




Effectiveness of Parent-Led Applied Behavior Analysis at Improving Outcomes for Parents of Autistic Children


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Abstract

The current study sought to understand the effect of parent-led applied behavior analyses (ABA), in comparison to practitioner-led applied behavior analysis, on parental stress and parental self-efficacy. To do this, we analyzed secondary data from a large behavioral health provider for individuals with autism spectrum disorder. We conducted a regression analysis to understand the relationship between parental stress and parental self-efficacy and a two-way mixed ANOVA to evaluate if differences existed between parent-led and practitioner-led ABA on parental stress and parental self-efficacy. The regression analysis included parents of 2,276 children with autism spectrum disorder and the comparison analysis of parent-led and practitioner-led applied behavior analysis included 152 children with autism spectrum disorder, with 76 participants in each group. The analysis found parental self-efficacy predicts 21% of parenting stress with a significant negative relationship. The results of the comparison between parent-led and practitioner-led ABA resulted in a significant difference in parental self-efficacy, whereby the parent-led group exhibited a significant increase in parental self-efficacy while the practitioner-led group did not. These results further support the efficacy of parent-mediated treatment for children with autism spectrum disorder and underscore the importance of significant inclusion of parents into ABA treatment.

Keywords: parent-mediated, parent-led ABA, applied behavior analysis, self-efficacy, parenting stress

Date Submitted: December 21, 2021 | **Date Published:** August 11, 2022

Recommended Citation

Sneed, L., & Samelson, D. (2022). Effectiveness of parent-led applied behavior analysis at improving outcomes for parents of autistic children. *Journal of Social, Behavioral, and Health Sciences*, 16(1), 160–177.
<https://doi.org/10.5590/JSBHS.2022.16.1.12>

Introduction

Parental self-efficacy is defined as a parent's confidence in their ability to successfully parent their child (Kurzrok et al., 2021). High parental self-efficacy is positively related to healthy functioning in children and parents (Albanese et al., 2019). Researchers have consistently demonstrated parental stress and parental self-

efficacy have a reciprocal relationship, whereby as parental self-efficacy increases, parental stress decreases and vice versa (Bloomfield & Kendall, 2012; Shiri et al., 2020; Sofronoff et al., 2004; Sofronoff & Farbotko, 2002). While all parents experience parenting-related stress, parents of children with autism spectrum disorder (ASD) consistently report greater stress than parents of typically developing children and parents with children with other developmental disabilities (e.g., Down Syndrome; Eisenhower et al., 2005; Hayes & Watson, 2013; Padden & James, 2017; Pastor-Cerezuela et al., 2016; Postorino et al., 2017; Schiltz et al., 2018).

Behavioral, naturalistic-developmental and speech therapies are shown to positively impact children with ASD by increasing communication and adaptive skills, as well as decreasing challenging behaviors (Makrygianni et al., 2018; Rogers et al., 2021; Rose et al., 2020). Parent-mediated forms of these interventions have also been found to positively impact children with ASD as well as positively impact their parents (Anan et al., 2008; Brown & Woods, 2016; DeVeney et al., 2017). Specifically, previous researchers have demonstrated that parent-mediated interventions effectively increase parental self-efficacy and decrease parental stress (Kuravackel et al., 2018; Sofronoff & Farbotko, 2002). The purpose of this study is to understand the effect of parent-led applied behavior analysis (ABA; Sneed, 2021), a parent-mediated method of ABA, on parental stress and self-efficacy in comparison to practitioner-led ABA.

Literature Review

Autism Spectrum Disorder

ASD is a developmental disability characterized by impairment in social interactions, social understanding, and social communication, as well as the presence of restrictive and repetitive patterns of behavior which present in a variety of forms (American Psychiatric Association [APA], 2013). The prevalence rate of ASD in the United States increased from one in 54 in 2019 (Maenner et al., 2020) to one in 44 in 2021 (Maenner et al., 2021). The diagnosis of autism first occurred in the *Diagnostic and Statistical Manual of Mental Disorders—Third Edition* (DSM-III) (APA, 1980), and, since then, criteria changed with the most recent version of the DSM-5 moving to a two-factor model (e.g., broad-base social deficits and restrictive and repetitive patterns of behavior) (APA, 2013). The diagnosis of ASD has three corresponding levels ranging from low support to high support. Specifically, Level 1 is qualitatively described as requiring support, Level 2 is requiring substantial support, and Level 3 is requiring very substantial support (APA, 2013).

Additionally, the diagnosing clinician rates the two core features of ASD separately, with socialization receiving a diagnostic level and restrictive and repetitive behaviors receiving a diagnostic level. With the change to a spectrum disorder, Asperger's syndrome, pervasive developmental disorder—not otherwise specified—and disintegrative childhood disorder were absorbed into the autism spectrum (Masi et al., 2017), leading to greater heterogeneity within this population of individuals. Other factors contributing to the heterogeneity of this population include the presence of co-occurring mental health disorders (Lecavalier et al., 2019), medical conditions (Bauman, 2010), gender (Hull et al., 2020), as well as the level of intellectual functioning (Matson & Shoemaker, 2009). Given this complexity of ASD, it is not surprising to see high levels of stress in parents of children and adolescents with ASD.

Applied Behavior Analysis

ABA is considered an evidence-based intervention for children and adolescents with ASD (Wong et al., 2015). ABA has been shown to increase communication, social skills, and adaptive functioning as well as decrease challenging behaviors in children and adolescents with ASD (Irwin & Axe, 2019; Makrygianni et al., 2018). Starting in the early 2000s, individual states in the United States began passing laws mandating health insurance coverage for people with ASD to include ABA (Autism Speaks, 2019; Health & Safety Code, 2011),

making ABA a commonly implemented intervention for children with ASD. ABA can be provided through either a practitioner-led model or a parent-mediated model.

Practitioner-Led ABA

The most common model provided to families with a child with ASD is a practitioner-led model (The Council of Autism Service Providers, 2014). The practitioner-led ABA model is typically composed of a Board Certified Behavioral Analyst® (BCBA®) who oversees the implementation of treatment with the support of a mid-level clinician who has at least a bachelor's degree with specialized training in ABA and a paraprofessional who has received training in implementing ABA. In addition to this 3-tier model, there is also a 2-tier model of practitioner-led, consisting of the BCBA and paraprofessional. In both 3- and 2-tier models of the practitioner-led ABA model, the paraprofessional provides most of the direct intervention with the child or youth with ASD.

Parent-Mediated ABA

In parent-mediated ABA models, the parent (or caregiver) implements ABA procedures with their child to effect change in acquiring new skills, as well as decrease challenging behaviors that are above and beyond what is expected for the child's age. In this model the parents, instead of a paraprofessional, implement ABA with the child. The BCBA and mid-level clinician provide training, support, and coaching to the parent. Like practitioner-led ABA models, parent-mediated ABA can also be done without a mid-level clinician. There is broad empirical support for parent-mediated interventions for children and adolescents with ASD (Anan et al., 2008; Kuravackel et al., 2018; Pickles et al., 2016; Postorino et al., 2017; Rogers et al., 2019). Parent-mediated ABA, such as parent-led ABA, has been shown to be as effective as practitioner-led treatments (Shiri et al., 2020; Sneed, 2021). Despite the success of parent-mediated ABA for individuals with ASD, the trend in recent years has been toward practitioner-led ABA.

Parental Self-Efficacy, Stress, and Parent-Mediated Intervention

Parental Self-Efficacy

Self-Efficacy is a cognitive mediating factor that leads to behavior change. First described by Albert Bandura (1977), self-efficacy is the belief a person has in their ability to be successful in a particular task, skill, or goal accomplishment. Self-Efficacy is developed by four means: practice, observing, verbal persuasion, and affect (Bandura, 1977). Parental self-efficacy refers to a parent's belief in their ability to effectively parent their child (Sofronoff & Farbotko, 2002). Parents of children with ASD consistently have lower self-efficacy than other parenting populations (Shiri et al., 2020; Smart, 2016).

Parenting Stress

Parents of children with ASD are amongst the most stressed parenting populations (Lai & Oei, 2014; McAuliffe et al., 2017). Many studies have demonstrated that parents of children with ASD are more stressed than parents of typically developing children and more stressed than parents of children with other developmental disabilities (Hu et al., 2019; Padden & James, 2017; Pastor-Cerezuela et al., 2016). There are many factors contributing to parental stress for this population; these include autism severity (Iadarola et al., 2018), the co-occurrence of intellectual disability (Pastor-Cerezuela et al., 2016; Postorino et al., 2017), and the presence of challenging behaviors, such as dangerous elopement, physical aggression, self-injury, and property destruction (Argumedes et al., 2018). These parents experience greater demand for caregiving, including significant supervision requirements, leading to less time to care for personal needs as well as family needs (Postorino et al., 2019) and increased social isolation (Lunsky et al., 2018).

Behavioral intervention (Shiri et al., 2020), cognitive behavior therapy (Cook et al., 2019), and speech and language pathology (DeVeney et al., 2017) when implemented through a parent-mediated modality, positively

mitigate some of these challenges by teaching parents how to engage and teach their child more effectively. These interventions teach parents a different way to parent their child, not requiring a specified time commitment, rather allowing parents to implement these learned interventions with their child during all their waking hours. Parent-mediated interventions consistently and positively impact both child and parent outcomes (Bearss et al., 2013; Kuravackel et al., 2018; Postorino et al., 2017; Scahill et al., 2016; Siller et al., 2013).

Parent-Mediated Intervention

In their 2019 study, Zhou et al. investigated the impact of family-focused psychoeducation for 64 families of children with ASD and 63 families of children with typically developing children. At the start of treatment, the families of children with ASD exhibited significantly less parenting self-efficacy than parents of typically developing children. At the conclusion of the family-focused psychoeducation, parents of children with ASD exhibited significantly greater self-efficacy, as well as greater emotional control and self-acceptance. These authors went on to recommend the need for greater familial involvement and training in ASD services for families to effectively care for their child, leading to greater parental empowerment and understanding overall (Zhou et al., 2019).

Similar to Zhou et al., Shiri et al. (2020) investigated the effectiveness of a family-based behavioral management program for parents who have children with ASD in Iran. Included in this study were 17 families of children with ASD who received a 10-week intensive training program to address restrictive and repetitive behaviors causing marked impairment in the child's life. At the conclusion of the 10-week program, the children exhibited significantly decreased restrictive and repetitive behaviors across domains (e.g., self-injurious behavior, compulsive behavior, etc.) and parents exhibited significantly increased parental self-efficacy, as well as significantly decreased parenting stress (Shiri et al., 2020). These authors noted the significant change in a short period of time could be due to the parent implementing the ABA procedures during all their waking hours, and, while parents reported it was hard to implement all the time, they also reported it was possible.

To understand the impact of ASD treatment on parental self-efficacy, Kurzrock et al. (2021) evaluated parental involvement in their child's treatment as well as the overall level of caregiver burden, intensity of treatment, and satisfaction with treatment. There were 438 parents of children with ASD 2–17 years old included in this study (Kurzrock et al., 2021). While parents who reported greater burden, both socially and financially, exhibited lower parental self-efficacy, overall parents who were more significantly involved in their child's treatment reported greater autism-specific parental self-efficacy regardless of burden. Additionally, intensity of treatment did not impact self-efficacy. Rather it was the amount of time the parent spent engaged in the intervention that significantly predicted greater parental self-efficacy (Kurzrock et al., 2021).

Parental Self-Efficacy and Parent Stress

There is a substantial amount of literature demonstrating the effectiveness of parent-mediated therapies in affecting positive change in both parenting self-efficacy and parental stress (Bearss et al., 2015; Rogers et al., 2019; Siller et al., 2013), as well as affecting positive change in the children and adolescents with ASD (Anan et al., 2008; Koegel et al., 2002; Postorino et al., 2017). While there is also substantial literature supporting the efficacy of practitioner-led behavioral intervention for children with ASD (Makrygianni et al., 2018; Virués-Ortega, 2010), there is a paucity of research evaluating parental outcomes for this intervention modality. Furthermore, there has yet to be research investigating the impact of practitioner-led therapies on parental self-efficacy and parental stress, specifically comparing practitioner-led ABA to parent-mediated ABA.

Purpose of the Study and Research Questions

This study examined the relationship between parental self-efficacy and parental stress in parents of children and adolescents with ASD receiving parent-led ABA or practitioner-led ABA, as well as the differences in parental self-efficacy and parental stress between the two modalities of ABA delivery. To do this, secondary data from a large community-based organization were evaluated to answer the following questions:

1. What proportion of parental self-efficacy can be accounted for in parenting stress?
2. What is the effect of parent-led ABA on parental self-efficacy and parenting stress?
3. What is the effect of practitioner-led ABA on parental self-efficacy and parenting stress?
4. Is there a difference between parent-led ABA and practitioner-led ABA on parental self-efficacy and parenting stress?

Methods

Research Design

The nature of this study was a quasi-experimental, nested design, utilizing secondary data to evaluate the research hypotheses. This methodology enabled the comparison of two groups, the parent-led ABA group and the practitioner-led ABA group, on the two outcome measures, Catalight Parental Self-Efficacy Scale (Catalight PSES) and the Parenting Stress Scale (PSS; Berry & Jones, 1995). A nested design allowed for the analysis of the between-subjects variables (e.g., parent-led ABA and practitioner-led ABA), within-subjects variable (e.g., time), and the dependent variables (e.g., Catalight PSES, PSS).

Data for this study were obtained from a large behavioral health organization in a metropolitan area of California that manages the behavioral health treatment for individuals with developmental disabilities. These secondary data included descriptive data, pre-treatment scores, and reassessment scores on the scales used to measure progress during treatment implementation for participants. So we could better understand how parenting stress and parenting self-efficacy interact within this population of parents, our initial analysis included 2,276 parents of children with ASD. The sample population for the comparison analysis included 152 participants (113 males and 39 females) between 2 years and 11 years of age ($M = 4.3$; $SD = 2.4$) with a diagnosis of ASD receiving ABA treatment between 2020 and 2021, with 53% of the sample population having a diverse ethnic background. For a full breakdown of the ethnic breakdown of participants, see Table 1. All children included in this study received an ASD diagnosis under the DSM-5 criteria by a licensed and qualified clinician (e.g., psychologist, California psychological assistant, psychiatrist). The sample population represents a diversity in the ASD diagnostic level criteria as well as co-occurring diagnoses (e.g., ADHD, anxiety, intellectual disability). Thirty-one percent of the included sample did not have the specified levels detailed on the diagnostic report, 39% of the sample had Level 1 in both socialization and restrictive and repetitive behavior, 15% of the sample had Level 2 in both socialization and restrictive and repetitive behaviors, one individual had Level 3 in both socialization and restrictive and repetitive behaviors, and one individual did not have ASD. Additionally, 42% of the included population had one or more co-occurring diagnoses, with 19 participants having three or more diagnoses. For a complete listing of the diagnostic criteria of the sample population, see Table 2.

Table 1. *Gender and Ethnic Background*

Factor	Total Sample	Treatment Group	
		Practitioner-Led ABA	Parent-Led ABA
Gender			
<i>n</i>	152	76	76
Male	113 (74%)	58 (76%)	55 (72%)
Female	39 (26%)	18 (24%)	21 (27%)
Ethnicity			
<i>n</i>	152	76	76
African American	17 (12%)	9 (12%)	8 (10%)
Asian	23 (15%)	13 (17%)	10 (13%)
Caucasian/White	66 (43%)	31 (41%)	35 (46%)
Hispanic/Latino	30 (20%)	18 (24%)	12 (16%)
Native American	1 (<1%)	1 (1%)	0 (0%)
Non-White	8 (5%)	3 (4%)	5 (7%)
Declined to Answer	7 (4%)	1 (1%)	6 (8%)

Table 2. *Diagnostic Level and Co-Occurring Diagnoses*

Factor	Total Sample	Treatment Group	
		Practitioner-Led ABA	Parent-Led ABA
ASD Levels and Diagnoses			
ASD—No level indicated	48 (31%)	21 (28%)	27 (36%)
ASD Level 1 A, Level 1 B	59 (39%)	27 (35%)	32 (42%)
ASD Level 2 A, Level 2 B	23 (15%)	13 (17%)	10 (13%)
ASD Level 3 A, Level 3 B	1 (<1%)	1 (1%)	0 (0%)
ASD Level 1 A, Level 2 B	10 (7%)	7 (10%)	3 (4%)
ASD Level 2 A, Level 1 B	7 (5%)	5 (7%)	2 (3%)
ASD Level 3 A, Level 2 B	2 (1%)	1 (1%)	1 (1%)
Provisional ASD	1 (<1%)	0 (0%)	1 (1%)
No ASD	1 (<1%)	1 (1%)	0 (0%)
Co-Occurring Diagnoses			
<i>n</i>	64 (42%)		
ADHD	12	9	3
Anxiety Disorder	8	3	5
GDD or IDD	14	8	6
Language/Speech Disorder	33	15	18
Epilepsy	2	0	2
Tourette's syndrome	2	1	1
GI related diagnoses	3	2	2

Other specified Disruptive, impulse control, and conduct disorder	4	0	4
Chromosomal disorder	4	2	2
Number of Co-Occurring Diagnoses			
% with co-occurring diagnoses	42%		
One additional diagnosis	45	19	26
Two or more diagnoses	19	8	11

Procedure for Recruitment, Participation, and Data Collection

Individuals with ASD whose data were analyzed for this study were referred to the organization through their insurance provider. Once a referral was received by the organization, an intake assessment was conducted, during which the PSS and Catalight PSES were administered via parent report through an online system. Once the intake assessment was complete, individuals were referred to an ABA agency for treatment for an initial behavioral assessment and treatment was authorized through 6-month treatment authorizations. At the conclusion of each 6-month treatment authorization, data for each client was aggregated to include the norm-referenced assessments mentioned previously. The data were accessed only after all agency requirements were met and approval to move forward with the study was granted.

Instrumentation

Parental Stress Scale

The PSS is an 18-item measure of parenting stress developed by Berry and Jones in 1995. The PSS is a self-report measure taking approximately 10 minutes to complete. This assessment assesses both positive and negative aspects of parenting and has a 5-point Likert scale (1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Undecided*, 4 = *Agree*, and 5 = *Strongly agree*). Original psychometric properties of the PSS were established in 1995 with a sample population of 1,276 parents with an alpha coefficient of .83, and convergent validity was established through the comparison of other constructs evaluating parenting stress (Berry & Jones, 1995).

Catalight Parenting Self-Efficacy Scale

The Catalight PSES is a brief survey developed by the agency whose data were utilized for this study. The survey, taking approximately 3 minutes to complete, is given during the intake appointment and subsequent re-authorizations for every client who receives treatment from the agency. The survey is a 5-point Likert scale (1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Neutral*, 4 = *Agree*, and 5 = *Strongly agree*), with the intake survey consisting of two questions and the in-treatment survey consisting of those same two questions with two additional questions related to parents' belief in their ability to implement learned interventions from their child's treatment as well as overall perception of treatment. Scores are converted to percentiles to allow for comparison across time. The intake version of the survey was normed by the agency with 1,629 participants with an acceptable alpha coefficient of .73. The in-treatment version of the survey was normed by the agency with 1,774 participants with an excellent alpha coefficient of .91. This survey evaluates parents' perception of the helpfulness of their child's treatment, belief in their ability to teach their child new skills as it relates to the specific treatment received, confidence in their ability to implement learned procedures with their child, as well as their perception of the positive impact of treatment for both their child and their family.

Intervention

Practitioner-Led ABA

Participants in the practitioner-led group received 3-tier ABA intervention. This model of ABA was composed

of a Board Certified Behavior Analyst® (BCBA®; e.g., high-level clinician) who oversaw intervention implementation with the support of a Board Certified assistant Behavior Analyst® (BCaBA®) or a bachelor's level clinician with additional education (e.g., mid-level clinician), and a paraprofessional who was certified from one of three possible certifications. In the 3-tier model, the paraprofessional implemented ABA directly with the client. The hours of direct treatment by the paraprofessional were determined by the ABA agency. Age, the level of disability (Level 1, 2, or 3), and family availability factored into the determination of the number of hours of direct treatment the client received. The average number of hours for the participants in the practitioner-mediated group was 35 hours of paraprofessional hours each month ($SD = 23$), 7.85 ($SD = 3.9$) hours of mid-level clinician intervention per month, and 3 ($SD = 1.17$) hours of high-level clinician intervention per month. As is prescribed by The Council of Autism Service Providers (2014), 20% of direct treatment hours are to be supervised by a BCBA or a delegated BCaBA (or other qualified professional); thus, clients received, on average, 5 to 16 additional supervised hours per month.

In practitioner-led ABA, a BCBA conducted the initial behavioral assessment, which included a norm-referenced assessment of adaptive behavior (e.g., Vineland-3), criterion-referenced assessment (e.g., VB-MAPP, AFLS), interview with caregivers, and direct observation of the client. From this assessment, skills to target for increase, as well as target behaviors for decrease (if applicable), were identified and incorporated into the client's 6-month treatment plan. Upon completion of the assessment, direct treatment began, with the paraprofessional working weekly with the client under the supervision and guidance of the BCBA and the mid-level practitioner (e.g., BCaBA, bachelor's level clinician). Direct observation of the paraprofessional working with the client occurred, with the supervisor providing behavior skills training on interventions and implementing the intervention directly with the client as well. The BCBA and mid-level clinician both provided parent training to the caregivers as it related to their child's treatment plan. Treatment plans included up to six domains: expressive communication, receptive communication, pragmatic communication, daily living skills, behavior reduction, and parent training. Every 6 months the client was reassessed utilizing the same norm-referenced and criterion-referenced assessment as the initial behavioral assessment to determine progress in treatment; additionally, each goal was reviewed and, based on visual analysis, was determined to be "met," "continued with revisions," "continued without revisions," or "discontinued." At the conclusion of the reassessment procedures, a new treatment plan was written or treatment was recommended to conclude based on client progress, family decision, and clinical recommendation. This same process occurred every six months until treatment concluded.

Parent-Led ABA

In the parent-led ABA group, parents directly implemented the intervention with their children in their natural environment. In this model, parents were taught to directly implement treatment with their child based on family priorities and the need(s) of the child. A BCBA oversaw the treatment program, including writing the assessment, treatment implementation, parent training, and the oversight of BCaBA or bachelor's level clinician who supported treatment implementation. Depending on the level of disability and family schedules, parents received a range of 2–3.5 hours of training and support per week from the BCaBA or bachelor level clinician and an additional 0.5–1.5 hours of supervision and support from the BCBA per week. The average number of hours received in the parent-led ABA group was 2.70 ($SD = 1$) per month for the high-level clinician (e.g., BCBA) and 7.22 ($SD = 2.22$) per month by the mid-level clinician (e.g., BCaBA).

The parent-led ABA assessment was similar to the practitioner-led assessment in that it includes the same norm-referenced assessment of adaptive behavior (e.g., Vineland-3), a criterion-referenced assessment (e.g., VB-MAPP, AFLS), and interview with caregivers. The direct observation was parent-implemented in a coaching methodology, whereby the clinician coached the parents through a series of activities. In this situation where there was an older client receiving treatment (e.g., over 6 years of age), a general observation occurred in the absence of parent implementation (unless clinically indicated). Once the assessment was

concluded, a treatment plan was developed based on client skills, areas for skill attainment, behavior reduction (when applicable), as well as parent-specific goals around treatment goals and treatment implementation, and then the intervention began. Treatment plans included goals in six possible domains: expressive communication, receptive communication, pragmatic communication, daily living skills, challenging behaviors for reduction, and parent training goals.

At the outset of treatment, parents were taught pivotal skills such as teaching requesting (Chaabane et al., 2009) and differential reinforcement (Robertson, 2016; Tarbox et al., 2010). In addition to pivotal skills such as these, parents were taught basics of applied behavior analysis processes such as antecedents, consequences, reinforcement, and punishment (Cooper et al., 2020) and how those relate to everyday teaching skills for their child(ren) and to the child's treatment plan. From there, parents were taught how to specifically implement their child's treatment plan as it relates to skill acquisition and behavior reduction. Clinicians and parents met for an average of 1–3 hours weekly where basic education was provided, and then specific skills were taught, and modeled by the clinician. Subsequently clinicians observed parents as they implemented the program with their children through a behavior skills training methodology (Dogan et al., 2017; Loughrey et al., 2014). Through this manner of intervention, parents implement treatment and strategies with their children during all waking hours, leading to many opportunities for children to encounter contingencies of learning. Parents in the parent-led ABA program report overall satisfaction and acceptance of this model of intervention with parents referencing how this intervention has changed the way they parent their child(ren).

After six months of treatment, children were reassessed using the original norm and criterion-referenced assessment completed at the outset of treatment. Each treatment goal was also evaluated for progress through visual analysis and determined to be “met,” “continued with revisions,” “continued without revisions,” or “discontinued.” Just as with practitioner-led ABA, at the conclusion of the reassessment procedures, a new treatment plan was written or treatment was recommended to conclude based on client progress, family decision, and clinical recommendation. This same process occurred every six months until treatment concluded.

Data Analysis

We analyzed the data using IBM SPSS Statistics for Windows, version 27 (2020). The data were aggregated by the agency that owns the data through their business intelligence department and then provided to the primary investigators in an Excel document for analysis. Missing data were omitted, and the remaining cases were included in the analysis.

Statistical Procedures

To understand the relationship between parental stress and parental self-efficacy, we conducted a linear regression. To understand if differences existed between the parent-led ABA and practitioner-led ABA groups on the two outcome measures, we used a two-way mixed ANOVA. A two-way mixed ANOVA compares the mean differences between the between-subjects factor, as well as analyzes the within-subjects factor across continuous variables (Warner, 2013).

Results

Relationship Between Parental Stress and Parental Self-Efficacy

We ran a linear regression to understand the effect of parental self-efficacy on parental stress. Level of parental self-efficacy statistically significantly predicted parental stress, $F(1, 2274) = 600.95, p < .0001$, accounting for 21% of the variation in parental stress with adjusted $R^2 = .209$, a medium size effect according

to Cohen (1988). For every one-point increase in parental self-efficacy, parental stress score goes down by 2.82 points (95% CI, -3.05 to -2.60).

Parent-Led ABA and Practitioner-Led ABA Comparison

We ran a two-way mixed ANOVA to understand if there were differences in parental stress and parental self-efficacy based on the type of treatment the child received after the first 6 months of treatment. There were 152 participants included in this analysis, 76 of whom received parent-led ABA and 76 of whom received practitioner-led ABA. There were no outliers as assessed by boxplot and there was homogeneity of variances ($p > .05$) as assessed by Levene's test of homogeneity of variances. There was no statistically significant interaction between the models of ABA and time on parental stress and parental self-efficacy, $F(2, 149) = 2.464$, partial $\eta^2 = .032$. The main effect of time showed a statistically significant difference in mean stress and self-efficacy scores at the different time points, $F(2, 149) = 3.534$, $p < .05$, partial $\eta^2 = .045$.

To understand where the specific differences were by time on the outcome measures, we conducted univariate analyses. This resulted in the simple effect of time not having a statistically significant difference from time 1 ($M = 38.68$) to time 2 ($M = 37.76$) for parental stress and revealed a statistically significant difference from time 1 ($M = .76$) to time 2 ($M = .80$) for parental self-efficacy. Univariate analysis in the simple effect of time by model of ABA demonstrated a statistically significant difference in parental self-efficacy, $F(1, 150) = 4.752$, $p < .05$, partial $\eta^2 = .031$. Pairwise comparisons revealed parent-led ABA to have a statistically significant difference from time 1 ($M = .74$) to time 2 ($M = .83$) on parental self-efficacy, while practitioner-led ABA did not have a significant difference from time 1 ($M = .77$) to time 2 ($M = .77$). There was no statistically significant difference of time by model of ABA on parental stress, $F(1, 150) = .057$, partial $\eta^2 = .0001$. Pairwise comparison of parent-led ABA showed a non-significant decrease in parental stress from time 1 ($M = 40.00$) to time 2 ($M = 39.24$) and a non-significant decrease in parental stress from time 1 ($M = 37.34$) to time 2 ($M = 36.28$) for practitioner-led ABA.

Table 3. PSS and PSES Pre-Treatment and 6-Month Treatment Scores

Factor	Pre-Treatment Scores		6-Month Treatment Scores	
	Parent-Led ABA	Practitioner-Led ABA	Parent-Led ABA	Practitioner-Led ABA
PSS	40.00	37.34	39.28	36.28
PSES	14.66	15.39	16.37*	15.48

Note: * $p < .05$

Discussion

The purpose of this study was to understand the difference in outcome for parental stress and parental self-efficacy for parents of children with ASD receiving practitioner-led ABA or parent-led ABA. To do this, we evaluated two outcome measures at two different time points for 152 parents of children with ASD receiving either parent-led or practitioner-led ABA. The Parental Stress Scale and Catalight Parental Self-Efficacy Scale were analyzed from pre-treatment score to first reassessment for children between 2–11 years of age. Additionally, pre-treatment PSS and Catalight PSES scores were analyzed for 2,276 parents of children with ASD in order to understand how parenting self-efficacy affects parental stress.

For parents of children with ASD 2–11 years of age included in this study, parenting self-efficacy accounted for 21% of parenting stress as there was a negative predictive relationship between these two constructs ($r = -.457$), demonstrating that, as parenting self-efficacy increases, parental stress decreases. Therefore, when clinicians are working with children with ASD, including parents in the intervention can be a vital component for families as there is opportunity to simultaneously teach parents important skills regarding their child's growth and

development, improve child skills, as well as address parenting stress, which can negatively impact treatment outcome (Osborne et al., 2008). Previous researchers presented the negative impact of parenting stress on child outcomes (Robbins et al., 1991; Strauss et al., 2012), with intensive parent training shown to support parental confidence and ultimately decrease stress (Bloomfield & Kendall, 2012; Kurzrok et al., 2021; Shiri et al., 2020), underscoring the importance of parent involvement in treatment. The results of this study are further supported by Kurzrok et al. (2021), as these researchers evaluated the impact of family involvement and training as part of their child's intervention program, investigating whether more intervention hours are correlated with greater stress and less self-efficacy. Results from this analysis revealed the number of hours did not impact parental stress or self-efficacy, rather it was parents' level of involvement in the intervention that positively impacted stress levels and parental self-efficacy. In addition to this finding, these researchers found that while parent burden does impact parental stress, the level of parent burden did not impact parents' ability to benefit from parent training (Kurzrok et al., 2021).

Results from the mixed model ANOVA demonstrated a significant difference between groups on parental self-efficacy, whereby parents in the parent-led ABA group had a statistically significant increase from pre-treatment to first reassessment in their parental self-efficacy and parents in the practitioner-led ABA group did not. Parenting stress, however, was not significantly different between groups, and, while there was an average mean decrease in parenting stress for both groups, it was not a statistically significant decrease. The lack of significant change in parenting stress for the parent-led ABA group was surprising, given the results of the regression analysis showing that as parenting self-efficacy increases, stress decreases. This lack of significant change, though, may be due to the added work parents were implementing on a daily basis, as is consistent with Shiri et al. (2020), where parents reported parent-mediated intervention resulted in significant work as a parent, but that it was possible to implement. Therefore, it is proposed that parenting stress levels may significantly reduce after more time has passed and the parents become more independent with the strategies learned and implementation of these strategies is commonplace within the family system.

Regarding the practitioner-led ABA group, parenting self-efficacy remained stable from pre-treatment ($M = .77$) to first reassessment ($M = .77$). Consequently, practitioner-led ABA did not result in increased parenting self-efficacy; therefore, parental confidence in their ability to effectively parent their child was not improved with practitioner-led intervention. Practitioner-led ABA, which has a paraprofessional providing direct care to the identified client, focuses on treatment acquisition of the child, rather than equipping parents with skills to work effectively with their child. While some hours from the mid- and high-level clinician are used to support parent education, most hours are utilized to train and support the paraprofessional, observe and provide feedback during sessions to the paraprofessional, and write treatment plans, leaving little time to work directly with the parents. For these reasons, it is not surprising parental self-efficacy did not improve for this group of parents; however, this emphasizes the importance of including parent training as part of the practitioner-led format of ABA.

Results of this archival study, which evaluated community-based implementation of ABA in both a parent-mediated format and a practitioner-mediated formats, contribute to the literature base demonstrating that parent-mediated interventions, such as parent-led ABA, significantly increase parental self-efficacy. Furthermore, this is the first study to compare parent-mediated ABA and practitioner-mediated ABA on parental outcomes, thus, contributing to literature demonstrating the treatment efficacy of parent-mediated ABA. Results from this study establish the importance of substantial parent involvement in treatment for children with ASD in community-based care. Consequently, practitioners of ABA should prioritize parental training and involvement throughout the intervention.

Recommendations

Future studies should evaluate the long-term impact of parent-led ABA and practitioner-led ABA on parenting stress and parental self-efficacy. Specifically, as there was not a significant decrease in parenting stress for the

parent-led ABA group, a future study should focus on parenting stress after 12 months of intervention and at the conclusion of intervention as well. A study evaluating parental self-efficacy for practitioner-led ABA after 12 months of intervention, as well as at the conclusion of intervention, is also recommended, as this study demonstrated parental self-efficacy does not improve after six months of treatment for this group of parents. A study comparing parent-led ABA and practitioner-led ABA for both parent and child outcomes for children with autism is recommended. There is literature supporting the efficacy of both parent-led (Anan et al., 2008; Postorino et al., 2017; Sneed, 2021) and practitioner-led ABA on child outcomes (Makrygianni et al., 2018; Virués-Ortega, 2010), and there is literature supporting positive outcomes for parent-led ABA for parents and caregivers (Bearss et al., 2015; Kuravackel et al., 2018). However, there has yet to be a study comparing both types of treatment (e.g., practitioner-led and parent-led ABA) on both child and parent outcomes. Finally, the number of participants included in this study with severe autism (e.g., Level 3 in one or both factors) was small; therefore, a more targeted study of the impact of parent-led and practitioner-led ABA on this subpopulation of parents of children with ASD is needed.

Limitations

There are several limitations associated with this study that are important to consider. First, this study was based on secondary data, and, while this provides a wealth of information regarding community-based care, it is not a randomized clinical trial. Thus causal conclusions cannot be drawn. Additionally, there is a paucity of information regarding the demographic information for parents included in this study; specifically the education level, socio-economic status, and age of caregivers were not known. Therefore, the generalizability of this study's results is inconclusive as far as reach to parents of different age groups, education statuses, and socio-economic statuses. Lastly, due to the small number of individuals included in this study with severe autism, the impact of parent-led ABA or practitioner-led ABA on parental self-efficacy and stress is unknown.

Conclusion

This study set out to answer four questions regarding the outcome of parenting stress and parental self-efficacy for parents of children with ASD receiving either parent-led ABA or practitioner-led ABA. Results of the analysis revealed parental self-efficacy and parenting stress have a negative relationship, with parental self-efficacy accounting for 21% of parenting stress. Furthermore, while parent-led ABA significantly and positively impacted parenting self-efficacy, practitioner-led ABA did not result in change in parenting self-efficacy and both treatment types did show a non-significant mean decrease in parenting stress. These results emphasize the importance of parent involvement in ABA treatment for children with autism in community-based care. To that end, significant inclusion and training of parents in ABA intervention not only positively impacts their confidence in their ability to effectively parent their child, but also decreases parenting stress, which, in turn, has a positive impact on the child receiving treatment as well as the whole family system.

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