills, decreases in problem behavior, as well as, increased parental self-efficacy (Anan et al., 2008; Bibby et al., 2002; Koegel et al., 2002; Sallows & Graupner, 2005; Sheinkopf et al., 1998; Smith et al., 2000; Sofronoff et al., 2004; Sofronoff & Farbotko, 2002; Symon, 2005). Despite these outcomes and the heavy inclusion of parents in Lovaas' seminal work, the methodology of parent mediated ABA is not expansive. Parent-led ABA, a parent mediated approach to ABA, places parents and families at the forefront of their child's treatment, teaching them to implement strategies that will give their child new skills as well as address problem behavior. Parent mediated treatments for ASD and other developmental disabilities is used widely with therapy models such as speech and language pathology (Brown & Woods, 2016; DeVeney et al., 2017) and early intervention (Bradshaw et al., 2017; Landa, 2018). These therapeutic methodologies consistently produce positive outcomes, and in many cases better outcome than clinician directed treatment. Nevertheless, despite the empirical basis for parent mediated ABA the implementation of this model is not widely applied.

This chapter includes an overview of behavioral theory and Albert Bandura's unifying theory of behavior change as the theoretical foundation for this study. Next, this chapter will overview ASD, including the diagnostic criteria, prevalence rates, and heterogeneity. The experience of parental stress for parents of children with ASD will then be reviewed, followed by a history and description of ABA. After this, an overview of parent mediated treatments will be elucidated, followed by a summary including how parent-led ABA may fulfill a gap in the current literature regarding the need for its broader base application for children with autism as well as its impact on parents.

Literature Search Strategy

Prior to implementing this study, a thorough literature review was conducted with the following search terms and Boolean operators *autism* OR *ASD* OR *Asperger's* OR *autism spectrum disorder.* Additionally, *parent led* OR *parent directed* OR *parent implemented* OR *parent facilitated* OR *parent mediated* OR *parent Education.* Another descriptor used was *ABA* OR *applied behavior analysis* OR *behavior modification* OR *behavioral treatment.* Other common treatment modalities for autism spectrum disorder were also reviewed with the following search terms *SLP* OR *speech* OR *speech and language pathology* as well as *early intervention* OR *EI.* Another variable reviewed was *parent empowerment* OR *parent self-efficacy* OR *parental self-efficacy* OR *parent confidence.* Multiple combinations of these search terms were also used in search engines, including EBSSCO host, ProQuest, PsycINFO, PubMed, and Google Scholar. In addition to peer-reviewed articles, books, and dissertations were included as relevant to the topics studied.

Theoretical Foundation

Behavioral theory is primarily concerned with the effect stimuli have on behavior. This theory posits that human psychology can be understood through the objective observation and measurement of behavior that is visible to the naked eye. Through the lens of this theory, all learning occurs through environmental factors by a process of operant conditioning and classical conditioning. In 1913, John Watson's seminal article, "Psychology as the behaviorist views it," transformed the world of psychology, demanding psychologists reject the idea of introspection as a means of understanding human behavior. Watson's work began a slow-moving change in the field of psychology from a science that focused primarily on sensation and introspection to a science of human behavior as a means of understanding the human experience (Benjamin, 2019).

In the 1930s behavioral theory expanded with the work of B.F. Skinner (Benjamin, 2019). Skinner's work in operant conditioning was influenced by Edward Thorndike's "Law of Effect" which demonstrated behavior is likely to occur again in the future if it is followed by a pleasant experience. Operant conditioning explained this phenomenon further with the term of consequences. In behavioral theory, a consequence is a stimulus that occurs directly after a behavior. Consequences are either reinforcing or punishing, with reinforcement increasing the future probability of behavior and punishment decreasing the future probability of behavior. From his work in operant conditioning, Skinner began the experimental analysis of behavior which was a radical behavioral theory emphasizing the control and prediction of behavior (Iversen, 1992). ABA uses the principles of the experimental analysis of behavior in applied settings to

teach new skills as well as decrease problem behavior. Behavioral theory is the basis of ABA, and thus, pivotal to the foundation of this study.

Albert Bandura's unifying theory of behavior change was also fundamental to this study. Bandura proposed that self-efficacy is a mediating cognitive factor to behavior change (Bandura, 1977). Self-efficacy refers to one's belief in their ability to accomplish a particular skill or behavior (Bandura, 1977). If an individual has high self-efficacy, they believe in their ability to accomplish a particular outcome. Inversely, when an individual has low self-efficacy, they have low or no belief in their ability to accomplish an outcome and are, therefore, less likely to accomplish it. Bandura proposed four methods in which efficacy could be acquired, performance accomplishments, vicarious experiences, verbal persuasion, and emotional arousal (Bandura, 1977).

Performance accomplishment increases the self-efficacy of an individual through a process of engaging in the target skill or steps towards the target skill, demonstrating to the individual they are able to perform the behavior leading to an outcome (Bandura, 1977). Therefore, they have belief in their ability to accomplish an outcome. Vicarious experiences refer to experiencing an outcome through the performance of another person. The individual self-efficacy increases by observing someone else successfully engage in the target skill. Self-efficacy increases through verbal persuasion either through self-talk or encouragement from another person. Finally, the emotional state of an individual impacts self-efficacy (Bandura, 1977). For example, feelings of anxiety increase fear, as well as stress and anxiety, fear, and stress are not compatible with feelings of confidence, thus decreasing a person's belief in their ability to accomplish an outcome.

In 2002, Sofronoff and Farbotko conducted a study of parent mediated behavioral treatment for children with ASD utilizing pivotal response training. Results from this study not only demonstrated improvement in child skills and decreases in problem behavior, it also revealed increases in parental self-efficacy. Self-efficacy was improved as parents learned behavior change procedures, implemented them with their child, and saw immediate changes in their child's skills. Parental self-efficacy is an important variable to this study as parent-led ABA utilizes all four methods of Bandura's theory to effect behavior change for both parents and their children with ASD.

Autism Spectrum Disorder

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by deficits in social-emotional reciprocity and the presence of restrictive and repetitive patterns of behavior (American Psychiatric Association, 2013). First defined by Leo Kanner in 1943, the most recent criteria for autism in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition likened back to his original classification of young children presenting with an odd pattern of engaging with the world. Since that time, the rate of autism diagnoses increased significantly with autism now one of the most common childhood developmental disabilities. This section will review the diagnostic history and criteria of autism, prevalence rates, and heterogeneity of this disorder.

Diagnostic History and Criteria

In Kanner's (1943) original article, "Autistic disturbance of affective contact" he qualitatively described a marked phenotype of 11 children who appeared more interested

in things than people. Each child presented with perseverative interests in objects or words that were out of the ordinary for same-aged peers and did not have clear desire to engage in social relationships (Kanner, 1943). One year later, Hans Asperger published an article describing similar traits in children, but these children did not appear to be as significantly impacted as those described in Kanner's publication (Evans, 2013). Nearly 30 years after Kanner and Asperger's descriptive accounts, autism was defined in the Diagnostic and Statistical Manual, Third Edition (DSM-III) (American Psychiatric Association, 1980) as infantile autism (Volkmar & Reichow, 2014).

The criteria laid out in the DSM-III included social challenges and difficulties with language development that were not related to an intellectual disability and the presence of restrictive patterns of behavior (Volkmar & Reichow, 2014). Additionally, all these characteristics needed to be present in the child before 30 months of age. With the introduction of the DSM-III R (American Psychiatric Association, 1987), the criteria for autism broadened in both traits and age with 16 possible behavioral traits for a diagnosis of autistic disorder (with eight traits needing to be present for the diagnosis) and age of onset could occur after 36 months (Evans, 2013). The occurrence of age of onset of autism after 36 months was not well researched and few examples existed backing this diagnostic criterion, thus, in 1994 with the DSM-IV (American Psychiatric Association, 1994) the age of onset after 36 months was removed (Volkmar & Reichow, 2014).

Additional to this time, DSM-IV introduced criteria for Asperger Syndrome, which is similar in presentation to autism without the same severity and was aligned with Hans Asperger's original description of autistic psychopathy in 1944 (Masi et al., 2017).

Lorna Wing, an English psychiatrist, was instrumental in the Asperger diagnosis inclusion (Volkmar & Reichow, 2013). Wing devoted her work as a psychiatrist to the study of developmental disabilities and she did significant work regarding autism and Asperger Syndrome, coming to the same conclusion as Hans Asperger that the disorders were distinct from each other as autism is more severe as those with Asperger presentation had intact language skills (Wing, 1981). Despite this work and the inclusion of the disorder in 1994, the most recent version of the DSM did not include Asperger Syndrome as a stand-alone diagnosis (American Psychiatric Association, 2013).

The development of the DSM-5 brought significant change to the diagnostic criteria of autism, transitioning to a spectrum disorder rather than one discrete diagnosis. During this transition Asperger syndrome, pervasive developmental disorder – not otherwise specified, and childhood disintegrative disorder were all removed as distinct disorders (Volkmar & Reichow, 2013). Rather, these four disorders were absorbed into the newly defined autism spectrum disorder or social communication disorder (American Psychiatric Association, 2013). In the DSM-IV, autism was defined by three factors, deficits in social interaction, impairment in communication, and the presence of restricted and stereotyped behaviors; however, the DSM-5 introduced only two factors, impairment in social-emotional reciprocity and the presence of restrictive and repetitive behaviors (Chen et al., 2019). The criteria for autism spectrum disorder in the DSM-5 (American Psychiatric Association, 2013, pp. 50-59) is now as follows:

A. Persistent deficits in social communication and social interaction across multiple contexts, as manifested by the following, currently or by history:

1. Deficits in social-emotional reciprocity
2. Deficits in nonverbal communicative behaviors used for social interaction
3. Deficits in developing, maintaining, and understanding relationships

B. Restrictive and repetitive patterns of behavior, interest, or activities, as manifested by at least two of the following, currently or by history:
    1. Stereotyped or repetitive motor movements, use of objects, or speech
    2. Insistence. On sameness, inflexible adherence to routines, or ritualized patterns of verbal or nonverbal behavior
    3. Highly restricted, fixated interests that are abnormal in intensity or focus
    4. Hyper- or hyporeactivity to sensory input or unusual interests in sensory aspects of the environment
C. Symptoms must be present in the early developmental period (but may not become fully manifest until social demands exceed limited capacities, or may be masked by learned strategies in later life).
D. Symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning.
E. These disturbances are not better explained by intellectual disability or global developmental delay.

Prevalence

Presently, autism occurs in 1 in 54 children (CDC, 2019). This rate increased since the 2014 estimates of 1 in 59 children and is starkly different from the 1992 rate of 1 in 150 children (Sheldrick & Carter, 2018). In fact, when autism was newly defined in the 1940s the best prevalence estimate was 1 in 100,000 (Nevison & Parker, 2020). The State of California autism prevalence rate is 1.5% and is slightly lower than the national average of about 2% (Nevison & Parker, 2020). The increasing rates of autism diagnoses over the last 30 years is accredited to more sensitive diagnostic practices, increased awareness, as well as genetic and environmental factors (Kroncke et al., 2016). While the exact causes are not completely known, Nevison and Parker (2020) detailed that autism rates amongst some communities is slowing or decreasing, particularly with wealthy White Americans. However, with the newly adapted DSM-5 criteria for ASD (American Psychiatric Association, 2013), it will be interesting to see if the change in diagnostic criteria contributes to decreasing or increasing rates of the disorder in coming years.

Heterogeneity

Hallmark to ASD is the heterogeneity of this population (Lombardo et al., 2019). According to Masi et al. (2017) there are three primary factors that contribute to autism diversity, these include genetics, gender, and comorbidities. It is estimated upwards of 1000 genes are responsible for autism susceptibility (Lombardo et al., 2019) and there is strong evidence for heritability of the disorder based on numerous twin studies (Tick et al., 2016). However, even within family, severity of autism is diverse. While one sibling with autism may be severe on the autism spectrum as evidence by decreased language skills, low intellectual ability, and high rates of repetitive behaviors, the other sibling may

be considered on the high end of the spectrum, with language skills intact, low rates of repetitive behaviors, and have average intellectual functioning (Frazier et al., 2014).

Gender difference is another area contributing to the heterogeneity of autism. Studies demonstrate a four to one ratio of males to females with ASD (Maenner et al., 2020). Additionally, many females with autism show greater severity in symptoms than male counterparts (Kroncke et al., 2016); however, controversy exists regarding this phenomenon as there is recent research demonstrating masking symptoms (or camouflaging) in females without a severe presentation (Hull et al., 2020). Females are believed to camouflage their autistic traits as a means of assimilating, thusly their symptoms are not identified early in life leading to an overrepresentation of male traits in the autism spectrum diagnostic criteria (Kroncke et al., 2016). The range of female presentations contribute to the vastness of this disorder, as well as the need for more female representation in studies in order to understand the extensive phenotype in females with autism.

The co-occurrence of psychiatric disorders, intellectual disability, and other medical conditions is significant in ASD (Mannion & Leader, 2013; Wolfers et al., 2019). Depression, anxiety, and attention deficit hyperactive disorder (ADHD) are the most common psychiatric conditions cooccurring with autism (Lecavalier et al., 2019). In their 2016 study, Bitsika et al. evaluated individuals with autism for comorbid anxiety or depression with results demonstrating 45% of the sample having either anxiety or depression or both. This is consistent with other studies with results demonstrating upwards of 70% of the autism population having cooccurring anxiety or depression (van

Steensel & Heeman, 2017). ADHD occurs in anywhere from 50%-70% of the autism population (Brookman-Frazee et al., 2018), in fact Brookman-Fraze et al.'s (2018) study evaluating comorbidity in ASD demonstrated 92% of their sample also had a non-ASD diagnosis.

While the exact percentage of comorbid intellectual disability is not known, it is estimated to occur in approximately 30%-70% of the autism population, ranging from borderline to profound intellectual disability (Maenner et al., 2020; Matson & Shoemaker, 2009). Intellectual functioning is of particular importance as IQ is shown to be the most significant predictor in positive treatment outcomes for people with autism (Kroncke et al., 2016; Tiura et al., 2017). Finally, medical conditions are also common, including seizure disorders, sleep disorders, metabolic disorders, and gastrointestinal disorders (Bauman, 2010; Croen et al., 2017; Mannion & Leader, 2013). The presence of any of these medical conditions is shown to increase behavioral problems such as aggression, self-injury, and property destruction due to the low threshold to tolerate additional environmental demands (Bauman, 2010).

Parental Stress

Parents of children with autism are one of the most stressed parent populations (Lai & Oei, 2014; McAuliffe et al., 2017). Many studies have demonstrated parents of children with autism experience more stress than parents with typically developing children or other developmental disabilities (Hu et al., 2019; Padden et al., 2019; Pastor-Cerezuela et al., 2016). Understanding what contributes to higher stress levels in these parents is important, as well as what mitigates stress, as parental stress is linked to poorer

treatment outcomes for children (Strauss et al., 2012). For this reason, this section will review the impact of parental stress on a wide range of treatment outcomes for children, and the contributing and mitigating factors to parenting stress for parents of children with autism.

Parental Stress and Child Treatment Outcomes

Carlson-Green et al. (1995) conducted a study on behavioral and cognitive outcomes for pediatric brain tumor patients. While this study evaluated many factors contributing to the identified outcomes, parental stress was one variable that negatively impacted behavioral and cognitive functioning post recovery. Similarly, Robbins et al. (1991), Osborne et al. (2008), and Strauss et al.'s (2012) all demonstrated high parental stress negatively impacted treatment efficacy for young children with autism. Parental experience of stress, particularly for children with autism, can impede treatment outcomes, thus, it is an important factor to evaluate when beginning treatment for this population. In fact, the Osborne et al. study showed that children whose parents had higher parental stress did 50% poorer than their counterparts whose parents did not exhibit high stress. For this reason, it is vital to understand what factors contribute to and mitigate parental stress. This way clinicians can further support families in treatment implementation in a holistic manner that addresses both child and parent outcomes.

Factors Contributing to Parental Stress

Child and parental factors contribute to levels of parental stress of children with autism. Autism severity, child IQ, and the presence of behavioral problems are factors consistently shown to impact parental stress (Pastor-Cerezuela et al., 2016; Postorino et

al., 2019; Schiltz et al., 2018). Parental factors include resilience, coping styles, and familial support systems (Ilias et al., 2018; Schiltz et al., 2018; Wang et al., 2020). These variables will be briefly reviewed next.

The most recent version of the DSM has categorized autism severity on a three-level scale, with a rating of one being the least impacted and a rating of three being the most impacted, or most severe (American Psychiatric Association, 2013). Social communication and restrictive and repetitive behaviors are rated separately on this scale; thus, a child can be significantly impaired in one area of autism and not as impaired in the other. An individual with a rating of three in the social communication area is marked by extreme deficits in social understanding and communication. An individual with a rating of three in the restrictive and repetitive area exhibits repetitive patterns of behavior that interfere with most aspects of life or exhibit extreme rigidity in patterns of functioning (Kroncke et al., 2016). Therefore, parents who have children with more severe forms of autism experience greater caregiving burdens than their counterparts who have children with less severe presentations (Iadarola et al., 2018). In their 2016 study, Pastor-Cerezuela et al. evaluated autism severity level as a predictor for parenting stress of children with autism. Results of this study revealed a significant relationship between autism severity and the presence of parenting stress and is consistent with similar studies (Hsiao, 2016; Vasilopoulou & Nisbet, 2016), with more severe autism predicting higher stress levels.

As mentioned previously, there is a high comorbidity rate of intellectual disability and ASDr (Masi et al., 2017). Intellectual disability predicts parenting stress much like

autism severity (Pastor-Cerezuela et al., 2016; Postorino et al., 2019). The more profound the intellectual disability the greater the caregiver burden, as individuals with greater intellectual disability are more reliant on others to get their basic needs met. In addition to this, intellectual disability impedes capacity for learning and is indicative of lifelong care from external sources (Minnes et al., 2007) and greater cost on families (Leigh & Du, 2015), and consequently, leads to increased anxiety about their child's future (Fletcher et al., 2012).

The presence of problem behavior is hallmark in ASD (Argumedes et al., 2018). Problem behaviors are idiosyncratic for every person with autism but could include topographies such as physical aggression, self-injury, property destruction, and dangerous elopement (Kroncke et al., 2016). The presence of any one of these behaviors cause disturbance amongst the family, increase supervision requirements, and increase parenting stress (Iadarola et al., 2018; Postorino et al., 2019; Shiri et al., 2020). The impact of problem behaviors on family functioning is significant and numerous studies have demonstrated how this leads to higher parental stress levels (Argumedes et al., 2018; Postorino et al., 2019; Shiri et al., 2020), especially as their children get older and larger as they have more potential to cause harm (Schiltz et al., 2018).

Resilience refers to a person's ability to recover from emotional or mental challenges quickly (Aithal et al., 2020). Lack of resilient traits in parents of children with autism consistently proves to influence parenting stress, whereby less reliance significantly increases parenting stress (Ilias et al., 2018, 2019; Kuhlthau et al., 2020). Resilient traits include the ability to accept one's circumstances (Ilias et al., 2019), adapt

to stressful events (Kuhlthau et al., 2020), and for parents of children with autism to learn about what autism is and understand how it impacts their child (Karst & Van Hecke, 2012). The behavioral presentation of a child with autism can be unpredictable and when parents are unable to accept, adapt, and learn about these circumstances, their stress levels increase (Ilias et al., 2018).

Coping strategies can mitigate or magnify stress, and commonly these strategies are defined as either active or avoidant (Bozkurt et al., 2019). Oftentimes, receiving a diagnosis of autism is stressful for parents due to uncertainty about what it is, ambiguity about their child's future, and how to best parent their child (Reed & Osborne, 2012). Upon receiving the diagnosis, parents engage in active or avoidant coping, with active coping including strategies such as joining a support group, learning about the diagnosis, and seeking out resources (Ang & Loh, 2019; Bozkurt et al., 2019). Whereas avoidant coping, in the context of autism, includes not acknowledging the differences of one's child, blaming oneself, and withdrawing socially, to name a few (Lai & Oei, 2014; McAuliffe et al., 2017). This type of coping for parents of children with autism is linked to both depression (Ang & Loh, 2019) and higher stress levels than parents who utilize active coping strategies (Ilias et al., 2018). These findings underlie the importance of educating parents about their child's autism diagnosis and helping them navigate available support systems (e.g., support group, advocacy groups, treatment options) from the outset.

Finally, family support systems can significantly impact parental stress (Marsack & Samuel, 2017). Social support includes numerous systems such as familial, school,

community, friend, and spousal support. When systems such as these are intact, parenting stress lessens for parents of children with autism (Ilias et al., 2018). Spousal support, in particular, can reduce parenting stress for both partners (Chong & Kua, 2017), as there is a social network readily available when parenting partners are on the same page regarding addressing the unique needs of their child (Santoso et al., 2015). Inversely, lack of social supports across these various contexts consistently reveals to be a contributing factor to heightened parenting stress for parents of children with autism (Bozkurt et al., 2019; Ilias et al., 2018; Vasilopoulou & Nisbet, 2016).

Mitigating Parental Stress

Just as lack of resilient traits, maladaptive coping strategies, and diminished social supports increases parenting stress for parents of children with autism, any one of these constructs in place can assist in reducing parenting stress (Ang & Loh, 2019; Bozkurt et al., 2019; Marsack & Samuel, 2017). Another important variable that mitigates parenting stress for parents of children with autism is parenting self-efficacy (Smart, 2016). Self-efficacy refers to the belief one has about their ability to attain a skill or goal (Chong & Kua, 2017). According to Albert Bandura (1977), self-efficacy is a cognitive process that mediates behavior change, in that the belief a person has in their ability to accomplish something will assist in the behaviors necessary to complete that goal. The role of self-efficacy in parenting for children with autism is an important influence on parenting stress and this concept will be reviewed next.

In 2016, Smart's dissertation revealed parents of children with autism exhibited significantly reduced parenting self-efficacy compared to their counterparts whose

children had down syndrome, behavioral disorders (e.g., ADHD, bipolar disorder, etc.), or were typically developing. Self-efficacy for parents of children with autism is important as it pertains to the belief the parent has about their ability to effectively parent their child. However, this can be particularly challenging for parents of children with autism as their child's behavior can be unpredictable and difficult to manage. Additionally, a core deficit in autism is lack of social reciprocity and understanding, thus, parents may not experience the same amount of affection and engagement from their child with autism than they would from a typically developing child, decreasing the parent-child bond (Argumedes et al., 2018; Chong & Kua, 2017). These features negatively impact a parent's belief in their parenting skills (Shiri et al., 2020).

Importantly, parenting self-efficacy has been shown to improve with subsequent decreases in parenting stress through various parent training program for parents of children with autism (Sofronoff & Farbotko, 2002; Sofronoff et al., 2004; Shiri et al., 2020). Iadarola et al. (2018) compared two groups of parents with children with autism, one receiving a psychoeducation program and the other receiving a hands-on parent training program that was behaviorally based. While both treatment groups made gains, the behaviorally based parent training group made significantly more, increasing their parent competence and self-efficacy, with decreased parent stress (Iadarola et al., 2018). Similarly, Sofronoff and Farbotko (2002) conducted a parent training program for parents of children with Asperger's. The results of the treatment revealed significant decreases in problem behavior, as well as increases in parenting self-efficacy. In 2020, Shiri et al. also conducted a study evaluating the effectiveness of a family-based management program

targeting behavior management for children with autism. At the conclusion of treatment, difficult behaviors had significantly decreased, parent stress significantly decreased, with significant increases in parenting self-efficacy (Shiri et al., 2020).

Parents' confidence in their ability to manage problem behavior as well as increase their child's skills is a tool they always have. According to Bandura (1977), one way self-efficacy is improved is through experiences; therefore, each experience in positive management of problem behavior or skill attainment increases confidence in the parent's ability to do this again. While there are many child and parent factors that contribute to parenting stress, increasing parental self-efficacy can mitigate some of these factors, particularly child factors (Shiri et al., 2020) as has been detailed in the above studies. In addition to this, parental stress and parental self-efficacy are strongly correlated (Hastings & Symes, 2002), therefore, if self-efficacy is increased stress is decreased (Iadarola et al., 2018) and lower stress levels can optimize treatment outcomes for children with autism (Osborne et al., 2008).

Applied Behavior Analysis

Applied behavior analysis (ABA) is the treatment of choice to remediate skill deficits and problem behaviors for young children with autism (Irwin & Axe, 2019). ABA evolved from B.F. Skinner's experimental analysis of behavior, which utilizes the principles of operant conditioning to shape, change, and diminish behavior (DeGrandpré & Buskist, 2000). In 1987, Lovaas utilized the principles of ABA in an early intensive behavioral treatment for children with autism with encouraging results. Many studies since that time were conducted to evaluate the efficacy ABA treatment for autism

(Eikeseth et al., 2007; Makrygianni et al., 2018; Sallows & Graupner, 2005) and is now classified as an evidenced based treatment for individuals with autism. The following section will review the utilization of ABA treatment, the subsequent laws that passed mandating insurance companies cover ABA treatment for individuals with autism, and the typical treatment format of this methodology.

ABA Treatment and Autism

ABA utilizes the principles of operant conditioning to teach skills. An important concept in ABA is the behavior chain consisting of the antecedent (the stimulus occurring before a behavior), the behavior, and the consequence (the stimulus occurring after the behavior) (Cooper et al., 2020). Consequences include reinforcement and punishment. Reinforcement is the process by which a stimulus immediately following a behavior increases the future probability of that behavior (Cooper et al., 2020). Punishment occurs when a stimulus immediately following a behavior decreases the future probability of that behavior happening again (Cooper et al., 2020). An important teaching methodology in ABA is knowns as discrete trial instruction, whereby trials are presented in a directed, massed format allowing for rapid acquisition of skills (Sigafoos et al., 2019). Naturalistic teaching is another common method utilizing the behavior chain to teach skills in a more natural setting with naturally occurring reinforcers. While this is not an exhaustive detailing of behavior analytic principles in ABA, it provides a basic background. The usage of ABA treatment for children with autism, utilizing principles such as these, is elucidated next.

After Lovaas' (1987) landmark work, more studies soon followed with researchers evaluating the efficacy of ABA for young children with autism. Eikeseth et al. (2002) conducted a study on two groups of children with autism one receiving behavioral treatment and the other receiving eclectic treatment. Results indicated that the children receiving the behavioral treatment made greater gains on the outcome measure than the eclectic group. Similarly, Sallows and Graupner (2005) utilized ABA treatment for young children with autism, with one group receiving treatment at a clinic and the other group receiving parent directed treatment at their home. Results indicated that both groups made significant gains on the IQ measure used. Additional studies conducted produced similar findings to these described (Eikeseth et al., 2002; McEachin et al., 1993) and several meta-analyses have aggregated these results, these will be described below.

Eldevik et al.'s (2009) meta-analysis included nine studies evaluating the effect size of full-scale IQ and adaptive behavior based on the outcome measures used in their included research. The effect size was calculated with Hedge's *g* and reveled a 1.10 effect size for change in full-scale IQ which is considered a large effect and a .66 effect for adaptive behavior which is moderate (Eldevik et al., 2009). Results of this meta-analysis were robust and strengthened the efficacy of ABA treatment for young children with autism. Soon after this, Virués-Ortega (2010) conducted a meta-analysis including 22 studies evaluating ABA treatment for young children with autism with similar robust results. These authors evaluated many outcome measures including language, non-verbal IQ, social functioning, and daily living skills, the effect sizes ranged from moderate to

large (Virués-Ortega, 2010). Most recently, Makrygianni et al. (2018) meta-analysis included 29 studies with effect sizes ranging from very small for daily living skills, to large for expressive language skills. Results from these three meta-analyses support the evidence-base of ABA treatment for improving skill deficits for children with autism, particularly in the areas of communication, intellectual abilities, social skills, and adaptive living skills.

While for many children with autism it is clear ABA treatment is very effective, there is also a sizeable population of children with autism for whom ABA treatment is moderately, minimally, or not effective (Sallows & Graupner, 2005; Smith et al., 2015; Tiura et al., 2017). Smith et al. (2015) detailed that approximately 30% of children with autism are considered rapid learners in regard to response to ABA, about 50% are moderate learners, and 10-20% make little to no progress in treatment. For this reason, it is important to understand what factors contribute to greater success in treatment outcomes. Lovaas noted in his 1987 research that children with lower IQ at the start of treatment did poorer than children with a higher IQ. This phenomenon is a consistent finding across studies (Eikeseth et al., 2002; Sallows & Graupner, 2005). In addition to this variable, age of entry is another factor impacting treatment outcomes, whereby children entering treatment at younger ages exhibit greater success (Tiura et al., 2017). Tiura et al. (2017) conducted an in-depth analysis of variables influencing ABA treatment outcomes for children with autism, with cognitive functioning proving to be the most significant predictor of positive treatment outcomes. Age at entry influenced treatment outcomes as well, and interestingly treatment hours did not significantly predict

treatment outcomes (Tiura et al., 2017). Importantly, as referenced earlier, a significant proportion of children with autism have comorbid intellectual disability (Masi et al., 2017) and for this reason it is vital to explore how to best support this heterogenous population and their family.

Autism Insurance Law

Throughout the last 11 years all 50 States passed autism insurance laws requiring insurance agencies to cover behavioral health treatment for individuals with ASD (Autism Speaks, 2019). In 2011, the State of California passed a law mandating insurance companies cover ABA treatment for individuals with autism regardless of age (S.B. 946, 2011). Up until this time, families sought treatment either through private pay or through California's Regional Center system (California State Dept. of Developmental Services, 1999). The passing of this law was considered a momentous milestone for the autism population in California, guaranteeing families and their children with autism could receive needed supports. Now upon receiving a diagnosis of autism, young children have access to treatment options. This access facilitates the teaching of pivotal skills such as verbal development, which not only improves the quality of life for the child but also for their parents as they are readily able to understand the needs of their children (McAuliffe et al., 2017). ABA treatment is available for all people with autism in the State of California. The treatment formats reviewed next primarily focus on the implementation of ABA for young children.

Treatment Format

There are many formats by which ABA treatment is implemented, including school-based, clinic-based, and home-based options. School-based methods are typically done in a special education format with a consultant who specializes in ABA (Martinez et al., 2016). Clinic and home-based options are typically composed of what is considered a three-tier model, two-tier model, or a consultant model (The Council of Autism Service Providers, 2014). These models will be briefly reviewed next.

A three-tier model has a certified or licensed clinician called a BCBA® who oversees the treatment program, followed by a Board Certified Assistant Behavior Analysts® (BCaBA®) (or someone with similar education) who assists with treatment oversight and implementation guided by the BCBA. A paraprofessional directly implements the treatment program under the guidance and supervision of the BCBA and BCaBA and these individuals are called a Registered Behavior Technician® (RBT®) (The Council of Autism Service Providers, 2014). A two-tier model is composed of a BCBA and an RBT, thusly, in this model the BCBA provides more treatment hours than in the three-tier model (The Council of Autism Service Providers, 2014). Finally, in the consultant model a BCBA, or a clinician with similar education (e.g., clinical psychologist), works directly with the parents or caregivers to implement behavioral strategies with their child(ren) (Kratochwill & Bergan, 1990).

This consultant model is the most conducive to parent mediated treatment, whereby, parents are taught the skills and strategies associated with their child's treatment plan to implement in a naturalistic way through their typical daily routines (Koegel et al., 2002). Brookman-Frazee (2004) evaluated the efficacy of two different

philosophies in treatment, the clinician-directed model and the parent-clinician partnership model. The clinician-directed model is described as an expert model where the clinician makes the decisions in treatment and guides the overarching goals for what will be accomplished in treatment, this model is conducive to the three- and two-tier model described earlier and can also be applied in the consultant model. The parent-clinician partnership model emphasizes a collaborative approach in treatment where the parents are the expert of their child, and the clinician comes alongside the parent to teach strategies and skills associated with the needs of their child in the context of the family system (Brookman-Frazee, 2004). In this study, parents in the parent-clinician partnership model demonstrated reduced stress levels and greater parental confidence than the parents in the clinician-directed model (Brookman-Frazee, 2004). Additionally, children who were part of the parent-clinician partnership model exhibited greater affect, engagement, and responding than their counterparts in the clinician-directed model (Brookman-Frazee, 2004). Studies evaluating the efficacy of consultant models, like the one just described, specifically parent mediated approaches, will be more thoroughly reviewed in the next section.

Parent Mediated Treatment

Parent mediated treatment is a broad range of treatment methodologies whereby parents work closely with a licensed, certified, or trained clinician to learn the skills and tools needed to implement the target treatment with their child (Bearss et al., 2015). This method of treatment is supported in speech and language pathology (DeVeney et al., 2017), early intervention (Ruppert et al., 2016), with some emerging evidence in

cognitive behavior therapy (Cook et al., 2019); and while there is literature supporting this treatment methodology in behavioral models (Anan et al., 2008; Rogers et al., 2019), parent mediated applied behavior analysis historically has not evaluated the effects of this model of treatment on caregivers (Factor et al., 2019), nor is it widely implemented. The following section will explicate the research base of parent mediated therapies, such as speech and language pathology, as well as parent mediated behavioral treatments.

Parent Mediated Therapies

DeVeney et al. (2017) conducted a systematic review of literature evaluating the effectiveness of parent mediated speech and language pathology and clinician-directed speech and language pathology for late-talking toddlers. Both methods of implementation were found to be significantly effective at improving the language development of the young children included in the studies ($N = 175$) (DeVeney et al., 2017). Another finding of this review was greater improvement in the parent mediated models over the clinician-directed models for some of the studies. The Hanen model is a well-known speech and language pathology program centered around the training and equipping of parents for children 0-5 years of age. This parent mediated speech program has consistently proven to effectively improve child language development, as well as improve parents' confidence in their ability to effect positive change in their children (Rose et al., 2020; Senent-Capuz et al., 2020; Sokmum et al., 2017). In addition to speech and language pathology, early intervention services use of parent mediated treatment have yielded positive results (Brown & Woods, 2016; Ruppert et al., 2016; Windsor et al., 2019). Recently, Windsor et al. (2019) conducted a single subject design study across three

participants evaluating the effectiveness of parent mediated treatment in an early intervention program focused on communication and motor skills. Visual analysis of the multiple baseline design study revealed very promising results with increased communication and motor skills from baseline to intervention to maintenance phases of treatment (Windsor et al., 2019).

In addition to the above-mentioned studies, there is promising research in the area of parent mediated cognitive behavior therapy (Cook et al., 2019; Lebowitz et al., 2014). In fact, Cook et al. (2019) included children with high functioning autism and comorbid anxiety in their study, utilizing parent mediated methods to implement cognitive behavior therapy. Interestingly, initial post-treatment outcomes did not reveal a significant effect; however, 3-month post treatment follow up did reveal a significant reduction in internalizing behaviors (Cook et al., 2019). While this is an area needing continued research, it demonstrates the possibilities of parent mediated treatments across a range of methods and diagnoses.

Parent Mediated ABA

Behaviorally based parent training is a common methodology for parents of children with autism (Postorino et al., 2017). Many of the parent training programs focus on behavior management (Bearss et al., 2013; Pennefather et al., 2018; Scahill et al., 2016) and facilitation of communication (Johnson et al., 2016; Meadan et al., 2009) with positive results. Bearss et al. (2015) described parent training as a broad range of methods of treatment delivery for ASD, comprising parent support which includes psychoeducation and is more knowledge based with the child indirectly benefiting from

this model. Parent implemented models are skill focused and the child directly benefits from the treatment (Bearss et al., 2015). Bearss et al. further describe parent mediated treatments as a focus on core deficits of autism for skill remediation.

Sofronoff and Farbotko (2002) evaluated the effectiveness of a parent management program for children ages 6-12 with Asperger's syndrome. Results from this parent mediated program revealed significant decreases in the child's problem behavior as well as significant increases in parental self-efficacy. Two years after this study, Sofronoff et al. (2004) set out to research a similar procedure but added an additional variable, social skills, to determine if the positive results from the first study could be replicated. As with the first study, child problem behavior significantly decreased, social skills significantly increased, and parental self-efficacy increased, per parent report.

Smith et al. (2000) utilized a single-subject design study to evaluate the effectiveness of a parent-implemented ABA program for children with autism or pervasive developmental disorder, not otherwise specified. The model of this study included parents who directed the treatment implementation of their child's ABA program with direct care paraprofessionals assisting with the implementation for up to 26 hours of treatment each week. Additionally, the parents and the paraprofessionals attended an intensive training along with supervisory support from experts in the field (Smith et al., 2000). Visual analysis of the data indicated increases in child's skills; additionally, parents reported decreased parenting stress, more confidence in managing their child's problem behaviors, and a general optimism about the program and their child's functioning and future (Smith et al., 2000). Sallows and Graupner (2005)

investigated a similar model of treatment, comparing a clinic directed program and a parent directed program with similar outcome for both treatment groups. This study, however, was a group design study including 23 participants with autism (Sallows & Graupner, 2005). Results from the statistical analysis revealed significant changes in outcome measures for both groups, including full scale IQ and adaptive functioning (Sallows & Graupner, 2005).

In 2008, Anan et al. investigated the feasibility of an intensive family training model, whereby BCBA's worked with 72 parent-child dyads for 12 consecutive weeks, teaching them to implement behavioral procedures with their young child with autism. After the 3 months of treatment concluded, significant changes were observed across all outcome measures (e.g., Mullen Scales of Early Learning, Vineland Adaptive Behavior Scales) (Anan et al., 2008). Notably, significant and positive changes were made by the young children with autism in a short period of time, demonstrating the feasibility in both implementation and cost for an intensive program such as this one. Koegel et al. (2002) also conducted an intensive parent training model across one week for a total of 25 hours. These researchers utilized a single-subject design study across five participants with autism and their parents. Visual analysis post training indicated increases in skills for the children with autism and, in addition to this, parents reported greater confidence in their ability to effectively parent their child (Koegel et al., 2002). These results also demonstrate the feasibility of an intensive parent training model that is both clinically and cost effective.

In addition to this, many studies have demonstrated the effectiveness of parent implemented behavior reduction procedures for individuals with autism and intellectual disability (Bearss et al., 2013; Harrop, 2015; Postorino et al., 2017; Scahill et al., 2016). In fact, many studies aimed at parent implemented behavior reduction included components where parents conducted a functional behavior assessment or functional analysis with the support of clinician (Postorino et al., 2017), demonstrating parents' ability to effectively implement complex procedures. Recently, there has been much work around the feasibility of parent mediated telehealth treatment for individuals with ASD, producing positive results across a multitude of outcome measures, including communication (Meadan et al., 2016), problem behaviors (Kuravackel et al., 2018; Pennefather et al., 2018), and parental self-efficacy (Kuravackel et al., 2018). Likewise, Pivotal Response Treatment (PRT) and Early Start Denver Model (ESDM) are both behaviorally based methodologies incorporating parents into treatment either in a parent mediated model (Bradshaw et al., 2017; Hardan et al., 2015; McGarry et al., 2020; Rogers et al., 2019) or with a strong parent training component (Lin & Koegel, 2018; Sinai-Gavrilov et al., 2020). While there is clear evidence for the efficacy of parent mediated treatment there is still need for dissemination and implementation of this treatment model (Kuravackel et al., 2018; Pennefather et al., 2018). Bearss et al. (2015) further expounds on this need by describing the heterogeneity of ASD, thus expanding the range of treatments options that should be explored and utilized with this population. The present study will contribute to the literature base for parent mediated models

through the analysis of a parent mediated applied behavior analysis treatment called parent-led ABA. The details of this model will be elaborated upon in the next chapter.

Summary

This chapter reviewed ASD, the experiences of parental stress for parents of children with autism, applied behavior analysis treatment, and the utilization of parent mediated methods for children with autism. Specifically, the heterogeneity of ASD was explored, including the complexity of comorbid diagnosis for this population, thus, necessitating the need for more and varying treatment options based on individual presentation (Bearss et al., 2015). Options in treatment are also important to investigate as applied behavior analysis is very effective for approximately 30% of the population, leaving a large proportion making moderate or no gains with this treatment modality (Smith et al., 2015). The inclusion of more parent mediated models, such as parent-led ABA can meet this need, as parents are equipped to effectively parent their child regardless of the individual gains made in treatment. Meaning, even if the child makes moderate or no gains, the parents can acquire new behavioral skills since whereby they effectively manage problem behavior and teach skills.

In addition to this, parental stress of this population was reviewed. Findings were presented regarding the mitigating value of parenting self-efficacy in reducing parental stress associated with ASD. Specifically, the application of parent training and parent mediated models have demonstrated the ability to increase parental self-efficacy, subsequently reducing parenting stress. In fact, Argumedes et al. (2018) sites how more

research is needed in the area of parenting self-efficacy in reducing parenting stress associated with autism.

Finally, a parent mediated model of treatment for children with autism was explained. The success of this model of treatment was established as effective at increasing skill sets, as well as decreasing problem behaviors. Gillespie-Lynch and Brezis (2018) and Bearss et al. (2015) both urge for future research focusing on the continued dissemination and implementation of parent mediated models. Thus, the current research has this aim; as well as investigating the effectiveness of parent-led ABA for parents of children with autism specifically at increasing parenting self-efficacy and reducing parental stress. The next chapter will explain in detail the methodology of this research.

Chapter 3: Research Method

Introduction

The purpose of this study was to evaluate the efficacy of parent-led ABA treatment for children with autism and their parents. Specifically, outcomes on both a norm-referenced assessment and a criterion referenced assessment were examined for children receiving parent-led ABA, as well as for children receiving practitioner-delivered treatment as a comparison. For the parents of children with autism included in this research, parental self-efficacy and parental stress was analyzed. This chapter will review the research design and rationale, the methodology, including the population, sampling procedure, and procedures for recruitment. Next, an explanation of the instruments will be provided, followed by a review of parent-led ABA and practitioner delivered treatment as it is implemented by the agency whose archival data were analyzed for the purposes of this study. Threats to validity will follow this section, concluding this chapter with an outline of the ethical procedures.

Research Design

The nature of this study was a quasi-experimental, nested design, which utilized archival data to evaluate the research hypotheses. This methodology enabled the comparison of two groups, parent-led ABA and practitioner delivered ABA, as well as an independent examination of each group on the outcome measures. A nested design allowed for the analysis of the between-subjects and within-subjects variables and the four dependent variables.

This study included two independent variables, one between-subjects variable and a repeated measures variable. The between-subjects variable was treatment type and includes two levels: parent-led ABA or practitioner-led ABA. The dependent variables were the Vineland Adaptive Behavior Scales, Third Edition (Sparrow et al., 2016), the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP) (Sundberg, 2008), the Parental Stress Scale (Berry & Jones, 1995), and a parenting confidence survey.

Methods

Participants

Data for this study were obtained from a behavior health organization in a metropolitan area of California that manages the behavioral treatment for individuals with autism spectrum disorder (ASD) and other developmental disabilities. These archival data included descriptive data and pre-treatment and reassessment scores on the scales used to measure progress during treatment implementation for participants. In addition to these, parent confidence scores and parent stress scores were obtained. The population included in this study were children between the ages of 3 years and 7 years of age with a diagnosis of ASD. All children included in this study received an ASD diagnosis under the DSM-5 or the DSM-IV criteria.

Sampling and Sampling Procedure

This study utilized a secondary data sampling method (Johnston, 2014). Secondary data analysis is a systematic and valid process to analyze already existing data to answer research questions (Johnston, 2014). The data obtained for this study were

outcome data collected by this organization at the initial assessment and each subsequent treatment authorization occurring every 6 months. Outcome data include the Vineland Adaptive Behavior Scales, Third Edition (Sparrow et al., 2016), Verbal Behavior Milestones Assessment and Placement Program (Sundberg, 2008), Parental Stress Scale (Berry & Jones, 1995), a parenting confidence survey developed by the organization, number of treatment hours received during the previous 6-month treatment authorization, and number of goals mastered during the previous 6-month treatment authorization.

Procedure for Recruitment, Participation, and Data Collection

Individuals with ASD are referred to the organization whose data were analyzed for this study through their insurance carrier, as is mandated through Senate Bill number 946 of California (2011). Once a referral is received, an intake assessment is conducted at which time the Vineland, parent confidence scale, and PSS are taken via parent report through an online system. Once the intake assessment is complete, children are then referred to an applied behavior analysis (ABA) agency for treatment for an initial behavioral assessment and subsequent 6-month treatment authorizations. At every 6-month authorization this organization aggregates outcome data for each client, including the norm-referenced assessments mentioned previously, criterion referenced assessment, treatment hours utilized, and treatment goals mastered.

The data were accessed once all IRB requirements were met and approval to move forward with the study was granted (IRB approval number 04-12-21-0822120). Permission to access the data were sought through the agency's Vice President, whereby a written agreement was signed by both the Vice President and principal investigator.

Instrumentation

Vineland Adaptive Behavior Scales

The Vineland Adaptive Behavior Scales, Third Edition is a norm-referenced assessment evaluating adaptive skills and was developed by Sara Sparrow, Domenic Cicchetti, and Celine Saulnier in 2016. Adaptive skills are defined as everyday abilities people need to function in their environment. Adaptive behaviors are important to measure amongst the developmental disabilities population as it provides insights into skills a person can do or not and help frame treatment goals. The Vineland Adaptive Behavior Scales has been utilized as an outcome measure across numerous studies for individuals with developmental disabilities (Makrygianni et al., 2018; Postorino et al., 2019; Scahill et al., 2016). The Vineland can be administered via paper or through an online system and takes approximately 20-40 minutes to complete. This instrument has been normed with people from birth to 90 years of age and was standardized across four geographic areas of the United States with 2560 people (Cary & Sullivan, 2021). The Vineland has strong reliability with a coefficient alpha ranging from .83 to .98 with the Interview Form and .90 to .99 for the Parent/Caregiver Form (Cary & Sullivan, 2021). Validity has been established for the Vineland through comparison of assessments also measuring adaptive skills, through the review of special study groups, and through the evaluation of test content (Cary & Sullivan, 2021).

The Vineland Adaptive Behavior Scales – Third Edition includes three domains, Communication, Daily Living Skills, and Socialization with two optional domains, Motor Skills and Maladaptive Behavior (Cary & Sullivan, 2021). The coefficient alpha's for the

Parent/Caregiver Form domains are as follow: Communication is .94, Daily Living Skills is .93, Socialization is .97, and the Motor Skills is .91 (Sparrow et al., 2016). The test-retest reliability for the domains are .88 for Communication, .85 for Daily Living Skills, .79 for Socialization, and .90 for Motor Skills (Sparrow et al., 2016).

Verbal Behavior Milestones Assessment and Placement Program

The Verbal Behavior Milestone Assessment and Placement Program (VB-MAPP) is a criterion referenced assessment developed by Mark Sundberg in 2011. The VB-MAPP is behavioral assessment that requires direct observation of skills by a person who is trained in the implementation procedures for this tool. It measures verbal skills and social pragmatic skills and is based on the development milestones of children between the ages of 18-months and 48-months. It is comprised of three levels with a total possible score of 160; level 1 measures verbal and social skills based on developmental milestones between ages 18-months and 24-months, level 2 measures developmental milestones between ages 24-months and 36-months, and level 3 measures developmental milestones between ages 36-months and 48-months. The VB-MAPP has been used in other studies with people with developmental disabilities to measure the effectiveness of treatment (Mason et al., 2018; Montallana et al., 2019; Saaybi et al., 2019). Reliability for this behavioral assessment has been established with studies evaluating inter-observer agreement (IOA) between implementers, resulting in IOA scores between 83% and 93% (Meadows & Sheperis, 2017). Sundberg and Sundberg (2011) established validity of the intraverbal section of the VB-MAPP through an evaluation of children with autism and

typically developing children, comparing their results on this component of the instrument.

Parental Stress Scale

The Parental Stress Scale (PSS) is an 18-item measure of parenting stress developed by Berry and Jones in 1995. It takes approximately 10-minutes to complete and is self-report. This assessment evaluates both positive and negative aspects of parenting and has a 5-point Likert scale (1 = S*trongly disagree,* 2 = *Disagree,* 3 = *Undecided,* 4 = A*gree*, and 5 = *Strongly agree*). Original psychometric properties of the PSS were established in 1995 with a sample population of 1276 parents with an alpha coefficient of .83, and convergent validity was established through the comparison of other constructs evaluating parenting stress (Berry & Jones, 1995). The PSS has been utilized in studies to evaluate the parenting stress of parents who have children with autism and other developmental disabilities (Hsiao, 2018; Johnson & Onieka, & Mendoza, 2018) and thus, was an appropriate measure to utilize for the purposes of this study.

Parenting Confidence Survey

The parenting confidence survey is a brief survey developed by the agency whose data were utilized for this study. The survey is given at the intake appointments and subsequent re-authorizations for every client who starts treatment with the agency, consisting of two questions, taking approximately 3 minutes to complete. The survey is a 5-point Likert scale (1 = *Strongly disagree,* 2 = *Disagree,* 3 = *Neutral,* 4 = *Agree*, and 5 = *Strongly agree*) and was normed by the agency with 1629 participants (M = 7.4; SD =

1.80) with an acceptable alpha coefficient of .73. This survey evaluates parents' confidence in their ability to teach their child new skills and effectively manage their child's difficult behavior.

Treatment Type

Parent-Led ABA

Parent-led ABA is a parent mediated approach to ABA treatment. This particular method of parent mediated ABA was developed and is currently utilized by the company whose data were utilized for this research. In this model, parents are taught to directly implement treatment with their child with autism based on family priorities and the need(s) of the child. A BCBA oversees the treatment program, including writing the assessment, treatment implementation, parent training, and the oversight of BCaBA or master's level clinician who also supports in treatment implementation. Programs focusing on one or two developmental domains consists of 4 hours per month of BCBA training and support and 10-12 hours of BCaBA or master's level clinician training and support. Comprehensive programs, which target three or more developmental domains, consists of 6 hours per month of BCBA training and support and 14 hours of BCaBA or master's level clinician training and support.

Parent-led ABA includes training modules consisting of six parts:

1. Basics of ABA
2. Communication
3. Basic Teaching Strategies
4. Basic Behavioral Strategies

5. Advanced Behavioral Strategies
6. Taking Your Learning Further

Each part is comprised of lessons corresponding to the overarching theme. Basics of ABA includes 17 lessons and is assigned to all parents who start the program at the outset of treatment. Subsequent parts or lessons are assigned based on relevance to the child's ABA program. Every lesson incorporates a written lesson, video model demonstrating the skill with a parent and their child, an activity following the lesson, and a short quiz to assess for understanding of the content reviewed. In addition to these standardized training modules, parents meet weekly with their treatment team to review skills learned from the lessons from that week. Additionally, the treatment team models skills as needed, coach's parents through implementing skills to fidelity, and observes parent-child interactions, providing reinforcement on their parenting skills.

In addition to this parent training component, the treatment plan for the child is developed from the VB-MAPP (Sundberg, 2008). The VB-MAPP assessment is conducted at the beginning of parent-led ABA treatment and is used for reassessment every reauthorization period (six months). Baseline of skills are established at the initial assessment and are utilized to develop the treatment plan. At each subsequent reauthorization of treatment, the VB-MAPP is conducted to determine if skills that were targeted during that previous six months of treatment were met and then to also determine what will be focused on during the next treatment authorization.

Practitioner-Led Treatment

Practitioner-led ABA treatment is a 3-tier model of treatment delivery. This model is comprised of a BCBA who oversees treatment implementation with the support of a BCaBA or master's level clinician, and a Registered Behavior Technician (RBT) who directly implements ABA with the identified client. Depending on the age of the client and the level the individual is impacted by their diagnosis (Level 1, 2, or 3) will determine how many hours per week of direct treatment by the RBT the client will receive. The number of hours will typically range between 10 hours per week to 40 hours per week, with younger clients and those more impacted by the diagnosis receiving more. As is prescribed by The Council of Autism Service Providers (2014), twenty percent of direct treatment hours must be supervised by a BCBA or a delegated BCaBA (or other qualified professional), thus, a client will receive on average 8 to 35 additional supervised hours per month.

In this treatment model, for children between ages 3 to 7, at the agency whose data were utilized for this study, the VB-MAPP (Sundberg, 2008) is utilized for treatment planning. At the initial assessment, the VB-MAPP is conducted to determine baseline skills and determine what goals will be the focus of the treatment plan. At each subsequent reauthorization of treatment, the VB-MAPP is conducted to determine if skills that were targeted during that previous six months of treatment were met and then to also determine what will be focused on during the next treatment authorization. On average, children who receive this model of ABA are in treatment for 2 years.

Data Analysis Plan

The data were analyzed using IBM SPSS Statistics for macOS Catalina, version 27 (2020). The data were aggregated by the agency who owns the data by their business intelligence department and then provided in an excel document for analysis. Missing data were omitted, and the remaining cases were included in the analysis.

Research Questions

RQ1: What are the differences between parent-led ABA treatment and practitioner-led ABA treatment in adaptive functioning in children with autism as measured by the Vineland Adaptive Behavior Scales, Third Edition (Sparrow et al., 2016).

$H_0$1: Parent-led ABA treatment will not have significantly different post treatment results from practitioner-led ABA treatment in the Vineland Adaptive Behavior Scales, Third Edition

$H_1$1: Parent-led ABA treatment will have significantly different post treatment results from practitioner-led on the Vineland Adaptive Behavior Scales, Third Edition

RQ2: What are the differences between parent-led ABA treatment and practitioner-led ABA treatment in socially significant skills as measured by the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP) (Sundberg, 2008).

$H_0$2: Parent-led ABA treatment will not have a significant change in VB-MAPP results from pre-treatment to post treatment assessment.

$H_1$2: Parent-led ABA treatment will have a significant change in VB-MAPP results from pre-treatment to post treatment assessment.

RQ3: How does parenting confidence impact parenting stress for parents of children with autism as measured by the Parental Stress Scale and Parent Confidence Scale?

$H_0$3: Parents of children with autism's parenting stress is not impacted by their parenting confidence.

$H_1$3: Parents of children with autism's parenting stress is significantly impacted by their parenting confidence.

Statistical Procedures

To test the hypotheses regarding the differences between parent-led ABA and practitioner-led ABA, as well as the differences over time for each treatment level, a mixed model ANOVA was utilized. A mixed model ANOVA compares the mean differences between two treatment groups, as well as analyzes the within-subjects factor across continuous variables (Warner, 2013). Assumptions of this analysis include the use of continuous dependent variables, an independent categorical variable with two groups, and that the observations between groups are independent (Warner, 2013). Each of the assumptions of this statistical analysis were met in this study as continuous dependent variables were examined, the independent variable had two groups, and the observations were independent of each other.

To test if parenting confidence impacted parenting stress prior to treatment start a linear regression was conducted. A simple linear regression assesses the linear relationship between two continuous variables, predicting the value of the dependent variable based on the independent variable (Warner, 2013). The assumptions associated

with this analysis is both the dependent and independent variables are continuous, that a linear relationship exists between the dependent and independent variables, that there is independence of observations, and that there are no significant outliers (Warner, 2013). These assumptions were all satisfied within the study as the Parental Stress Scale and Parent Confidence Scale are continuous variables, that a linear relationship existed, and no significant outliers were present. According to G*Power 3.1, the sample size needed for this study was 54 with a power of 95%, an alpha level of .05, and an effect size of .25 (Faul et al., 2009).

Threats to Validity

Internal Validity

Internal validity refers to the extent a study measures what it claims to measure, and thus, threats to the internal validity of this study are important to review. First, because this was a secondary analysis of data there was potential for bias in the data selection for the purposes of this study because of the vast nature of the available data. The aim will be to mitigate this threat to internal data by only analyzing the data that is pertinent to this study. Secondly, testing effects may have impacted the internal validity of this research as parents completed the same self-report measures every six months for their child (e.g., Vineland, PSS, and parent confidence survey), thus, familiarity with the measure could have impacted how they answered. In addition to this, three of the outcome measures analyzed (Vineland, PSS, and parent confidence survey) were all self-report and may, therefore, under- or over-report skills and experiences. A third threat to the internal validity of this research was maturation effects by participants whose data

were analyzed. This is a factor to consider as all the data reviewed were for participants between the ages of 3 and 7 years old, thusly, are at a critical point in their development where they attain skills through the natural occurrence of environmental factors (e.g., schooling, peer interactions, family relationships). Therefore, conclusions about treatment effects were drawn cautiously.

External Validity

Threats to external validity refers to the generalizability of the research presented. A threat to the generalizability of the present research is there was no randomization of participants, nor was there a control group, as families chose at intake which type of ABA treatment they wanted. Without a control group it cannot be certain that outcomes were a result of the participants treatment received, therefore, limiting the generalizability of this research. To attempt to mitigate this threat to external validity the aim was to have large sample populations from both the parent-led ABA group and practitioner-led ABA groups to compare results.

Construct Validity

Construct validity of the parent confidence scale should be interpreted cautiously as this measure was developed by the agency whose data were utilized for this study. Additionally, normative information for this measure was conducted by the agency and has yet to be utilized in other research. As this was first study to analyze and interpret the data from this construct, this allows for future research studies to utilize the measure and replicate the results.

Ethical Procedures

As in accordance with Walden University's guidelines for archival research, written approval was obtained from the agency whose data were utilized for the purposes of this study prior to gaining access to the data. The data were de-identified and were provided by the agency's parent company's business intelligence department, which is independent from the clinical agency who owns the data. The data provided only included requested variables that were deidentified prior to analysis, thus protecting the privacy of all participants included. Prior to obtaining approval from the agency who owns the data, this research proposal was reviewed by Walden University's Institutional Review Board (IRB) and approved (IRB approval number 04-12-21-0822120), as in accordance with the American Psychological Association's (APA) ethical principles regarding research and publication (American Psychological Association, 2017).

Summary

This section reviewed the research design to be utilized, as well as the methods, instrumentation, treatment types, and data analysis plan. The statistical procedure, threats to validity, and ethical procedures were then expounded upon. The next chapter will provide an in-depth overview and analysis of the results of the statistical procedures.

Chapter 4: Results

Introduction

The purpose of this study was to evaluate the efficacy of parent-led ABA treatment for children with autism spectrum disorder (ASD) and their parents. Specifically, outcomes on both a norm-referenced assessment and a criterion referenced assessment were examined for children receiving parent-led ABA, as well as for children receiving practitioner delivered treatment as a comparison. For the parents of children with autism included in this research, parental self-efficacy and parental stress were analyzed. The research questions and hypotheses associated with this study were as follows:

RQ1: What are the differences between parent-led ABA treatment and practitioner-led ABA treatment in adaptive functioning in children with autism as measured by the Vineland Adaptive Behavior Scales, Third Edition (Sparrow et al., 2016).

$H_0$1: Parent-led ABA treatment will not have significantly different post treatment results from practitioner-led ABA treatment in the Vineland Adaptive Behavior Scales, Third Edition

$H_1$1: Parent-led ABA treatment will have significantly different post treatment results from practitioner-led on the Vineland Adaptive Behavior Scales, Third Edition.

RQ2: What are the differences between parent-led ABA treatment and practitioner-led ABA treatment in socially significant skills as measured by the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP) (Sundberg, 2008).

$H_0$2: Parent-led ABA treatment will not have a significant change in VB-MAPP results from pre-treatment to post treatment assessment.

$H_1$2: Parent-led ABA treatment will have a significant change in VB-MAPP results from pretreatment to posttreatment assessment.

RQ3: How does parenting confidence impact parenting stress for parents of children with autism as measured by the Parental Stress Scale and Parent Confidence Scale?

$H_0$3: Parents of children with autism's parenting stress is not impacted by their parenting confidence.

$H_1$3: Parents of children with autism's parenting stress is significantly impacted by their parenting confidence.

This chapter will include a review of the data collection procedures, fidelity procedures, the results of the analyses, and a summary of the chapter.

Data Collection

The archival data were provided by a large behavioral health organization who oversees behavioral treatment for individuals with ASD. The specific data for participants with ASD who received ABA treatment came from one provider within the network of providers of this organization who conducts both parent-led ABA treatment and practitioner-led ABA treatment within the models described in Chapter 3. The archival data also included parents' pretreatment scores on the Parental Stress Scale and Parent Confidence Scale for those entering treatment after September 2019. Thus, these pre-

treatment data for parents were prior to starting ABA services, thusly, before receiving a referral to a specific provider.

These data included 106 participants with ASD between ages 3-7 years of age (M = 5.01, SD = 1.28), receiving either parent-led ABA treatment (N = 49) or practitioner-led ABA treatment (N = 57), with a treatment start date ranging from 2016-2020 with an average duration of treatment being 20 months with a standard deviation of 13 months. Of those included, 85 (80.2%) were male and 21 (19.8%) were female. Additionally, the archival data included pretreatment data for 540 parents whose children have ASD, between 3-7 years of age (M = 5.2, SD = 1.34), and were referred to an ABA provider.

The original data collection plan was going to include an analysis of pretreatment and posttreatment outcome data for the parents whose children with autism were included in the study. However, for the participants who received parent-led ABA and practitioner-led ABA, there were a lack of posttreatment data for the parents. There were many pretreatment data points for parents whose children were between ages 3 – 7 years who were referred to ABA services. Thus, pretreatment Parental Stress Scale and Parent Confidence Scores were evaluated.

According to G*Power 3.1, the sample size needed for two-way mixed model ANOVA was 54 with a power of 95%, an alpha level of .05, and an effect size of .25 (Faul et al., 2009). The original sample of children with autism between ages 3 – 7 years old included in the archival analysis was 106 for the analysis of the VB-MAPP and 66 for the analysis of the Vineland-3, due to omitted cases because of missing data points, which is more than the needed sample size of 54. For the linear regression, the sample

size needed was 472 with a power of 95%, an alpha level of .05, and effect size of .15 (Faul et al., 2009). The sample size for the linear regression was 540, and therefore was well above the needed sample size for this analysis.

Fidelity of Treatment Implementation

Treatment fidelity refers to procedures which monitor treatment implementation, ensuring treatment is conducted in the manner it was intended. For practitioner-led ABA and parent-led ABA there were various fidelity measures in place ensuring treatment was conducted in the manner intended. This section will provide a brief review of fidelity procedures in place for both practitioner-led and parent-led ABA for the organization whose data were utilized for this study.

Practitioner-Led ABA

To ensure fidelity of treatment for practitioner-led ABA there were several procedures in place. First and foremost, the agency whose data were utilized for this study has a clinical competency checklist in place for all paraprofessionals who implement direct treatment with individuals with ASD. This clinical competency checklist ensures paraprofessionals meet above minimum certification standards to continue working with clients (passing scores are above 90%) and is conducted at least one time monthly. In addition to this checklist, paraprofessionals are monitored weekly in their treatment implementation across each client they work with either in person or through video conferencing, ensuring procedures are implemented correctly. Either the BCBA or delegated supervisor provides clinical oversight of treatment and supervision of

paraprofessionals either through direct observation or through the clinical competency checklist.

Parent-Led ABA

To ensure fidelity of treatment for parent-led ABA there are several procedures and methods in place to assist parents in correct implementation. First, the agency whose data were utilized for this study have trained their BCBA's and delegated supervisors in Motivational Interviewing (Rollnick et al., 2008) to facilitate motivation in treatment implementation. Cognitive affective strategies such as this have been shown to increase parental satisfaction in treatment, as well as enthusiasm to implement procedures (Pennefather et al., 2018). In addition to this, the parent-led ABA curriculum is multifaceted including video models, education modules, homework, and quizzes to promote understanding of treatment protocols. To bring all these components together the organization adopted a standardized coaching cycle developed by Ingersoll and Dvortcsak (2020) which was implemented one-year prior to this study. This coaching cycle includes specific procedures that facilitate fidelity and includes the following components: introducing the specific technique, BCBA or delegated supervisor then demonstrate the technique, parents are then provided with space to practice the technique with feedback from their treatment team, and, finally, provided with an opportunity to reflect on the practice and discuss how they will implement the technique between sessions. While this specific procedure was not adopted until Spring 2020, up until this time the agency implementing parent-led ABA had weekly sessions where all

components of treatment were brought together for parents to ensure understanding of information reviewed as well as implementation of the taught procedures.

Results of Analysis

To evaluate if parent-led ABA treatment would have different post treatment results from practitioner-led on the Vineland Adaptive Behavior Scales, Third Edition a two-way mixed model ANOVA was conducted. There were 66 participants included in this analysis, 34 who received practitioner-led ABA and 32 who received parent-led ABA. There were no outliers, as assessed by boxplot. There was homogeneity of variances ($p > .05$) and as assessed by Levene's test of homogeneity of variances and Box's M test, respectively. Mauchly's test of sphericity indicated that the assumption of sphericity was met for the two-way interaction as there were only two levels of the repeated measures. There was no statistically significant interaction between the models of ABA and time on the Vineland-3, $F(6, 59) = .912$, $p = .493$, partial $\eta^2 = .085$. The main effect of time showed a statistically significant difference in mean Vineland-3 scores for both Parent-led ABA and practitioner-led ABA at the different time points, $F(6, 59) = 2.347$, $p < .05$, partial $\eta^2 = .193$. The main effect of Model of ABA group showed that there was not a statistically significant difference in mean Vineland-3 scores between groups on the Adaptive Behavior Composite, $F(1, 64) = .440$, $p = .510$, partial $\eta^2 = .007$, Communication domain, $F(1, 64) = .069$, $p = .793$, partial $\eta^2 = .001$, Daily Living Skills domain, $F(1, 64) = .996$, $p = .322$, partial $\eta^2 = .015$, Socialization domain, $F(1, 64) = .084$, $p = .773$, partial $\eta^2 = .001$, Internalizing scale, $F(1, 64) = 1.449$, $p = .233$, partial $\eta^2 = .022$, and the Externalizing scale, $F(1, 64) = .257$, $p = .614$, partial $\eta^2 = .004$.

Univariate analysis resulted in the main effect of time demonstrating a statistically significant difference in mean Vineland-3 domain scores for both Parent-led ABA and practitioner-led ABA at the different time points for the Adaptive Behavior Composite, $F(1, 64) = 7.101$, $p < .01$, partial $\eta^2 = .100$, Communication domain, $F(1, 64) = 8.176$, $p < .01$, partial $\eta^2 = .113$, and for the Externalizing scale, $F(1, 64) = 4.861$, $p < .05$, partial $\eta^2 = .071$. There was no significant difference in mean Vineland-3 domain scores for both parent-led ABA and practitioner-led ABA in the Daily Living Skills domain, $F(1, 64) = 3.252$, $p = .076$, partial $\eta^2 = .048$, Socialization domain, $F(1, 64) = 2.145$, $p = .148$, partial $\eta^2 = .032$, and for the Internalizing scale, $F(1, 64) = .864$, $p = .356$, partial $\eta^2 = .013$. Pairwise comparisons revealed a significant main effect for time (ps < .05) for parent-led ABA from Time 1 ($M = 76.28$) to Time 2 ($M = 79.63$) for the Adaptive Behavior Composite, from Time 1 ($M = 76.50$) to Time 2 ($M = 79.63$) for the Communication domain, and from Time 1 ($M = 16.88$) to Time 2 ($M = 15.81$) for the Externalizing Scale. Practitioner-led ABA demonstrated similar significant results (ps < .05) for the main effect of time for Adaptive Behavior Composite from Time 1 ($M = 75.44$) to Time 2 ($M = 77.21$), for the Communication domain from Time 1 ($M = 75.74$) to Time 2 ($M = 78.41$), and the Externalizing scale from Time 1 ($M = 16.47$) to Time 2 ($M = 15.24$. Interestingly, the domains and scales that did have a significant effect of time, on average parent-led ABA made greater gain in mean score for Daily Living Skills, with an average gain in mean score of 3.32 as compared to practitioner-led ABA which had an average gain in mean score of 1.29 (see Figure 1). Similarly, while practitioner-led ABA demonstrated a decrease in mean score for the Socialization domain of -0.41, parent-led ABA

demonstrated an average increase in mean score of 3.94 (see Figure 2). Finally, for the internalizing scale, parent-led ABA demonstrated an average decrease in mean score by -0.78, while practitioner-led ABA demonstrated an average decrease in mean score by -.03 (see Figure 3).

Table 1

Within-Subjects and Between-Subjects Results of Vineland-3

Source	SS	df	F	η^2
Within-subjects				
Time				
ABC	215.10	1,64	7.10**	.100
Communication	277.42	1,64	8.18**	.113
DLS	174.91	1,64	3.25	.048
Socialization	102.46	1,64	2.15	.032
Internalizing	5.417	1,64	.86	.013
Externalizing	43.52	1,64	4.86*	.070
Time x model of ABA				
ABC	20.55	1,64	.68	.010
Communication	1.66	1,64	.05	.001
DLS	33.58	1,64	.62	.010
Socialization	155.92	1,64	3.26	.049
Internalizing	4.66	1,64	.74	.011
Externalizing	.25	1,64	.03	.000
Between-subjects				
ABC	87.55	1,64	.440	.007
Communication	32.25	1,64	.069	.001
DLS	215.56	1,64	.996	.015
Socialization	22.16	1,64	.084	.001
Internalizing	38.06	1,64	1.45	.022
Externalizing	7.94	1,64	.26	.004

Note. ABC is an abbreviation for Adaptive Behavior Composite and DLS is an abbreviation for Daily Living Skills.
*$p < .05$, **$p < .01$

Figure 1

Vineland-3 Daily Living Skills Domain

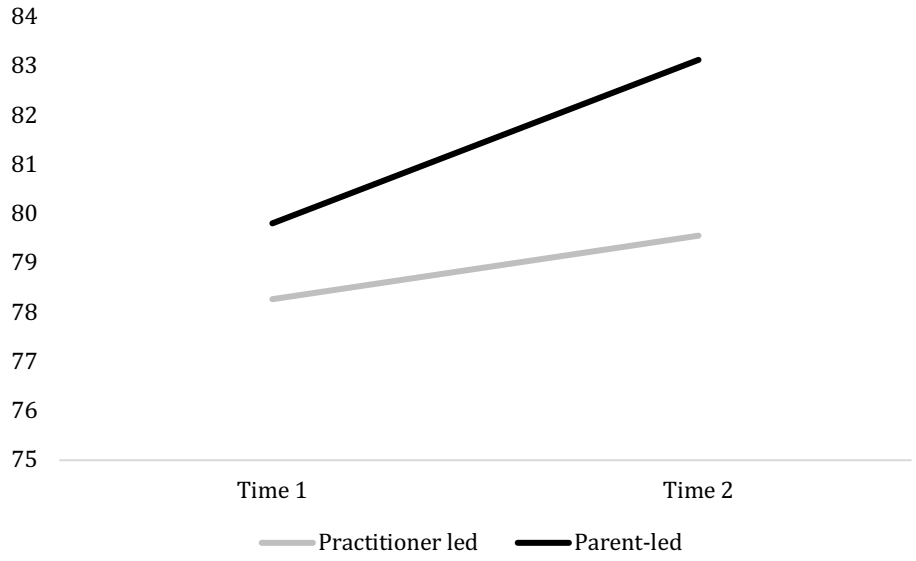


Figure 2

Vineland-3 Socialization Domain

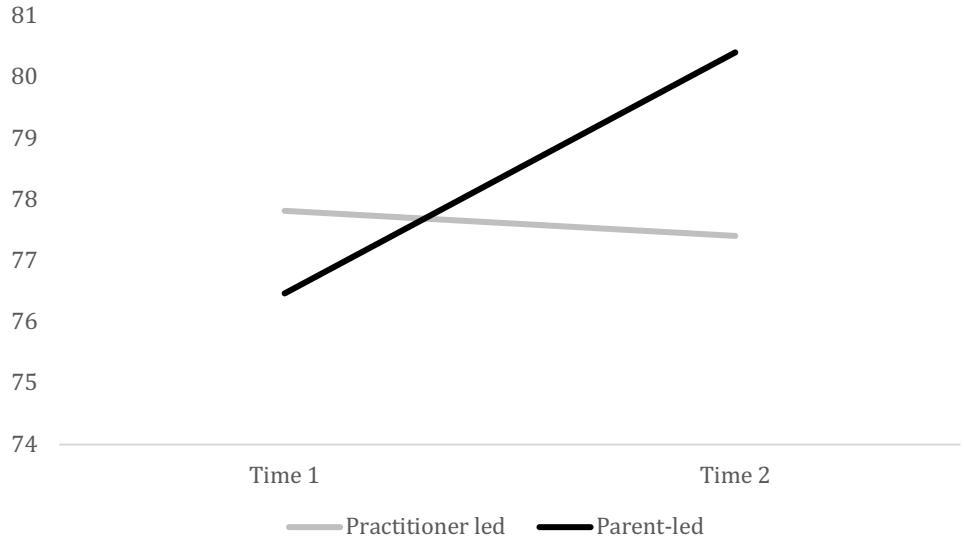
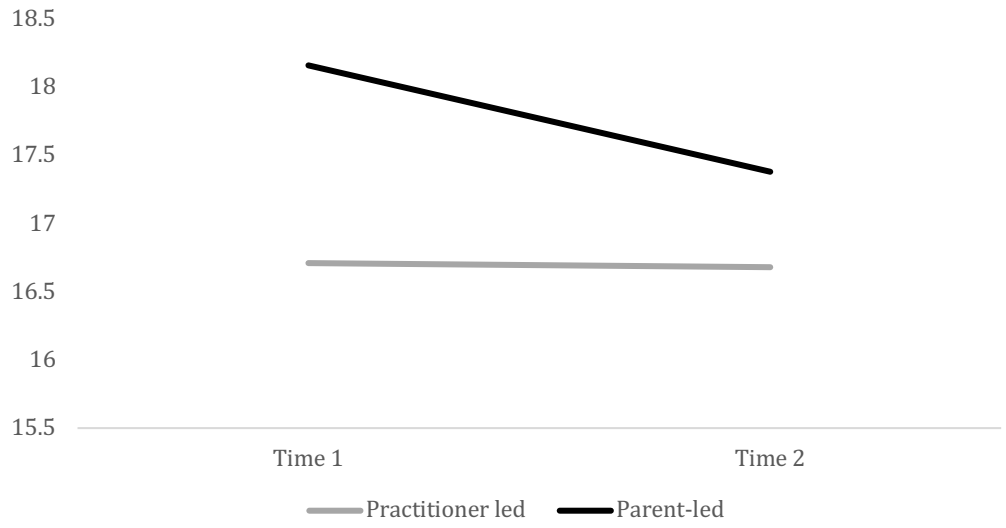


Figure 3

Vineland-3 Internalizing scale



To explore if parent-led ABA resulted in significant change in VB-MAPP results for children with autism from baseline to first reassessment as compared to practitioner-led ABA treatment a two-way mixed model ANOVA was conducted. There were no outliers, as assessed by boxplot. There was homogeneity of variances ($p > .05$) and as assessed by Levene's test of homogeneity of variances and Box's M test, respectively. Mauchly's test of sphericity indicated that the assumption of sphericity was met for the two-way interaction as there were only two levels of the repeated measures. There was no statistically significant interaction between the model of ABA provided (parent-led ABA and practitioner-led ABA) and time on VB-MAPP score, $F(1, 98) = .003$, $p = .958$, partial $\eta^2 < .001$. The main effect of time showed a statistically significant difference in mean VB-MAPP scores for both parent-led ABA and practitioner-led ABA at the

different time points, $F(1, 98) = 101.83$, $p < .001$, partial $\eta^2 = .510$. The main effect of group showed that there was not a statistically significant difference in mean VB-MAPP scores between groups $F(1, 98) = 2.514$, $p = .116$, partial $\eta^2 = .025$. Pairwise comparisons revealed a significant main effect for time (ps < .001) for parent-led ABA from Time 1 ($M = 42.91$) to Time 2 ($M = 60.38$), as well as for practitioner-led ABA from Time 1 ($M = 53.36$) to Time 2 ($M = 71.01$).

Table 2

Test of Within-Subjects Effects and Between-Subjects Effects

Source	SS	df	F	η^2
Within-subjects				
Time	15193.67	1,98	101.831***	.510
Time x Model of ABA	.43	1,98	.003	.000
Between-subjects				
Model of ABA	5475.62	1,98	2.51	.025

***$p < .001$

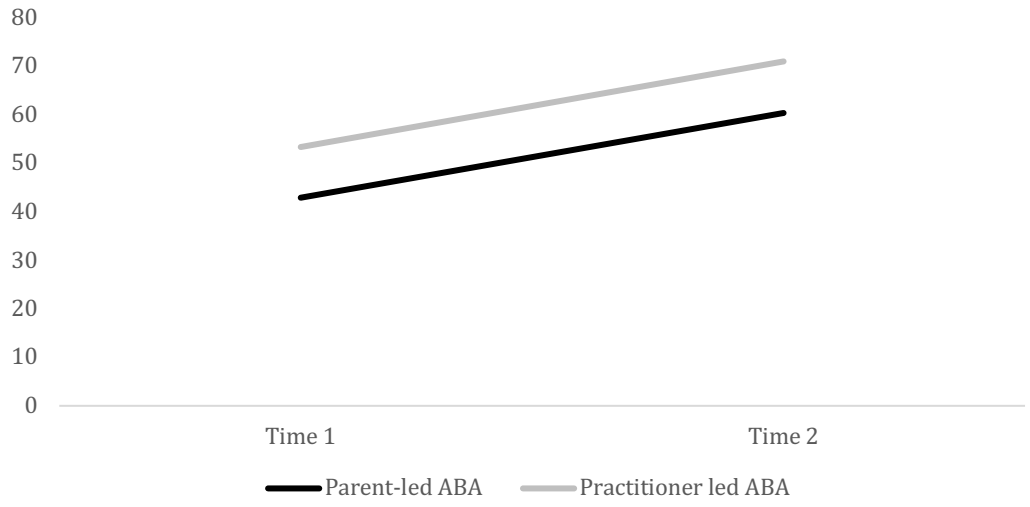
Table 3

Pairwise Comparisons Between Time 1 and Time 2 for Model of ABA

Variable	*n*	*VB-MAPP Score*	
		M	*SD*
Parent-led ABA			
Time 1	44	42.91	29.72
Time 2	44	60.38	32.45
Practitioner-led ABA			
Time 1	56	53.36	36.27
Time 2	56	71.01	36.30

Figure 4

VB-MAPP Mean Score Across Time

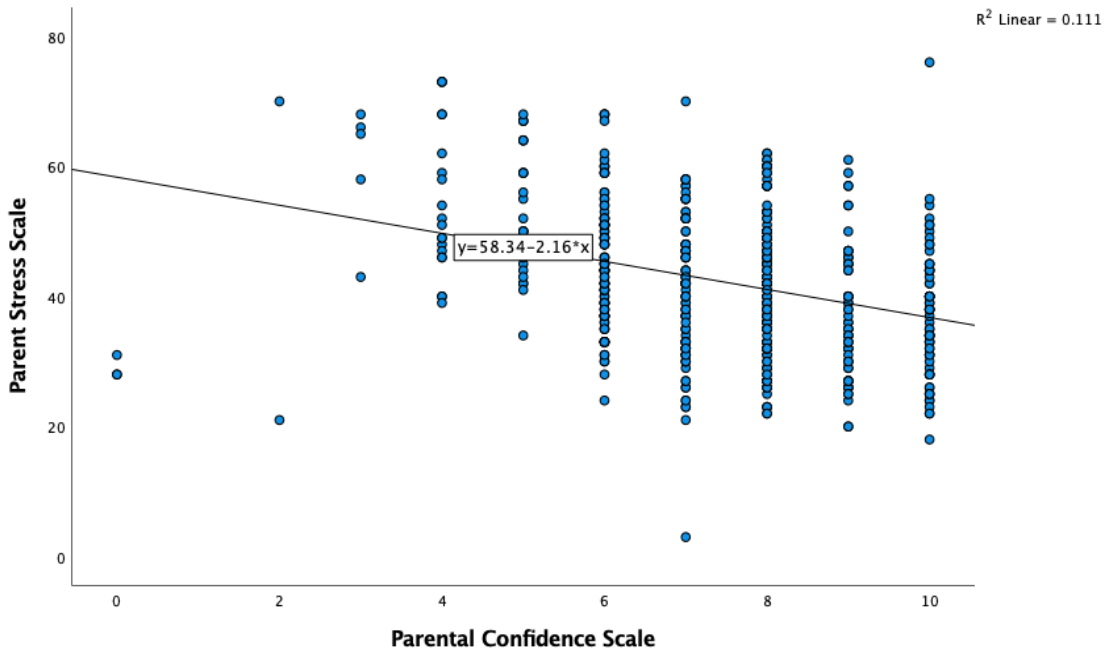


A linear regression was run to understand the effect of parental confidence on parental stress. To assess linearity a scatterplot of parental stress against parental confidence was superimposed and the regression line was plotted. Visual inspection of the plot indicated a linear relationship between the variables. There was homoscedasticity and normality of the residuals.

The prediction equation was: parental confidence statistically significantly predicted parental stress, $F(1, 538) = 66.85$, $p < .001$, accounting for 11% of the variation in parental stress with adjusted $R^2 = 11\%$, a medium size effect according to Cohen (1992). For every one-point increase in parental confidence, parental stress decreases by an average of 2.16 points.

Figure5

Simple Linear Regression of PSS and PCS



Summary

This chapter reviewed the data collection procedures for this study, as well as fidelity procedures for both practitioner-led and parent-led ABA, and the results of the analyses. Regarding the first research question exploring the differences between parent-led ABA and practitioner-led ABA utilizing the Vineland-3 as an outcome measure, the null hypothesis cannot be rejected as there were no differences found between parent-led ABA and practitioner-led ABA on the Vineland-3. Parent-led ABA did not have significantly different post treatment results from practitioner-led ABA on this outcome measure, in fact the results were equivalent in regard to significant changes in the outcome measure. However, parent-led ABA did produce greater, but not significant,

mean change on the Daily Living Skills domain, Socialization domain, and the Internalizing scale as compared to practitioner-led ABA. For the second research question, which set to explore the differences between parent-led ABA and practitioner-led ABA in socially significant behavior change as measured by the VB-MAPP, the null hypothesis can be rejected. Parent-led ABA did produce significant change in the VB-MAPP from pre-treatment to first follow up assessment. Additionally, the results were equivalent to practitioner-led ABA, which also demonstrated a significant change in VB-MAPP score from pre-treatment to first follow up assessment. Finally, to evaluate how parenting confidence impacts parenting stress as posed by the third research question, the null hypothesis can be rejected as parenting stress significantly predicted parenting stress and accounts for 11% of the total stress reported by this parenting population. The next chapter will further elucidate these results, including a review of the findings, limitations to this study, recommendations for further research, and the implications for the field of ABA and social change.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this study was to evaluate the efficacy of parent-led ABA for children with autism spectrum disorder (ASD). To do this, outcome data were evaluated for parent-led ABA, as well as practitioner-led ABA as a comparison. The Vineland Adaptive Behavior Scales, 3rd Edition and VB-MAPP were analyzed from pretreatment to first reassessment for children with autism between ages 3 – 7 years. Additionally, the Parental Stress Scale and Parent Confidence Scale pre-treatment scores were analyzed for parents of children with autism between 3 – 7 years of age to evaluate how parenting confidence impacts parenting stress. This chapter will provide an interpretation of the findings from the analyses conducted, limitations of the study, recommendations for further research, and implications of the findings.

Interpretation of Findings

Results from this archival study provide preliminary efficacy of parent-led ABA treatment for children with autism between the ages of 3 – 7. Regarding parenting stress and parenting confidence it was found that for this population of parents 11% of parenting stress can be accounted for by parenting confidence. Accordingly, if parenting confidence can be effectively increased then parenting stress decreases as there is a strong negative relationship demonstrating as parenting confidence goes up, parenting stress goes down. This is understandable, as many researchers have demonstrated that by increasing parental confidence, parental stress decreases (Kuravackel et al., 2018; Sofronoff et al., 2004; Sofronoff & Farbotko, 2002). Specifically, research consistently

demonstrates parent training and parent mediated programs increase parenting self-efficacy, subsequently decreasing their stress (DeVeney et al., 2017; Rogers et al., 2019). Parent-led ABA equips parents to teach their children skills and address challenging behavior, thus, it is possible this parent mediated program increases a parent's confidence to effectively parent their child; however, that was beyond the scope of this study to evaluate and should be studied in future research.

Treatment outcomes were evaluated at pretreatment and again after 6 months of treatment for both parent-led ABA and practitioner delivered ABA. The Vineland-3 was used to measure progress over time for both treatment models. Results of the analysis demonstrated parent-led ABA was equivalent in treatment outcome as compared to practitioner-led ABA, in that, both models of ABA produced significant increases in Vineland-3 scores. Specifically, the Adaptive Behavior Composite and Communication domain significantly increased across 6 months of treatment for parent-led ABA and practitioner delivered treatment. The Externalizing Scale from the Maladaptive Behavior Index also decreased significantly across 6 months of treatment for both treatment models. There were no other observed differences between the models of ABA as measured by the Vineland-3. These results are consistent with other studies which have shown applied behavior analysis significantly improves language development for young children with ASD (Makrygianni et al., 2018; Virués-Ortega, 2010). Similarly, studies evaluating challenging behaviors, such as those measured by the Externalizing scale of the Vineland-3 Maladaptive Behavior Index, have reliably been shown to decrease with

parent mediated behavioral treatments (Postorino et al., 2017; Sofronoff & Farbotko, 2002), these results are consistent with these studies.

Regarding the Vineland-3, no other significant changes were observed across time for the other domains and scales for both parent-led ABA and practitioner-led ABA. However, for the Daily Living Skills domain, the average mean increase for parent-led ABA was 3.32 points and was 1.29 for practitioner-led treatment, while not significant, this reveals that parent-led ABA may improve daily living skills at greater rate than practitioner-led ABA. This result is consistent with research conducted by Scahill et al. (2016), which revealed parent mediated treatment to significantly improve the Daily Living Skills domain on the Vineland-3 across a 24-week and 48-week treatment for young children with autism as compared to parent education alone. Additionally, as parents have the most time at home with their children, they have more opportunities to work with their children on these skill during natural opportunities. More than this, in clinic-based settings, opportunities to practice these skills may not be comparable to real world settings nor occur often enough to facilitate learning. Furthermore, paraprofessionals may not be as equipped as parents to target these pivotal life skills.

Similarly, on the Socialization domain there was an average mean gain of 3.94 points from pre-treatment to first reassessment for parent-led ABA, but practitioner-led ABA revealed to have an average mean decrease of -0.41 on this domain. These results were surprising as other studies have demonstrated the effectiveness of practitioner-led ABA at increasing social skills (Makrygianni et al., 2018). However, with parent-led ABA occurring in children's natural environment through natural opportunities and

family-based routines, there may be more natural opportunities to practice social skills. Furthermore, this model promotes continuing extra-curricular activities which may offer more natural opportunities to interact with peers. Also, by improving communication skills and decreasing challenging behaviors, children are more readily able to interact with their peers, also facilitating socialization improvement.

The Internalizing scale from the Maladaptive Behavior Index revealed an average mean decrease of – 0.78 for parent-led ABA and an average mean decrease of – 0.03 on practitioner-led ABA, revealing that parent-led ABA may better decrease internalized behaviors, such as anxiety, than practitioner-led ABA. This result is not surprising as individuals with autism have a high co-occurring rate of anxiety disorders, specifically social anxiety disorder (Kroncke et al., 2016; Masi et al., 2017), thus, with practitioner-led ABA having more people coming into the child's home, this may not facilitate an environment to decrease anxiety. Moreover, parent-led ABA may more naturally facilitate decreasing child anxiety as it provides parents with skills to effectively manage their child's behavior as well as increase positive interactions between parent and child which have been shown to facilitate coregulation and ultimately decrease anxiety symptoms (Gulsrud et al., 2010; Valentovich et al., 2018).

Unlike the Vineland-3, which is a norm-referenced, self-report measure, the VB-MAPP is a criterion referenced assessment based on direct testing and observation. Results from the analysis of the VB-MAPP revealed a significant increase in skills from pre-treatment to reassessment after 6 months of treatment for both parent-led ABA and practitioner-led ABA. There was no significant difference between models of ABA, in

fact, visual analysis of Figure 4 demonstrates through the parallel data paths the equivalent findings of these models of treatment. The significant finding of the VB-MAPP is consistent with the results of the Vineland and assist in confirming the validity of the Vineland results, as the VB-MAPP curriculum focuses on increasing social pragmatic communication skills. Again, the VB-MAPP assessment is conducted through direct testing and observation, thus, the BCBA's testing of the communication skills is commensurate with the parents reported Vineland results.

Taken together, these results provide initial efficacy for parent-led ABA for children with ASD. Specifically, these results demonstrate the effectiveness of parent-led ABA increasing communication skills and decreasing challenging behaviors as measured by the Externalizing scale of the Vineland-3 Maladaptive Behavior Index. These results also revealed parent-led ABA and practitioner-led ABA are equal in improving skill sets as measured by the VB-MAPP. Overall, this parent mediated model of ABA appears to be similar in treatment outcomes as practitioner delivered treatment. Of importance, as this was an archival analysis, it demonstrates the effectiveness of parent-led ABA and practitioner-led ABA in real world settings. A benefit of this being an archival analysis is it demonstrates the significance of ABA treatment for individuals with autism in real life settings, as opposed to a contrived research settings which may be difficult to replicate in the real world.

Limitations

There are several limitations associated with this study. First, the study was an archival study, thus, was not a randomized control study, which would produce more

robust results and ensure the results of treatment were an outcome of the treatment implemented. More specifically, randomized clinical trials lead to causal inferences and thus, elicit strong empirical support. The next limitation is regarding the parent-led ABA fidelity of treatment protocols, as it is not known if the coaching cycle reviewed in Chapter 4 was conducted with every client in every session as was designed. Specifically, the coaching cycle was not adopted into the parent-led ABA treatment model until Spring 2020, thus, only participants included in this study who started treatment after that time had this component of treatment included. In addition to this, as this was an archival study, it is not known whether the parent-led ABA curriculum was implemented in the manner intended for every client. Similarly, for the practitioner delivered treatment, while there were fidelity checks in place with the agency whose data were utilized, it cannot be certain this was the case for every client included in this study.

At the outset of this study, data were going to be analyzed at pre-treatment and at subsequent follow up assessments for both children with autism and their parents; however, the data set did not include enough re-assessment data for parents to conduct a repeated measures analysis. So, for both parent-led ABA and practitioner-led ABA, it is not known whether either model positively or negatively impacts parental confidence and parenting stress. In addition to this limitation, the scale utilized to measure parental confidence was a tool created and normed by the agency whose data were utilized in this study, therefore, has not been used in prior studies, which could further demonstrate its efficacy.

Another limitation of this study is the use of self-report measures. The Parental Stress Scale, Parent Confidence Scale, and Vineland-3 are all self-report measures parents fill out prior to treatment start and at every reassessment period. Consequently, the results of these measures are not based on observable behavior. Parents may not be insightful into their experiences or answer the Vineland-3 accurately based on their child's adaptive presentations, thus, decreasing the validity of the results of these measures. Also, parents, particularly those in the parent-led ABA model, may have a bias towards inflating their children's scores as a way to reflect positively on their own treatment implementation behavior.

A final limitation of this study is while the age of the participants is known, the level of their ASD diagnosis and any co-occurring diagnoses are not known, subsequently, the heterogeneity of the sample population is unknown. As discussed in Chapter 3, the heterogeneity of this population of individuals is vast with different levels of autism, possible mental health diagnoses (e.g., depression, anxiety), behavioral disorders (e.g., ADHD), and varying gradations of intellectual ability (e.g., intellectually disabled, gifted, average intelligence), having this information would contribute to understanding the generalizability of the study results. This information would also provide more insight into if individuals with specific clinical profiles would benefit from parent-led ABA and practitioner-led ABA.

Recommendations for Further Research

Future studies should focus on implementing randomized clinical trials (RCT) of parent-led ABA, which could further support the efficacy of this modality of applied

behavior analysis for children with ASD. Additionally, any future studies should expound further upon the demographics of participants included in their study such as level of ASD diagnosis (e.g., Level 1, 2, or 3), the presence of co-occurring disorders, and level of intellectual functioning. This information could speak to the generalizability of the methodology and the importance of acknowledging the heterogeneity of this population, who may or may not benefit from various treatment formats. Furthermore, future studies should evaluate if this methodology of treatment is effective across various age groups as individuals over the age of 7 do not make as significant of gains in treatment as those 7 and younger (Granpeesheh et al., 2009; Tiura et al., 2017).

Another area for future research includes evaluating parental stress and parental efficacy at subsequent reassessment periods and post-treatment for parent-led ABA as this could provide valuable information regarding the benefit of this model for parents. Previous studies have demonstrated the effectiveness of parent mediated models at decreasing parental stress and increasing parental self-efficacy (Bearss et al., 2013; Kuravackel et al., 2018; Postorino et al., 2017); therefore, evaluating if this is true for parent-led ABA can contribute to its overall effectiveness.

Finally, more research is needed around the parent-led ABA curriculum, which was developed by the agency whose data were used in this study. This is important to assess as the validity of this curriculum has not previously been studied. Therefore, additional information is needed to understand how to best use the curriculum and how parents and caregivers utilize the curriculum outside of treatment sessions. Moreover,

fidelity of implementation by parents applying this model of treatment is important to measure, for this reason, research evaluating treatment fidelity should be conducted.

Implications for Social Change

This research sought to understand the efficacy of parent-led ABA for children with autism and their parents. The results revealed parent-led ABA to be as efficacious of practitioner-led ABA (or 3-tier ABA, traditional ABA) for children between 3-7 years of age with ASD. Subsequently, there is strong support for wider acceptance and use of this model in the field of applied behavior analysis (ABA), and more importantly in the field of autism treatment. This has important implications for social change as it provides practitioners of ABA support for utilizing different models of ABA, which in turn, positively impacts families who have children with autism, as it provides them more options in treatment decision making.

Also, of importance, parent-led ABA is meant to equip and encourage parents to be at the forefront of their child's treatment. Placing the parent, the most important person in a child's life, at the center of treatment implementation provides them lifelong skills in their parenting tools. This model of ABA provides parents with evidence-based methods to effectively teach their children new skills and decrease challenging behaviors, which can have a daily and lifelong impact for these families as autism is a complex developmental disability, presenting with many challenges. This research contributes to the knowledge base of efficacious treatment options for children with ASD and is likely to positively impact the field of applied behavior analysis and autism treatment.

Conclusions

The ASD population is a heterogenous group of people presenting with various skills, interests, and needs. This group of individuals commonly presents with co-occurring mental health disorder, varying intellectual abilities, and may have a variety of medical needs (e.g., GI problems, sleep disorders, etc.). While this population has a variety of clinical presentations, the most common treatment modality available for this population is practitioner-led ABA, leaving families with few options to support their child and their family. For this reason, more family focused, and evidence-based treatments are needed to better serve people with autism and their families; thus, the exploration of parent-led ABA, a parent mediated approach to ABA, that places families at the center of the child's treatment with an evidence-based foundation. This study set out to understand if parent-led ABA is an efficacious parent mediated approach to ABA treatment for young children with ASD.

Through the lens of behavioral theory, the foundation of ABA, and Albert Bandura's theory of self-efficacy this study investigated parent mediated ABA as a means of increasing skills of young children with autism. Self-efficacy is cognitive mediating factor to behavior change, whereby as people feel more confident in their ability to accomplish a goal, they are more likely to accomplish that goal. Self-efficacy is at the core of parent-led ABA which sets out to provide parents with tools needed to effectively teach their child new skills and decrease challenging behaviors through means of education, modeling, practice, rehearsal, and implementation, as well as verbal encouragement through their treatment team. Each of these means facilitate self-efficacy,

thus increasing a parent's belief in their ability to effectively parent their child. The foundation of parent-led ABA is applied behavior analysis, grounded in behavior theory, this treatment adjusts an individual's environment through antecedents and consequences to teach new behaviors and decrease challenging behaviors that do not facilitate learning and decrease social engagement.

The results of this study demonstrated parent-led ABA is an efficacious treatment for children with autism. The analyses revealed parent-led ABA to be as effective as practitioner delivered treatment at increasing skills as measured by two outcomes measure, the Vineland-3 and the VB-MAPP. This methodology of ABA provides families with more options when discerning the best treatment for their child with autism, that is both family-centered and evidence-based. By placing parents at the forefront of their child's treatment we equip families with lifelong skills, which in turn can positively impact their parenting abilities and increase their own self-efficacy regarding their belief to positively parent their child, thus, making a lasting impact on their child's life.

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Appendix A: Data Use Agreement

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DATA USE AGREEMENT

This Data Use Agreement ("Agreement"), effective as of 04/01/2021, is entered into by and between Lindsey Sneed ("Data Recipient") and The Behavior Health Provider Network ("Data Provider"). The purpose of this Agreement is to provide Data Recipient with access to a Limited Data Set ("LDS") for use in research in accord with the HIPAA and FERPA Regulations.

1. Definitions. Unless otherwise specified in this Agreement, all capitalized terms used in this Agreement not otherwise defined have the meaning established for purposes of the "HIPAA Regulations" codified at Title 45 parts 160 through 164 of the United States Code of Federal Regulations, as amended from time to time.

2. Preparation of the LDS. Data Provider shall prepare and furnish to Data Recipient a LDS in accord with any applicable HIPAA or FERPA Regulations

Data Fields in the LDS. **No direct identifiers such as names may be included in the Limited Data Set (LDS).** The researcher will also not name the organization in the doctoral project report that is published in Proquest. In preparing the LDS, Data Provider or designee shall include the **data fields specified as follows**, which are the minimum necessary to accomplish the research: Parent-led ABA and 3-tier ABA data, including descriptive information, PSS, Parent Confidence Scores, Hours in Treatment, Duration of treatment, Vineland-3 Scores, VB-MAPP.

3. Responsibilities of Data Recipient. Data Recipient agrees to:

   a. Use or disclose the LDS only as permitted by this Agreement or as required by law;

   b. Use appropriate safeguards to prevent use or disclosure of the LDS other than as permitted by this Agreement or required by law;

   c. Report to Data Provider any use or disclosure of the LDS of which it becomes aware that is not permitted by this Agreement or required by law;

   d. Require any of its subcontractors or agents that receive or have access to the LDS to agree to the same restrictions and conditions on the use and/or disclosure of the LDS that apply to Data Recipient under this Agreement; and

   e. Not use the information in the LDS to identify or contact the individuals who are data subjects.

4. Permitted Uses and Disclosures of the LDS. Data Recipient may use and/or disclose the LDS for its research activities only.

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5. Term and Termination.

   a. Term. The term of this Agreement shall commence as of the Effective Date and shall continue for so long as Data Recipient retains the LDS, unless sooner terminated as set forth in this Agreement.

   b. Termination by Data Recipient. Data Recipient may terminate this agreement at any time by notifying the Data Provider and returning or destroying the LDS.

   c. Termination by Data Provider. Data Provider may terminate this agreement at any time by providing thirty (30) days prior written notice to Data Recipient.

   d. For Breach. Data Provider shall provide written notice to Data Recipient within ten (10) days of any determination that Data Recipient has breached a material term of this Agreement. Data Provider shall afford Data Recipient an opportunity to cure said alleged material breach upon mutually agreeable terms. Failure to agree on mutually agreeable terms for cure within thirty (30) days shall be grounds for the immediate termination of this Agreement by Data Provider.

   e. Effect of Termination. Sections 1, 4, 5, 6(e) and 7 of this Agreement shall survive any termination of this Agreement under subsections c or d.

6. Miscellaneous.

   a. Change in Law. The parties agree to negotiate in good faith to amend this Agreement to comport with changes in federal law that materially alter either or both parties' obligations under this Agreement. Provided however, that if the parties are unable to agree to mutually acceptable amendment(s) by the compliance date of the change in applicable law or regulations, either Party may terminate this Agreement as provided in section 6.

   b. Construction of Terms. The terms of this Agreement shall be construed to give effect to applicable federal interpretative guidance regarding the HIPAA Regulations.

   c. No Third Party Beneficiaries. Nothing in this Agreement shall confer upon any person other than the parties and their respective successors or assigns, any rights, remedies, obligations, or liabilities whatsoever.

   d. Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

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e. Headings. The headings and other captions in this Agreement are for convenience and reference only and shall not be used in interpreting, construing or enforcing any of the provisions of this Agreement.

IN WITNESS WHEREOF, each of the undersigned has caused this Agreement to be duly executed in its name and on its behalf.

DATA PROVIDER

Signed: DocuSigned by: Tracy Gayeski 3EC825EB96FF483...

Print Name: Tracy Gayeski

Print Title: VP, Network Operations

DATA RECIPIENT

Signed: DocuSigned by: Lindsey Sneed 6E1DB1FAD113453...

Print Name: Lindsey Sneed

Print Title: Principle Investigator