# Examining the Efficacy of the RUBI Parent Training Program in a Clinical Setting for Parents of Children Older Than 7 Years of Age with Autism Spectrum Disorder and Disruptive Behaviors

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## Abstract

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Disruptive behaviors are common and severe in children with autism spectrum disorder (ASD) due to deficits with social and communication skills and restricted or rigid behaviors and interests. Parenting interventions are an effective means of providing support for children with ASD; however, parenting interventions with a specific aim of reducing of disruptive behaviors in children with ASD are limited. The Research Units in Behavioral Intervention (RUBI) parent training was created to increase access to an evidence-based parenting intervention to help decrease the presence of disruptive behaviors in children with diagnoses of ASD and is an evidence-based intervention to reduce disruptive behaviors in children less than 7 years old. The current study assessed the efficacy of the RUBI parent training program in a clinical setting with $N = 55$ children between 7 to 13 years of age to understand the average trajectory of change in

child outcomes associated with parent RUBI participation from baseline through post-treatment follow-up, and the extent to which child age and sex, treatment dosage, and provider education level are associated with such changes. Results indicate that the RUBI parent training program is efficacious in reducing child disruptive behaviors of irritability and noncompliance based on parent ratings; specifically, results revealed a mean 40% decrease in child irritability ratings and mean 52% decrease in child noncompliance ratings. Child age, child sex, treatment dosage, or provider education level did not influence the growth rates. Additionally, children 8.6 years old and above had lower baseline levels of irritability scores, and higher scores at baseline were associated with a greater number of treatment sessions (14 or more sessions). The results suggest that the RUBI parent training program is an efficacious intervention in reducing disruptive behaviors for parents of children above 7 years of age with ASD and disruptive behaviors in clinical settings.

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# Chapter one: Introduction

Autism Spectrum Disorder (ASD) is a spectrum neurodevelopmental disorder characterized by social and communication impairments, and the presence of restricted, repetitive, and stereotyped behaviors and interests (American Psychiatric Association [APA], 2013). The social communication challenges, interests, and patterns of behaviors associated with ASD are typically present from a young age and may become more evident as social demands increase with age. These social communication challenges and patterns of behavior may increase the occurrence of clinically significant disruptive behavior problems for children with ASD in comparison to neurotypical (NT) peers (Matson et al., 2009; Medeiros et al., 2012). Given that the current Centers for Disease Control and Prevention (CDC) prevalence rate for ASD is estimated to be about 1 in 31 children 8 years of age (CDC, 2025), empirically-based interventions that incorporate both developmental and behavioral components to help support these clinically significant disruptive behaviors in this population are needed (Kaat & Lecavalier, 2013; Konst et al., 2013; Lord et al., 2006; Matson, 2009; Rodriguez et al., 2019).

## Prevalence of Disruptive Behaviors in Children with ASD

Children with ASD have been reported to exhibit more disruptive behaviors than NT peers (Baker & Blacher, 2015; Brown et al., 2023; Brown et al., 2024; Matson et al., 2009; Medeiros et al., 2012). Disruptive behaviors can be particularly common and severe in children with ASD because of additional deficits with social and communication skills and behaviors and interests that are restricted or rigid (Brereton et al., 2006; Brown et al., 2024; Kaat & Lecavalier, 2013; Kanne & Mazurek, 2011; Konst et al., 2013; Maddox et al, 2018; O'Nions et al., 2018). Disruptive behaviors are acknowledged as associated behaviors to core ASD symptoms, despite

the limited information about the etiology of disruptive behaviors for this population (Hill et al., 2014; Hirota & King, 2023; Lecavalier, 2006; Matson, 2009; Shawler & Sullivan, 2017; Quetsch et al., 2022). However, prevalence estimates of disruptive behaviors in children with ASD vary greatly due to the operational definitions of disruptive behaviors, the age of the child, and the assessment measures used (Brown et al., 2023; Fitzpatrick et al., 2016; Hill et al., 2014; Kaat & Lecavalier, 2013; Maskey et al., 2013; Quetsch et al., 2022). For example, an examination of the frequency of disruptive behaviors in 176 children and adolescents with ASD, Matson and colleagues (2009) found that 94.3% exhibited challenging behaviors. On the other hand, Kanne and Mazurek (2011) examined aggressive behaviors in over 1,300 children with ASD aged 4 to 17 years old, and more than half (56%) of the children assessed exhibited aggressive behaviors toward caregivers and about one-third (32%) exhibited aggressive behaviors toward non-caregivers. Similarly, Mazurek and colleagues (2013) examined aggressive disruptive behaviors in over 1,500 children and adolescents with ASD across 17 sites in the United States and Canada, in which over half of the sample (53.7%) exhibited aggressive behaviors. In contrast, Hill and colleagues (2014) examined aggressive behaviors in a sample of 108 children with ASD aged 6 to 16 years old, in which almost one-quarter (23%) exhibited aggressive behaviors. Thus, variability in reported prevalence rates may be based on varied sample sizes, characteristics, operational definition, and measures used for each study.

In addition to the prevalence rates of disruptive behaviors in children with ASD, analysis of possible trends in comparison to NT children and children with other disabilities may provide insight to the unique contribution of ASD symptoms to the presence of disruptive behaviors. For instance, differences in gender based disruptive behaviors are not seen in children with ASD, as male and female children with ASD tend to exhibit aggressive behaviors equally, while NT

males tend to exhibit more aggressive behaviors than NT females (Brown et al, 2023; Brown et al., 2024; Card et al., 2008; Fitzpatrick et al., 2016; Kaat & Lecavalier, 2013; Kanne & Mazurek, 2011; Maskey et al., 2013; Mazurek et al., 2013). Moreover, although intellectual functioning is typically a predictor of disruptive behaviors for NT children, mixed findings have been reported from different samples regarding intellectual functioning and disruptive behaviors in children with ASD; while the majority of studies indicate intellectual functioning does not predict the presence or severity of disruptive behaviors (Baker & Blacher, 2015; Baker & Blacher, 2020; Bradley et al., 2004; De Giacomo et al., 2016; Kaat & Lecavalier, 2013; Kanne & Mazurek, 2011; Mayes et al., 2012a; Mayes et al, 2022; Mazurek et al., 2013), while some studies indicate lower intellectual functioning increases disruptive behaviors in children with ASD (Brown et al., 2024; Hill et al., 2014; Matson, 2006). For example, Baker and Blacher (2015) examined the presence of disruptive behaviors in 58 children with ASD, in comparison to 100 neurotypical children and 40 children with intellectual disability and found that children with ASD significantly exhibit more disruptive behaviors than both neurotypical children with and without intellectual disability. Contrary to neurotypical children, Backer and Blacher report children with ASD and comorbid intellectual disability did not have a negative association between disruptive behaviors and intellectual functioning; these findings indicate that ASD symptomology increases the presence of disruptive behaviors, regardless of the child's cognitive abilities. Additionally, parent marital status and socioeconomic status have not been associated with heightened aggressive behaviors for children with ASD, while they are typically related with higher aggression rates in NT children (Kaat & Lecavalier, 2013; Kanne & Mazurek, 2011; Mayes et al., 2012a). However, in a recent study of 2,142 youth aged 6 to 18 with ASD, Brown and colleagues (2024) found that household income had negative relationship with youth physical

aggression; namely, lower household income was associated with higher aggressive behaviors, consistent with the literature regarding NT youth. Nonetheless, children with ASD may exhibit more disruptive behaviors as a result of their unique ASD symptomology (Brown et al., 2024; Kaat & Lecavalier, 2013; Kanne & Mazurek, 2011; Mayes et al., 2012b; Quetsch et al., 2022). Furthermore, in comparing disruptive behaviors between young children (3 to 6 years old), middle childhood (7 to 10 years old), and young adolescents (11 to 14 years old), Matson and colleagues (2010a) found disruptive behaviors in children with ASD persisted and remained stable over time. This persistence of disruptive behaviors in children and adolescents with ASD highlights the importance of understanding the relationship between ASD symptomology and disruptive behaviors. Brown and colleagues (2023) analyzed the parent ratings of 511 children with ASD between 4 to 17 years of age and report type of aggression (i.e., physical versus verbal aggression) is correlated with child age; specifically, they report more instances of physical aggression with younger children and more instances of verbal aggression with older children. Moreover, disruptive behaviors in children with ASD have substantial impacts on familial functioning and the experiences of their parents (Factor et al., 2019; Hall, 2012; Higgins et al., 2005; Sikora et al., 2013). Understanding the relationship between disruptive behaviors, ASD symptoms, and the impact on familial functioning (i.e., parental stress levels) can inform clinical implications for supporting children with ASD who exhibit disruptive behaviors and their families.

**Statement of the Problem**

Despite the availability of ASD-focused interventions, receiving interventions to help manage symptoms of ASD and disruptive behaviors is often prolonged due to limited access to services (Gordon-Lipkin et al., 2016; Jones et al., 2017). Families of young children with ASD

are often given the recommendation of applied behavioral analysis (ABA) therapy, and the importance of early intervention is emphasized for children with ASD (Gordon-Lipkin et al., 2016; Lord et al., 2006). Long waitlists, limited availability of trained therapists, and high demand for ASD services has made it challenging to receive early interventions targeted for children with ASD. Furthermore, children 7 years old and above continue to exhibit disruptive behaviors (Baker et al., 2024; Kanne & Mazurek, 2011; Matson et al., 2009; Mazurek et al., 2013; Quetsch et al., 2022) and require access to services to help decrease the occurrence of clinically significant disruptive behaviors.

Parenting interventions are an effective means of providing support for children with ASD (Burrell & Borrego, 2012; Estes et al., 2019; Kaminski et al., 2008; Prata et al., 2018; Schultz et al., 2011; Steiner et al., 2012). Children with ASD have an increased need for supportive services and a limited number of trained therapists are available to provide these supports, especially in areas with limited or no access to ASD services (Pickard & Ingersoll, 2016; Prata et al., 2018). Thus, parental involvement in interventions for their child with ASD may allow access to services that may be unavailable otherwise (Gordon-Lipkin et al., 2016; Jones et al., 2017), have extremely long waitlists, or be problematic for work and school schedules due to time away to regularly receive interventions.

Parental involvement in interventions for their child with ASD has many benefits for both the parent and their child (Burrell & Borrego, 2012; Kaminski et al., 2008; Merriman et al., 2020; Prata et al., 2018). First, parents spend more time with their child than therapists; therefore, parents can provide teaching opportunities throughout the day at home and in varied contexts as opposed to limited hours on a daily or weekly basis from a therapist (Burrell & Borrego, 2012; Symon, 2001). The increased time for intervention implementation is beneficial,

as evidence suggests early and intensive interventions allow for more improvements in children with ASD (Burrell & Borrego, 2012; Lovaas, 1987; Zwaigenbaum et al., 2015). Second, earlier intervention has been associated with greater skill acquisition for children with ASD (Burrell & Borrego, 2012; Zwaigenbaum et al., 2015). Additionally, involving parents in intervention delivery can improve child outcomes, especially because more opportunities to practice skills with parents has been shown to promote more skill generalizability for the child (Burrell & Borrego, 2012; Merriman et al., 2020; Prata et al., 2018). In addition to increased child improvements, both parents of children with ASD and parents of NT children who participate in a parenting intervention program tend to have lower levels of parental stress, higher levels of confidence as a parent, and more positive interactions with their child (Brookman-Frazee & Koegel, 2004; Burrell & Borrego, 2012; Merriman et al., 2020; Prata et al., 2018; Preece & Trajkovski, 2017; Tarver et al., 2019). Improved parent-child relationships can have significant implications, as evidence suggests that children who exhibit disruptive behaviors may have impaired relationships with their parents (Baker et al., 2011; Crowell et al., 2019; Kaminski et al., 2008; Neece et al., 2012).

Parenting interventions are provided in one-on-one settings or in group settings; the latter being a cost-effective solution with a built-in support system for participating families (Kaminski et al., 2008; Preece & Trajkovski, 2017; Schultz et al., 2011; Steiner et al., 2012). Methods of delivery include face-to-face intervention, telehealth videoconferencing, websites, computer programs, DVDs/videos, smart phone and/or tablet applications (Bearss et al., 2015a; Corralejo & Domenech Rodríguez, 2018; Preece & Trajkovski, 2017; Steiner et al., 2012). The intervention may be delivered in clinical settings, community centers, or the family's home (Bearss et al., 2015a; Kaminski et al., 2008; Preece & Trajkovski, 2017; Steiner et al., 2011).

Duration of treatment varies greatly among parent interventions; with short term interventions delivered across one or a limited number of sessions, and more intensive interventions spanning 12 or more weeks for one hour or longer per session (Nevill et al., 2018; Oono et al., 2013; Schultz et al., 2012; Steiner et al, 2011). Just as the delivery method, location and duration of the interventions differ, parenting interventions vary in the skills targeted (i.e., social communication, disruptive behaviors, general increase of parent knowledge of ASD; Bearss et al., 2015a; Kaminski et al., 2008; Merriman et al., 2020; Nevill et al., 2018; Prata et al., 2018; Schultz et al., 2011).

While various parenting interventions are available for parents of children with ASD (Bearss et al., 2015a; Nevill et al., 2018; Preece, & Trajkovski, 2017; Ratliff-Black, & Therrien, 2021), parenting interventions with a specific aim of reducing of disruptive behaviors in children with ASD are limited (Bearss et al., 2015a). The Research Units in Behavioral Intervention (RUBI) parent training intervention was created to increase access to an evidence-based parenting intervention to help decrease the presence of disruptive behaviors in children with diagnoses of ASD (Bearss et al., 2013a; Bearss et al., 2015b). The RUBI parent training intervention is a primary parent mediated intervention, in which trained therapists provide a manualized intervention and psychoeducation directly to parents who then implement the intervention with their child (Bearss et al., 2013a; Bearss et al., 2015a; Bearss et al., 2015b; RUPP, 2007; Scahill et al., 2012). Despite the presence of empirically-based parenting interventions for parents of children with ASD (such as the empirical evidence for the RUBI parent training program; Bearss et al., 2015a; Prata et al., 2018; Preece & Trajkovski, 2017; Ratliff-Black & Therrien, 2021), community-based clinical practice may not use evidence-based practices (Boyd et al., 2022; Stahmer et al., 2005). Interventions may not be implemented as

described in the literature in clinical practice (i.e., varying dosage length or fidelity to treatment; Barkham & Mellor-Clark, 2003; Stahmer, 2007) or may also combine different strategies that have not been studied in conjunction with one another (Boyd et al., 2022; Chasson et al., 2007). Thus, therapists within clinical settings may see clients for a longer treatment dosage or select aspects of an intervention provided to their therapy clients; creating a disconnect between clinical research and clinical practice. Additionally, therapist characteristics can vary in applied clinical settings (e.g., training level or training background); however, studies report no or minimal effects of training status (Anderson et al., 2016; Wampold et al., 2017) or therapist experience over time (Goldberg et al., 2016) on intervention treatment outcomes. Therefore, this study aims to bridge the gap between research and clinical practice by examining the efficacy of the RUBI parenting-training intervention on disruptive behavior outcomes of children with ASD aged 7 years old and above while controlling for therapist educational level.

## Chapter two: Literature Review

ASD encompasses social communication challenges and restrictive and repetitive behaviors and interests (RRBI; APA, 2013). Social communication challenges for children with ASD encompass social-emotional reciprocity, difficulties in nonverbal communicative behaviors such as eye contact and limited facial expressions, and difficulties in initiating, sustaining, and understanding interpersonal relationships (Lord et al., 2018). Evidence suggests impairments in social skill functioning in younger children with ASD typically relate to a greater occurrence of disruptive behaviors (Brown et al., 2023; Hutchins & Prelock, 2014; Konst et al., 2013; Lecavalier, 2006; Matson, 2006; Matson et al., 2010b). Thus, the presence of disruptive behaviors may be heightened for children with ASD due to their social communication and social interaction challenges. For example, children with ASD may struggle with social

reciprocity in interactions, specifically in responding to the conversational bids of another person, understanding the emotional tone of the conversation, or understanding when it is their turn to talk in the conversation (Lord et al., 2018). Disruptive behaviors associated with social reciprocity may be due to a lack of understanding the social demands of a situation, uncomfortable feelings with the situation or with the person who is attempting to engage them in conversation or used as an attempt to leave the interaction. For example, children with ASD may engage in behaviors such as screaming, self-injurious behaviors, and aggression when someone attempts to communicate with them (Koegel et al., 1992) or communicate in an unexpected manner with them (e.g., not following a specific social script; O'Nions et al., 2018).

In addition to challenges with social reciprocity, many children with ASD struggle with having limited peer relationships, understanding and sharing imaginative play, and initiating and maintaining interactions and friendships (Lord et al., 2018). Social skill challenges may result in limited relationships, and the presence of disruptive behaviors during interactions with others may further decrease potential relationships for children with ASD. A transactional relationship of social skills and social acceptance may be present for children with ASD; specifically, minimal or no opportunities to practice engagement with others in relationships can further compound the challenge of understanding relationships for children with ASD exhibiting problem behaviors (Mundy & Neal, 2000; Viecili et al., 2010). These challenges may also translate to interpersonal relationships with adults such as teacher-student relationships; when children with ASD exhibit disruptive behaviors they tend to have more problems with teacher relationships and these problems tend to persist over time (Brown & McIntosh, 2012; Caplan et al., 2016; Eisenhower et al., 2015). The student-teacher relationship is bidirectional; student

disruptive behaviors seem to increase relationship problems between teachers and students, and teacher reactions to relationship problems seem to increase student disruptive behaviors.

Expressive and receptive language abilities also serve important roles in social communication skill impairments in children with ASD. However, the association between lower communication abilities and higher presence of disruptive behaviors is unclear for children with ASD, as some studies document more disruptive behaviors linked to higher language abilities (Farmer & Aman, 2009; Hill et al., 2014) or no differences in disruptive behaviors based on language abilities (Kaat & Lecavalier, 2013; Kanne & Mazurek, 2011; Konst et al., 2013; Maskey et al., 2012; Mazurek et al., 2013; Sipes et al., 2011). Specifically, Hill and colleagues (2014) reported that children with ASD may be able to direct their aggression toward others when they have more social and language skills. Increased opportunities for social contact with others may also increase the occurrence of disruptive behaviors, in comparison with peers who have more impaired ability levels and less opportunities to exhibit disruptive behaviors (Hill et al., 2014). Similarly, Farmer and Aman (2011) found preliminary evidence suggesting that youth with ASD and higher language abilities may have more instances of verbal and covert aggression in comparison to youth with lower language abilities who may use physical aggression. On the other hand, Matson and colleagues (2009) found that young children with ASD who exhibited lower levels of receptive and expressive communication skills exhibited lower levels of aggression and self-injurious behaviors overall. However, children with ASD who exhibited lower levels of receptive communication skills alone exhibited higher levels of self-injurious behaviors, stereotypies, and aggression (Matson et al., 2009). This difference in behaviors may be due to the ability to understand given demands and expectations from caregivers, and higher

receptive language abilities may allow children to comprehend expectations in context and result in fewer disruptive behaviors.

Socially appropriate nonverbal communicative behaviors may also be challenging to navigate for children with ASD. Common examples may include decreased eye contact and abnormal modulation of eye gaze, acknowledgment of appropriate personal space, and understanding and use of gestures (Lord et al., 2018; Mayes et al., 2012; Scheeren et al., 2012; Tager-Flusberg & Caronna, 2007). Children with ASD also may not understand common nonverbal communications, such as social smiles, waving hello or goodbye, or following a gaze or pointing by another person. These difficulties may be interpreted as noncompliance (i.e., not complying with demands for appropriate eye contact when speaking or turning away from another person mid-conversation) or aggression (i.e., standing too close or clenching hands into fists) by others. For example, a child with ASD who crowds others physically is likely to do so because of limited social awareness rather than aggressive intent (Farmer & Aman, 2011). Children with ASD may not compensate for speech impairments with gestures such as pointing or waving typically used by NT children, and may rely on the use of physical contact such as pushing or moving or leading another individual's hand to fulfill their needs instead (Tager-Flusberg & Caronna; 2007). Regardless of the intention or the awareness of the child with ASD, nonverbal behaviors such as disregard for personal space may be interpreted as aggressive or disruptive by other individuals. Furthermore, lower nonverbal IQ may also be related to higher instances of exhibiting disruptive behaviors in children with ASD, which may be due to the effectiveness of disruptive behaviors to meet the needs of the child (Estes et al., 2007; Hill et al., 2014; Matson, 2009).

In addition to social communication challenges, restrictive and repetitive behaviors and interests (RRBI) are commonly seen in children with ASD. RRBI include stereotyped or repetitive motor movements and speech patterns, rigidity and inflexibility, ritualized verbal utterances or nonverbal behaviors, fixated interests that are abnormal in intensity and/or focus, unusual interests in sensory aspects of the environment, increased or decreased sensitivity to sensory input, and self-injurious behaviors (Berry et al., 2018; Matson et al., 2009; Lord et al., 2018). Although RRBI are common in children with ASD, limited evidence is available regarding the relationship between disruptive behaviors and RRBI (Berry et al., 2018), which may be due to RRBI being categorized as "disruptive" (e.g., self-injurious behaviors or resistance to change) due to a lack of unified definition of disruptive behaviors. Ritualistic behaviors and resistance to change are examples of how RRBI may be used as a coping mechanism for children with ASD, however, empirical evidence of using RRBI as a coping mechanism is limited. Keefer et al. (2014) found that children with ASD were more likely to exhibit aggression related to RRBI in classroom settings than at home, which may be due to the higher tolerance levels of aggression exhibited toward parents in comparison to teachers and aggression may also be used as an attempt to escape more demanding tasks required of the child at school in comparison to more lenient demands at home (e.g., math worksheets or writing practice), which may lead to higher instances of RRBI and aggression within the school setting (Keefer et al., 2014). Children with ASD may also have highly focused interests that are abnormal in intensity or focus, such as a preferred movie, video game, inanimate object, or activity (Lord et al., 2018). These interests may take over many or all of the child's conversations and interactions with others and affect the child's ability to engage in other important tasks such as chores, schoolwork, socialization, and time spent with family. An intense

preoccupation with a restricted interest may be associated with increased disruptive behaviors in children with ASD, however, no published research to date focuses on the specific relationship between disruptive behaviors and restricted, fixated interests in children with ASD.

Disruptive behaviors in children with ASD may also increase depending on sensory tolerance, over- or under-sensitivity to pain or temperature changes, and strong aversive reactions to specific sensations (Hazen et al., 2014; Lane et al., 2010). These sensory sensitivities in children with ASD have been correlated with self-injurious behaviors and social impairment (Hazen et al., 2014), and may further increase the compounded impact of ASD symptoms to influence disruptive behaviors in children with ASD. Children with ASD may have sensory responses to idiosyncratic stimuli that increase disruptive behaviors (Reese et al., 2003). Sensory responses may take on different forms depending on each child's sensory reactivity; for example, a child may exhibit hyper-reactive attention to fan blades that impedes compliance to parents' demands or triggers unintentional self-harming behaviors (i.e., attempting to touch the blades on the fan). An alternative sensory response may be a severe aversion to the sensation of a tag on a piece of clothing that leads to screaming and aggression toward parents. Sensory sensitivities may also influence disruptive behaviors during meals, such as food refusal and selectivity, noncompliance, or a lack of interest in food, as well as aggression and inappropriate language (Margari et al., 2020; Zobel-Lachiusa et al., 2015).

**Parent Intervention Techniques in ASD**

Given the increased presence of disruptive behaviors in children with ASD due to core ASD symptomology, the need for interventions to help decrease disruptive behaviors is critical (Bears et al., 2015a). As discussed in chapter one, parents can play a large role in increased intervention intensity and consistency of the intervention over time (Burrell & Borrego, 2012;

Kaminski et al., 2008; Prata et al., 2018; Steiner et al., 2012). Parenting interventions include parents at different levels of involvement and target various aspects of core and associated ASD symptomology, such as communication skills, emotional literacy, restricted and repetitive behaviors, disruptive behaviors, and adaptive skills (Bearss et al., 2015a; Karst & Van Hecke, 2012). However, the variety of parenting interventions for parents of children with ASD has led to a lack of unified nomenclature. Bearss et al. (2015a) presented a unified classification and categorization of specific parenting interventions for children with ASD, distinguishing interventions in one of two broad categories as parent-support interventions (PSI) and parent-mediated interventions (PMI; Dawson-Squibb et al., 2019; Prata et al., 2018; Preece & Trajkovski, 2017; Ratliff-Black & Therrien, 2021). The categorization of parenting interventions with clear descriptive labels such as "PMI for decreasing disruptive behaviors," allows for understanding of program features by parents and professionals who may not be familiar with specific parenting-intervention programs (Bearss et al., 2015a). Specificity in program descriptions captures the complexity of parenting interventions available to families of children with ASD and emphasizes the need for a unified classification system to help understand what techniques will provide optimal support for the child with ASD and their family. The broad term of PSI encompasses care coordination and parent psychoeducation, and PMI encompasses complementary and primary PMI (Bearss et al., 2015a).

### *Parent Support Interventions*

Parent-support interventions (PSI) are interventions in which the child is an indirect beneficiary of the intervention and knowledge is provided directly to the parent of the child with ASD. Parent-care coordination and parent psychoeducation are two subcategories of PSIs (Bearss et al., 2015a).

**Parent Care Coordination.** Parent-care coordination helps to facilitate appropriate care for the child via the parent and professional care provider(s) (e.g., a nurse or resource coordinator) who provide parents with resources and services (Bearss et al., 2015a; Carbone et al., 2009; Parker et al., 2020). Since children with ASD may need support in multiple domains (i.e., social skills, adaptive skills, disruptive behaviors), care coordination allows parents of children with ASD to delegate the substantial time commitment of coordinating treatment for their child to a knowledgeable professional (Parker et al., 2020). While coordination of care for children with ASD is a common need, Sobotka et al. (2015) found that many parents of children with ASD require more support with care coordination for their child, and Parker and Killian (2020) observed that parents who have access to services have reduced parental stress levels and higher perceived parental well-being. Additionally, care coordination for children with ASD can vary greatly based on the setting in which the child is receiving care (Carbone et al., 2009; Cheak-Zamora & Farmer, 2014; McClain et al., 2019; Parellada et al., 2011; Sobokta et al., 2015). Care coordination does not explicitly target disruptive behaviors in children with ASD, however, it may encompass referrals to targeted interventions to reduce disruptive behaviors.

**Parent Psychoeducation**. Parent psychoeducation provides parents with accurate information regarding their child's abilities and needs (Bearss et al., 2015a; McAleese et al., 2014; Preece & Trajkovski, 2017; Steiner et al., 2012). Psychoeducation allows parents to access evidence-based practices and interventions appropriate for their child's age and ability level, which may include knowledge of interventions for core ASD symptomology, management of the child's disruptive behaviors, and preparation for independence in adolescence and young adulthood. Informal psychoeducation typically occurs throughout a child's clinical appointments, and many self-guided resources including books and websites are available to parents of children

with ASD (Bearss et al., 2015a; Kaminski et al., 2008; Steiner et al., 2012). Formal psychoeducation programs are also available; however, these programs have limited empirical evidence, including information regarding efficacious psychoeducational components, frequency and duration of sessions, and parent and child outcomes. Three examples of formal parent psychoeducation programs are an adaptation of the Wright and Williams (2007) curriculum by McAleese et al. (2014), Al-Khalaf and colleagues (2014) group psychoeducation program in Jordan, and the Understanding Autism and Understanding my Child with Autism (UA; Farmer & Reupert, 2013) program in rural Australia. These programs vary in the number of sessions, session duration, and length of the intervention. Key components of parent psychoeducation programs in ASD tend to incorporate understanding of the symptoms associated with ASD, describing common evidence-based interventions available for children with ASD, and providing various strategies to families to help support their child with ASD. Thus, parent psychoeducation programs include information about the core symptoms associated with ASD and may include information about disruptive behaviors and/or behavioral management strategies (Bearss et al., 2015a; Chiang, 2014; Farmer & Reupert, 2013; McAleese et al., 2014; Preece & Trajkovski, 2017). The increase in knowledge for parents of children with ASD may help to facilitate further interventions by identifying the needs of the child and their family (Bearss et al., 2015a; Preece & Trajkovski, 2017).

### *Parent Mediated Interventions*

PMIs are skill focused and the child is a direct beneficiary of the intervention in which the parent acts as the mediator of the intervention, as the child receives the treatment from their parent (Bearss et al., 2015a; Ratliff-Black & Therrien, 2021). PMIs can be divided further into complementary or primary interventions. In complementary PMIs, parents work as part of a team

in a therapist led intervention, and the treatment is provided primarily to the child by a therapist with incorporated parent coaching components (Bearss et al., 2015a; Ratliff-Black & Therrien, 2021). In contrast to complementary PMIs, primary PMIs rely on parents to be the agent of change from the beginning of the intervention to help elicit behavior change or skill acquisition (Bearss et al., 2015a; Ratliff-Black & Therrien, 2021). These interventions may also be referred to as "parent training" (Bearss et al., 2015a; Iadarola et al., 2018; Ratliff-Black & Therrien, 2021).

**Complementary PMIs**. Similar to parent psychoeducation programs, the key components of complementary PMIs vary across different programs and sessions vary in length and frequency. Complementary PMIs typically require more total intervention sessions than parent psychoeducation programs, however, the duration and frequency of sessions vary widely. Complementary PMIs may target reduction of the core symptoms of ASD, such as Project Improving Parents As Communication Teachers (Project ImPACT; Ingersoll & Dvortcsak, 2010; Ingersoll & Wainer, 2013), Pivotal Response Treatment (PRT; Bryson et al., 2007; Koegel et al., 1992; Smith et al., 2010), and the Early Start Denver Model (ESDM; Dawson et al., 2010; Rogers & Dawson, 2009). Complementary PMIs may also target disruptive behaviors, such as severe eating challenges (i.e., selective eating and food refusal; Sharp et al., 2011).

**Primary PMIs.** Similar to parent psychoeducation programs and complementary PMIs, primary PMIs vary in session frequency and duration. Primary PMIs are typically more intensive than parent psychoeducational programs, and many primary PMI programs are shorter in duration than complementary PMIs. Primary PMIs may also target core ASD symptomology or related problems or deficits, such as disruptive behaviors or sleep problems. For example, Joint Attention Symbolic Play Engagement and Regulation (JASPER; Kasari et al., 2010) and Hanen's

"More Than Words" (HMTW; Sussman, 1999) target core ASD symptoms. A parenting intervention created to explicitly target disruptive behaviors in children with ASD is the Research Units in Behavioral Intervention (RUBI) parent training program (Bearss et al., 2015b; Johnson et al., 2007; RUPP, 2007). Since the creation of the RUBI parent training program, more parenting interventions have targeted disruptive behaviors in children with ASD, such as Aim High (Brookman-Frazee & Stahmer, 2018; Brookman-Frazee et al., 2019; Brookman-Frazee et al., 2020; Dyson, et al., 2019) and Predictive Parenting (Charman et al., 2021; Hallett et al., 2021; Palmer et al., 2019).

**Interventions Targeting Disruptive Behaviors in ASD**

A group parent intervention program targeting disruptive behaviors and symptoms of anxiety in children with ASD is Predictive Parenting (Charman et al., 2021; Hallett et al, 2021; Palmer et al., 2019). Through the focus on understanding and predicting social communication difficulties, repetitive and restricted interests, sensory sensitivities, motor skills, and anxiety, Predictive Parenting aims to help parents learn more predictable ways to understand their child's behaviors and experiences while helping children cope with unpredictability and changes, and increase emotional-regulation skills (e.g., relaxation and targeted exposures to sensory or rigidity challenges; Hallett et al., 2021). In Hallett and colleague's feasibility study (2021), 6 parents of 4- to 8-year-old children with ASD attended 12 weekly, 2-hour sessions, and received 2 individual phone calls for one hour each following weeks 2 and 9 of intervention. Two groups were run with 6 parents each, split by the child's verbal ability level (i.e., verbal and minimally-verbal). Similarly, Chapman and colleagues (2021) conducted a RCT comparing Predictive Parenting to a psychoeducational program about ASD providing psychoeducation and social support without behavioral management coaching ("Seven C's of ASD"; Chapman et al., 2021;

Palmer et al., 2019). A total of 62 parents in both groups received 12 weekly, 2-hour sessions, and the parents in the Predictive Parenting intervention group ($n$ = 31) received two one-hour individual telephone sessions. Chapman and colleagues found a decline in child disruptive behaviors in both groups, with a statistically nonsignificant effect size of the intervention versus psychoeducation group ($d$ = 0.18); however, they found an improvement in child compliance from the intervention group ($d$ = 0.44) and facilitative parenting practices (e.g., clear commands, providing praise/positive feedback, supportive physical guidance; $d$ = 0.63).

Another parent-training program developed to help reduce disruptive behaviors in children with ASD is An Individualized Mental Health Intervention for ASD (AIM HI), a community-based intervention program increasing ASD specific interventions via training community mental health therapists to deliver parent training (Brookman-Frazee & Stahmer, 2018; Brookman-Frazee et al., 2019; Brookman-Frazee et al., 2020; Dyson, et al., 2019). Developed for children between the ages of 5 and 13 years old, AIM HI utilizes parent-mediated and child-focused strategies to reduce disruptive behaviors through active teaching (i.e., modeling, behavioral rehearsal, in-home practice), positive reinforcement, positive alternative behaviors, and increasing predictability of parental responses. Parents and their children participate in a minimum of 13 sessions over a period of approximately 6 months. Therapists are trained for a period of approximately 6 months via an introductory workshop, 9 group and 2 individual feedback/consultation sessions, performance reviews of recorded sessions, and via a therapist manual, printed and electronic forms, and an AIM HI resource website (Brookman-Frazee et al., 2019). A cluster randomized control trial by Brookman-Frazee and colleagues (2019) examined the use of AIM HI for 156 children with ASD delivered via 130 therapists in 22 programs (i.e., outpatient clinic, school based mental health, or combined school-clinic settings)

over two waves of treatment, compared to usual community based care (i.e., no AIM HI training or clinical feedback) for 46 children with ASD delivered via 42 therapists in 16 programs (i.e., outpatient clinic or school based mental health). They found a statstically significant group by time interaction for parent ratings of disruptive behaviors ($d$ = -0.36) and intensity of behaviors ($d$ = 0.13), in that there was a larger decrease in ratings of disruptive behaviors and their intensity for the AIM HI group in comparison to the usual community-based care groups in the first wave of treatment and for both waves of treatment combined. While these effect sizes are small to medium, training community providers to provide a parenting intervention to help decrease disruptive behaviors in children with ASD when these providers are not formally trained in ASD treatment can increase access to needed services for the families of children with ASD (Brookman-Frazee et al., 2019).

**Evidence for the RUBI Parent Training Program**

The RUBI parent-training program was first examined in a feasibility study in combination with antipsychotic medication (i.e., Risperidone or Aripiprazole) to help reduce disruptive behaviors in children with ASD (RUPP, 2007). Antipsychotic medications such as Risperidone have been shown to significantly reduce the presence of disruptive behaviors in children with ASD (Fitzpatrick et al., 2016; Malone & Waheed, 2009; McCracken et al., 2002; McDougle et al., 1998). The initial RUBI parent training program included 11 core 75- to 90-minute sessions, three optional sessions, three booster sessions, and one to two hours of initial and follow up home visits. Seventeen children with a diagnosis of ASD and disruptive behaviors between the ages of 4 to 13 years old who were on stable medication for disruptive behaviors participated in this study with at least one caregiver (RUPP, 2007). In this initial feasibility study, child outcomes were assessed by: 1) parent ratings of child behavioral adjustment using

the Aberrant Behavior Checklist (ABC; Kaat et al., 2013; Norris et al., 2019), 2) parent ratings of child non-compliance by the per item mean score on the Home Situations Questionnaire - Autism Spectrum Disorder (HSQ; Chowdhury et al., 2010; Chowdhury et al., 2016), 3) a blinded-rater child improvement rating from baseline using a 7-point Clinical Global Impression-Improvement Scale (CGI-I; Guy, 1976), 4) parent ratings of child adaptive behaviors using the Vineland Adaptive Behavior Scales (VABS; Sparrow et al., 2016), and a measure incorporating child skills using a task analysis of adaptive behaviors (i.e., grooming, dressing, toileting, and feeding), the Assessment of Basic Language and Learning Skills (ABLLS; Partington & Sundberg, 1998). Additionally, parenting stress levels were assessed by using the Parenting Stress Index (PSI; Abidin, 1995). Mean child noncompliance as rated by a caregiver improved from baseline on the HSQ by 39.40% after a 24-week intervention period ($F = 13.36$, $p < 0.01$, $d = 1.11$; RUPP, 2007). On the ABC, mean caregiver ratings of child irritability reduced by 33.80% ($F = 6.89$, $p < 0.01$, $d = 0.90$), and mean hyperactivity/noncompliance ratings as measured by the ABC reduced by 20.60% ($F = 4.51$, $p < 0.05$, $d = 0.60$). Mean caregiver ratings on the VABS daily living skills domain showed an 18.70% increase in age equivalency, ($F = 14.60$, $p < 0.01$, $d = 0.34$) and an 22.30% increase in raw scores ($F = 11.72$, $p < 0.01$), however, there were no significant effects on standard scores. Mean caregiver ratings on the ABLLS indicated a 19.20% increase in adaptive skills ($F = 11.04$, $p < 0.01$, $d = 0.44$). Furthermore, blinded raters used the CGI-I to indicate the rates of improvement for each child and 53.00% rated as much improved or very much improved, 30.00% portrayed minimal improvement, and 6.00% portrayed no change. Mean parenting stress levels showed a 13.90% decrease in overall PSI scores over time ($F = 5.89$, $p < 0.05$, $d = 0.92$). Parental acceptance of the program was measured by the attendance at the 11 core parent training sessions, which was 93.10% across the

participating caregivers (RUPP, 2007). Parent satisfaction was rated using a likert scale questionnaire about program features (e.g., the number and length of sessions, difficulty/ease of the materials, utility of parent handouts) and a mean satisfaction rating of 91.60% indicated a high level of parent satisfaction with the program; moreover, 91.00% of parents reported more confidence in handling disruptive behaviors and 91.00% indicated they would recommend the RUBI parent training program to others. Parental adherence to implementation of the program (e.g., completed homework, asked questions, provided examples) as rated by their clinician was 80.00%. Additionally, a mean treatment integrity score measured by standardized the delivery of the material was 94.20% across sessions and therapists (range of 80.40% to 100.00%), and mean clinician self-ratings of integrity for the 11 core sessions was 95.70%. Thus, the RUPP (2007) feasibility study indicated that participants benefited from participation in the RUBI parent training and that the treatment was feasible to implement.

A randomized control trial (RCT) was conducted to evaluate the effects of the RUBI parent training program combined with an antipsychotic medication in comparison to the effects of an antipsychotic medication alone on children with ASD and disruptive behaviors (Aman et al., 2009). Caregivers of 124 children with ASD and disruptive behaviors aged 4 to 13 years old participated in the RCT by Aman and colleagues (2009) and were randomly assigned to a combined parent training and medication group ($n$ = 75) or medication only group ($n$ = 49). A total of 55 caregivers in the combined-treatment group and 40 caregivers in the medication-only group completed the intervention at 24 weeks. Inclusionary criteria included having a score of 18 of higher on the ABC irritability scale (ABC-I), a Clinical Global Impression severity score (CGI-S) of 4 or higher, a minimum IQ of 35 or a mental age of 18 months or above, and no medication for two weeks for psychotropic drugs/or four weeks for fluoxetine. Participants must

have been seizure free for six months or greater, and stable on an anticonvulsant medication for four weeks or more, if needed. Similar to the feasibility study by RUPP (2007), the RCT by Aman et al. (2009) included 11 core 75- to 90-minute sessions, three optional sessions, and up to three booster sessions (one in person and two via telephone), for a maximum of 17 sessions over a 24-week period. Outcome measures included: 1) child non-compliance captured by parent ratings on the HSQ, 2) parent ratings of child behavioral adjustment on the ABC, and 3) a blinded-rater child improvement rating from baseline using the CGI-I. Mean caregiver ratings on the HSQ showed a 71.00% decline in non-compliance for the combined treatment group in comparison to a 60.00% decline for the medication only group at 24 weeks, ($d = 0.34$, $p = 0.006$). Mean parent ratings on the ABC irritability, stereotypic behavior and hyperactivity/noncompliance subscales had significant group differences, with the combined-treatment group having better ratings overall. There was a small effect size at 16 weeks ($d < 0.20$); however, effect sizes were moderate at 24 weeks for the irritability ($d = 0.48$, $p = 0.01$) and hyperactivity/noncompliance ($d = 0.55$, $p = 0.04$) subscales, and small for the stereotypic behavior subscale ($d = 0.023$, $p = 0.04$). Additionally, there were no differences in CGI-I ratings between the two groups (Aman et al., 2009). The mean treatment fidelity for standardized sessions was 95.34%, with a range from 45.00% to 100.00% fidelity. Thus, the results from the Aman and colleagues (2009) RCT indicated that while both groups had improvements in the reduction of disruptive behaviors, the combination of RUBI parent training and antipsychotic medication was more effective for reducing disruptive behaviors than the medication alone group.

Scahill and colleagues (2012) provided further evaluation of the effects of the RUBI parent training with antipsychotic medication in comparison to medication alone on child

adaptive behavior scores for 124 children aged 4 to 13 years old. Results indicated that the combined-treatment group showed more improved standard scores on the VABS socialization ($p = 0.01$, $d = 0.32$) and adaptive composites ($p = 0.05$, $d = 0.22$). The combined-treatment group also showed more improvement on VABS age-equivalent scores for the socialization ($p = 0.03$, $d = 0.33$) and communication domains ($p = 0.05$, $d = 0.014$). The combined-treatment group showed a decline in noncompliance index of the VABS daily living skills composite in comparison to the medication-only group ($p = 0.03$, $d = 0.30$; Scahill et al., 2012). Furthermore, a logistic regression model showed significant odds ratio for 6 months gain on the VABS communication domain for the combined-treatment group in comparison to the medication-only group (odds ratio [OR] = 2.64, $p = 0.02$); however, when adjusted for IQ, this effect by group was no longer significant (OR = 2.21, $p = 0.07$). While main effects of treatment were not significant on the socialization domain of the VABS, participants with an IQ of 70 or more had a threefold greater likelihood of achieving 6 months gain on the socialization domain in comparison to subjects with IQ below 70 (OR = 4.89, $p = 0.01$), and no treatment by IQ interaction was found. Participants in the average IQ range were more likely to show at least 6 months gain in age equivalence on the VABS communication domain (OR = 4.89, $p \leq 0.001$). In addition, Scahill and colleagues reported that therapists had at least 80.00% fidelity to all of the parent training sessions. Thus, this RCT indicated that adaptive skills were higher for the combined-treatment group of medication and parent training compared to medication-alone group for children with ASD; however, no significant differences were found for child irritability or non-compliance between the two groups (Scahill et al., 2012).

Following these early studies of RUBI parent training combined with an antipsychotic medication to reduce disruptive behaviors in children with ASD, a feasibility study with only the

RUBI parent training intervention was conducted by Bearss and colleagues (2013a). Sixteen children aged 3 to 7 years old and at least one caregiver participated in this pilot study. Inclusionary criteria included child receptive language ability of at least 18 months or above, participation in a stable behavioral or educational program, and either no medication or on stable medication for at least 6 months with no anticipated changes throughout the duration of the study. Similar to Aman et al. (2009), the Bearss et al. (2013a) parent training components included 11 core sessions, up to two optional sessions, two home visits, and three booster sessions (two by phone and one in person). Outcome measures included: 1) child non-compliance captured by parent ratings on the HSQ, 2) parent ratings of child behavioral adjustment on the ABC, 3) parent ratings of child adaptive skills on the VABS, 4) a child improvement rating from baseline using the CGI-I rated by a blinded-rater who was not involved in the intervention and did not have contact with the therapist, 5) a description of the child's two most pressing problems via the Parent Target Problems (Arnold et al., 2003), in which frequency and severity of behaviors were recorded for the independent evaluators to use for overall CGI-I ratings, and 6) a parent satisfaction questionnaire used in RUPP (2007) to measure parental approval and utility of the RUBI parent training program. Bearss and colleagues found that mean parent ratings on the ABC-I decreased from 16 at baseline to 7.38 at 24 weeks ($p < 0.001$, $d = 0.94$), and mean ABC hyperactivity subscale scores decreased from 21.5 at baseline to 13.31 at 24 weeks ($p < 0.002$, $d = 0.81$). Additionally, mean parent ratings of child non-compliance on the HSQ decreased from 2.94 at baseline to 1.42 at 24 weeks ($p < 0.001$, $d = 1.44$). Parent ratings on the VABS domains indicated improvement across domains, except for daily living skills ($p < 0.98$, $d = 0.01$), including domains of communication ($p < 0.05$, $d = 0.41$) socialization ($p < 0.05$, $d = 0.43$), motor skills ($p < 0.01$, $d = 0.96$), and the overall VABS composite score ($p < 0.01$, $d =$

0.59). Independent raters evaluated the children's improvement using the parent ratings and target problems from the CGI-I, and they found that 14 out of 16 (88.00%) children were rated as much improved ($n$ = 8) or very much improved ($n$ = 6), while two participants dropped out and thus were rated as non-responders. As for parent satisfaction, 72.00% of parents felt the number (of parent training sessions) was appropriate. On the other hand, only 28.00% of parents found the video examples helpful, as families indicated a need for a broader range of abilities in the videos. All 16 families who completed the 24 weeks of treatment endorsed feeling more confident in managing disruptive behaviors in their child with ASD (Bearss et al., 2013a).

Bearss and colleagues (2015b) conducted a RCT with 180 children and at least one caregiver to evaluate the effects of the RUBI parent training program ($n$ = 89) in comparison to a parent psychoeducation only group ($n$ = 91). Inclusionary criteria included a diagnosis of ASD, a parent rating of 15 or above on the ABC-I, receptive language abilities of 18 months or above, participation in an educational program, at least one English speaking caregiver, on stable medication with no anticipated changes in dosage for the duration of the treatment, and no other parent training program attended by the caregiver for at least two years prior to participation. Similar to previous RUBI parent training studies (Aman et al., 2009; Bearss et al., 2013a; RUPP 2007), program components included 11 core 60- to 90-minute sessions, up to two optional supplementary sessions, three booster sessions (one via telephone and two in person), and two home visit sessions (Bearss et al., 2015b). Additionally, up to 6 parent-child coaching sessions may have been provided after 16-weeks of initial RUBI treatment. The families participating in the psychoeducation comparison group received 12 psychoeducation sessions of 60 to 90 minutes, and one home visit within the 24-week treatment period. The parent psychoeducation program also utilized therapist scripts and parental handouts to promote treatment fidelity,

similar to the RUBI treatment group. Parent psychoeducation content included information about the ASD diagnosis, how to interpret clinical evaluations, developmental issues, familial issues, genetics and medications, advocacy and support services, educational planning, play, and treatment options including how to choose effective treatments, alternative treatments, and treatment planning. The psychoeducation content did not include information about behavior management. The RCT outcome measures included: 1) parent ratings of child irritability on the ABC-I, 2) parent ratings of child non-compliance via the HSQ, and 3) a blinded-rater improvement score from baseline using the CGI-I. Bearss et al. (2015) also collected secondary outcome measures that were not analyzed in this study, which included the VABS, PSI, the Standardized Observation Analogue Procedure (SOAP; Johnson et al., 2009), and additional parent measures. Bearss and colleagues found that the treatment group showed more improvement on the ABC-I ratings at 24-weeks post baseline than the psychoeducation group (47.70% decrease compared to a 31.80% decrease, respectively, $p \leq 0.001$, $d = 0.62$). The treatment group also showed more improvement on the HSQ in comparison to the psychoeducation group (55.00% decrease compared to a 34.20% decrease, respectively, $p \leq 0.001$, $d = 0.45$). At 24-weeks post baseline, 68.50% of the treatment group was rated as much/very much improved on the CGI-I in comparison to 39.60% of the psychoeducation group ($p \leq 0.001$). At 48-weeks post baseline, 55 children continued to show a positive response to the parent training treatment. Of the children who did not have positive responses to the treatment at 24-weeks, 17 showed improvement via lower HSQ and ABC-I ratings at 48-weeks. Additionally, 48 children rated as much/very much improved on the CGI-I at 24-weeks maintained these positive ratings at 48-weeks. Among the children who did not show a positive response to treatment at 24-weeks, 9 were rated much/very much improved on the CGI-I by 48-weeks.

Similarly, 23 children in the psychoeducation group who showed a positive response at 24-weeks maintained the benefit at 48-weeks on the HSQ-ASD and ABC-I ratings. Furthermore, 16 children in the psychoeducation group maintained a positive rating on the CGI-I at 48-weeks post baseline. Thus, while Bearss and colleagues (2015b) reported that children improved in both the RUBI parent training group and the psychoeducation group, the RUBI treatment group showed a greater reduction of disruptive behaviors that was maintained over 24 weeks after the end of the intervention.

Iadarola and colleagues (2018) conducted a secondary data analysis from the Bearss et al. (2015) RCT in which they examined the effects of the RUBI parent training program on parents' levels of stress using the PSI, parenting efficacy and competence using the Parent Sense of Competence scale (PSOC; Gibaud-Wallston & Wandersman, 1978), and the parental burden of raising a child with ASD and the resulting interference on family activities using the Caregiver Strain Questionnaire (CGSQ; Brannan et al., 1997). Iadarola et al. (2018) found that both the RUBI parent training and parent psychoeducation groups showed improvements on the three parent measures. The RUBI parent training group showed a mean raw score reduction of 14.00% in total parenting stress scores as measured by the PSI, compared to a 9.30% reduction for the parent psychoeducation group. The RUBI parent training group had a mean raw score reduction of 17.20% in caregiver strain scores as captured by the CSGQ, while the parent psychoeducation group had a 7.10% reduction in mean caregiver strain raw scores. As for parenting sense of competency as captured by the PSOC total score, the RUBI parent training group had a mean raw score increase of 16.40% in competency scores in comparison to a 7.40% increase for the parent psychoeducation group. RUBI parent training did not have a significant advantage over parent psychoeducation on PSI least squared means from baseline to weeks 12 and 23, but the

RUBI treatment group showed more reductions than the parent psychoeducation group on the difficult child factor at weeks 12 and 24 (12 weeks: $p = 0.01$, $d = 0.40$; 24 weeks: $p = 0.004$, $d = 0.44$). Reduction in PSI total score for the RUBI treatment group was greater than the psychoeducation group at 24 weeks, but the effect was not statistically significant. At 12 and 24 weeks, the parent-training group had better CGSQ total scores (12 weeks: $p = 0.05$, $d = 0.32$; 24 weeks: $p \leq 0.001$, $d = 0.50$). and Internalized strain subscale scores (12 weeks: $p = 0.01$, $d = 0.35$; 24 weeks: $p \leq 0.001$, $d = 0.49$). Total parenting sense of competence scores on the PSOC were not significantly different between groups at 12 weeks, however, scores were significantly better for the RUBI group at 24 weeks ($p = 0.01$, $d = 0.34$). The RUBI group showed better gains on the PSOC satisfaction subscale at 12 weeks ($p = 0.04$, $d = 0.20$), but there was no statistically significant difference between groups at 24 weeks. In contrast, differences between groups on the PSOC efficacy subscale was not significant between groups at 12 weeks but showed significantly more improvement for the RUBI group at 24 weeks ($p = 0.001$, $d = 0.38$). Iadarola et al. (2018) also conducted an exploratory analysis to examine the relationship between the change in parenting competence as captured by the PSOC in the first 12 weeks and the change in parenting stress as measured by the PSI, caregiver report of strain as measured by the CGSQ, and child irritability as measured by the ABC-I within the next 12 weeks (i.e., week 13-24 of treatment). Both groups showed statistically significant change in competence from baseline to week 12 (RUBI group: $\beta = .68$, $p < .001$; parent psychoeducation group: $\beta = .49$, $p < .001$). The RUBI parent-training group reported statistically significantly greater gains on PSOC in comparison to the parent-psychoeducation group during the first 12 weeks of the intervention ($z = 2.72$, $p < .01$). Additionally, both groups had a statistically significant decrease in parenting stress (RUBI group: $\beta = -0.38$, $p = .01$; parent-psychoeducation group: $\beta = -0.39$, $p = .01$) and

parenting strain (RUBI group: β = −0.50, $p < .01$; parent-psychoeducation group: β = −0.45, $p < .01$) from 12 to 24 weeks. The change in parenting stress and caregiver strain did not differ between the two groups. Both groups had a statistically significant change in child irritability as captured by their caregiver ratings on the ABC-I from 12 to 24 weeks (RUBI group: β = −0.54; parent psychoeducation group: β = −0.50, $p < .001$). Overall, change in parent competence scores on the PSOC did not significantly predict change in PSI total score, CGSQ global score, or ABC-I subscale score. Iadarola and colleagues (2018) indicated that both the RUBI parent-training program and the manualized parent psychoeducation program used in Bearss et al. (2015b) showed significant reductions in parenting stress and caregiver strain, and increased parenting competence. The RUBI parent training program provided more robust decreases in parenting stress and strain, and increases in parental competence compared to a general parent psychoeducation program (Iadarola et al., 2018).

Bearss and colleagues (2018) further evaluated the effects of the RUBI parent-training program delivered in a telehealth format with 14 caregivers of a child between the ages of 3 to 8 years old. Inclusionary criteria for this feasibility study included a diagnosis of ASD, presence of disruptive behaviors, and residing in a rural area. As with previous RUBI studies (Aman et al., 2009; Bearss et al., 2013a, Bearss et al., 2015), the Bearss et al. (2018) feasibility trial components included 11 core sessions, up to two supplemental sessions, and only three telephone booster sessions to remain completely remote. Sessions were conducted from clinic to clinic over a 24-week period to make use of a sophisticated telehealth system and network previously in place, and to control for HIPAA compliant connections and clinical billing approved by insurance. Child treatment outcomes were assessed using: 1) parent ratings of child irritability on the ABC-I, 2) parent ratings of child non-compliance via the HSQ, 3) parent

ratings of child adaptive abilities on the VABS, 4) a blinded-rater improvement score from baseline using the CGI-I, and 5) description of the frequency and severity of the two most disruptive child behaviors via the parent target problems used in Bearss et al. (2013a). Additionally, Bearss et al. (2018) measured parent treatment outcomes via: 1.) the Parent Treatment Adherence Scale (PTAS) to rate parent engagement and understanding of in-session materials and assignments (e.g., answering questions about videos) on a 0-2 scale, in which a higher score indicates better adherence, 2) the parent satisfaction questionnaire used in previous RUBI studies (Bearss et al., 2013a; RUPP, 2007), and 3) the Telehealth Caregiver Satisfaction Survey designed to evaluate parental satisfaction specific for telehealth created for this feasibility study. Bearss and colleagues (2018) found statistically significant improvements on the parent-rated ABC-I and HSQ at 24 weeks; parent ratings indicated a mean reduction of 45.60% on the ABC-I ($p \leq 0.01$, $d = 1.25$) and the per-item mean scores on the HSQ were reduced by 39.50% ($p \leq 0.01$, $d = 0.86$). All ABC subscales also showed significant improvement from baseline to 24 weeks, this improvement included the social withdrawal ($p \leq 0.01$, $d = 0.76$), stereotypies ($p = 0.02$, $d = 0.49$), hyperactivity ($p \leq 0.01$, $d = 0.75$), and inappropriate speech subscales ($p = 0.01$, $d = 0.54$). There were no significant effects on child adaptive measures as captured by parent ratings on the VABS. On the CGI-I, 11 of 14 participants (78.60%) were rated as much improved or very much improved by the independent evaluator. As for parental acceptance of the intervention, 91.60% of core sessions were attended by parents. Parents indicated parent training via telehealth was acceptable and treatment could be delivered reliably by therapists. Twelve out of 12 parents who completed the telehealth caregiver satisfaction survey indicated they “agreed” or “strongly agreed” that the therapy could be delivered by telehealth. As for the therapist experience via telehealth, therapists attained 98.00% fidelity to the manual and 93.00%

of outcome measures were collected during this feasibility study. All therapist indicated they "disagreed" that telehealth interfered with the delivery of RUBI parent training, and all "disagreed/strongly disagreed" that the telehealth equipment was too complicated to use. Two of four therapists reported that delivery of parent training via telehealth was just as good as delivering in clinic, while two therapists endorsed feeling "unsure" on this point. Thus, these findings from Bearss et al. (2018) indicated that the RUBI parent-training program was efficacious in reducing child disruptive behaviors via a telehealth delivery model and was an acceptable model to parents and therapists. Furthermore, the findings from past RUBI feasibility studies and RCTs consistently indicate that the RUBI parent-training program is efficacious in reducing child disruptive behaviors in children with ASD as measured by parent ratings on the ABC and HSQ.

**Study Aim and Research Questions**

The RUBI parent training program has empirical evidence for decreasing child disruptive behaviors in children with ASD younger than seven years of age, but not older children; additionally, the RUBI program has only been evaluated in experimental settings with strict adherence protocols (i.e., randomized controlled trials; RCTs) with pretest-posttest designs. As such, the proposed study will offer three novel contributions to the literature, including: 1) understanding the extent to which participating in the RUBI program may be associated with decreased disruptive behaviors in older children aged 7-13 years; 2) understanding the effectiveness of the RUBI program for better child outcomes in clinical settings, including varied numbers of treatment sessions; and 3) understanding the average trajectory of change in child outcomes associated with RUBI participation from baseline through follow-up, and the extent to which child, treatment, and provider characteristics are associated with such changes.

In brief, the current study aimed to replicate and extend the current literature regarding the RUBI parent training program. Specifically, two outcomes are modeled – the HSQ and ABC-I – to describe and predict the trajectory of change in children ages 7-13 years with ASD and significant disruptive behaviors whose parents participated in the RUBI parent training program in a clinical setting. This study addresses the following three research questions:

1. What is the best-fitting mean trajectory in change over time in the two child outcomes from baseline to follow-up for participating families?
2. To what extent do child age and sex predict trajectories (including baseline and growth)?
3. To what extent do treatment dosage and treatment provider education level predict trajectories (including baseline and growth)?

# Chapter 3: Method

Data were collected at a large hospital-based outpatient clinic in the Pacific Northwest between December 2016 and March 2020 from participating parents of children with diagnoses of ASD and exhibited disruptive behaviors, as part of each family's clinical need for parent behavior management training. The outpatient clinic specializes in providing diagnostic evaluations, intervention, and ongoing psychiatric and psychological care to individuals from infancy to 21 years of age with developmental disabilities, especially ASD.

Parents participating in the RUBI parent training as part of their child's ongoing clinical care consent to the use of their data for research purposes evaluating the parent training program. The current study uses a subset of the clinical data of these families to evaluate the efficacy of the RUBI parent training program in clinical settings for children aged seven years and older.

## Participants

**Original study sample.** Caregivers for a total of 166 youth completed at least one intake for the RUBI parent training program between December 2016 through March 2020. Of these 166 patients, one was an atypical adult case who used RUBI principles with a caregiver and was excluded due to the focus on RUBI for children. Additionally, caregivers of 17 children attended one or two intake appointments but never started treatment; three children had no disruptive behaviors and were deemed inappropriate referrals, one was subsequently referred a more intensive biobehavioral program at SCAC, and the remaining 13 never started treatment due to external events (e.g., moving, caregiver wanted to start treatment at a future date, insurance did not cover treatment, long commute to the clinic, etc.). Thus, caregivers of 148 children with disruptive behaviors participated in the RUBI parent training program. Of these 148 children, 65

children were under 7 years of age (24 to 83 months; *M* = 65.74, *SD* = 13.34) at baseline, and 83 were above the age of 7 years old (85 to 157 months; *M* = 106.69, *SD* = 16.79) at baseline.

**Sample used for current study.** The present study focuses on data from *N* = 55 children male = 45, female = 10) with ASD who (a) were ages seven years or older (*Range:* 7 years 2 months to 12 years 9 months), (b) had a comorbid diagnosis meeting DSM-5 criteria for a disruptive disorder (i.e., unspecified disruptive disorder, conduct disorder, or ODD), (c) had caregiver(s) who participated in at least eight RUBI treatment sessions, and (d) had at least one data point/measurement reported from baseline to follow-up available for analysis. Children with documented cognitive functioning scores (*n* = 50) had scores above 40 points, ranging from 47 to 133 points (*M* = 93.04, *SD* = 22.59). Additionally, one child had a measure of non-verbal cognitive functioning of 87 points due to limited verbal abilities, and six children did not have data regarding their cognitive functioning.

Twenty-nine children in this study had a comorbid diagnosis of attention deficit hyperactivity disorder (ADHD). While 47 children met criteria for unspecified disruptive behavior disorder, seven had a diagnosis of oppositional defiant disorder (ODD), and one had a diagnosis of conduct disorder. Additionally, 19 children had diagnoses of an anxiety disorder (e.g., generalized anxiety disorder, unspecified anxiety disorder, social anxiety, separation anxiety disorder), and four had a diagnosis of a mood disorder (e.g., depression, disruptive mood disorder). Additional comorbid diagnoses for one to two children each included obsessive compulsive disorder (OCD), learning disorder (math, reading, and written expression), developmental delay, developmental coordination disorder, developmental delay of motor functioning, Chiari malformation, language disorder, fetal alcohol spectrum disorder (FASD),

sleep apnea, insomnia, sensory processing disorder, tic disorder, apraxia, and avoidant/restrictive food intake disorder (ARFID).

### *Recruitment*

Parents participated in the parent training based on the presence of their child's clinically significant disruptive behavior and consented to the use of their child's clinical data for research purposes. Providers (e.g., psychologists, psychiatrists, primary care physicians, and nurse practitioners) within and outside of the larger hospital network placed a referral for behavior management treatment to the outpatient clinic's biobehavioral program, and an initial intake was scheduled to learn more about the nature of the disruptive behavior. The children were then triaged into either the RUBI parent training program or a more intensive biobehavioral program within the clinic for children with acute disruptive behaviors (e.g., significant aggression toward self or others). Upon being triaged into the RUBI parent training program waitlist, families were scheduled for one or two intake appointments to confirm the presence of disruptive behaviors and allow parents to identify their child's top problematic behaviors for treatment focus. Intake appointments typically included a semi-structured interview collecting information about demographics, family structure, child educational placement, current and past therapies, common disruptive behaviors, and sleep, feeding, and toileting concerns (Appendix A), along with completion of questionnaires by parents, and a brief child cognitive assessment (SBAIQ). The intake appointment(s) were conducted by a licensed psychologist who was joined by psychology graduate student trainees (master- and doctoral- level students), postdoctoral psychology fellows, and psychiatry fellows for training purposes. Intake appointments ranged from 35 to 150 minutes in duration, or approximately 60 minutes on average, to identify if RUBI was appropriate for each family.

## Measures

Data was collected via parent report via questionnaires assessing their child's irritability and noncompliance.

### *Child Disruptive Behavior*

The Aberrant Behavior Checklist- Irritability (ABC-I) subscale (Aman, 2012; Aman & Singh, 1986) was used to measure the child's disruptive behaviors (e.g., injuring self on purpose, verbal and physical aggression toward others, tantrums, screaming, whining, inappropriate crying, sudden mood changes). The ABC is comprised of 58 items that measure behavior across 5 subscales (irritability, lethargy, stereotypy, hyperactivity, inappropriate speech), and takes approximately 10 to 15 minutes to administer. Items are rated on a 4-point Likert scale (0 [not at all a problem], 1 [the behavior is a problem but slight in degree], 2 [the problem is moderately serious], 3 [the problem is severe in degree]). Raw scores are tallied to form a total score for each subscale. The ABC-I score is based on 15 questions, with a range of total scores from 0 to 45. ABC-I scores of 18 and above were part of the inclusionary criteria for previous RUBI parent training RCTs (Bearss et al., 2013; Bearss et al., 2015b). Internal consistency for the ABC has ranged from acceptable to excellent, with the ABC-I alpha $\alpha = 0.92$ (Kaat et al., 2013; Norris et al., 2019). The ABC is well documented in measuring disruptive behaviors in children with ASD (Farmer & Aman, 2021; Kaat et al., 2013; Norris et al., 2019). Kaat and colleagues (2013) conducted confirmatory and exploratory factor analyses of the scores of 1,893 children aged 2 to 18 years old across 17 hospitals in the U.S. and Canada, and Norris and colleagues (2019) conducted confirmatory factor analysis for 470 youth with ASD aged 2 to 14 years old across the 8 hospitals in the United States focused on standards of care for ASD treatment; both studies report the ABC as an appropriate measure of child disruptive behaviors in children with ASD.

The ABC-I is used in the present study to study the trajectory of child irritability scores over time, and to compare the overall difference in scores to a previously completed RCT of the RUBI parent training program (Bearss et al., 2015b). A 25% decrease in scores reflects clinically significant improvement in child irritability (Aman et al., 2009; Bearss et al., 2015b, McCracken et al., 2002).

### *Child Noncompliance*

The Home Situations Questionnaire-modified for ASD (HSQ-ASD; Chowdhury et al., 2010; Chowdhury et al., 2016) was used as a measure of child noncompliance. The HSQ-ASD is based on the original Home Situations Questionnaire developed by Barkley and Edelbrock (1987) and was modified specifically for children with ASD aged 4 to 14 years old (Chowdhury et al., 2010; Chowdhury et al., 2016). The HSQ-ASD asks about 27 common situations when children may exhibit noncompliance (e.g., when asked to clean up, while in public, during bedtime, during transitions, while completing self-care activities such as dressing or toileting or bathing) over the past four weeks, producing a total number of problem settings score. The HSQ-ASD also measures the severity (i.e., mild, moderate, or significant) of the child's reaction, caregiver willingness to make demands as needed, and impact on family routines and activities using a 9-point Likert scale (mild 1 to 3, moderate severity 4 to 6, significant severity 7 to 9) to produce a raw sum severity score for the problematic settings parents endorsed. This raw severity score is then averaged across endorsed problematic settings to produce a mean severity score across these settings. The HSQ-ASD takes approximately 5 to 10 minutes to administer. Chowdhury and colleagues (2010) conducted an exploratory and confirmatory factor analysis for the HSQ–ASD and found that internal consistency was $\alpha = 0.84$ to 0.89 and test-retest reliability ranged from $r = 0.57$ to 0.58. Chowdhury and colleagues discussed the adequacy of the HSQ-

ASD of measuring noncompliance for 242 children with ASD; and further research is needed to provide more evidence for the continued use of HSQ-ASD. The HSQ-ASD is used in the present study to compare the trajectory of child noncompliance scores over time, and to compare the overall difference in scores to a previously completed RCT of the RUBI parent training program (Bearss et al., 2015b). A 25% decrease in HSQ mean severity score reflects clinically significant improvement in child noncompliance (Aman et al., 2009; Bearss et al., 2015b).

**Procedures**

Parents attended one hour weekly scheduled RUBI parent training sessions with trained clinical psychologists and psychology trainees (i.e., graduate practicum students, masters level therapists, post-doctoral residents, and child psychiatry fellows). An average of 11 core sessions and up to two supplemental sessions were offered to families, over a period of approximately 16 weeks to account for holidays, illnesses, and needing more than one session to review all session content. Therapists used verbatim scripts from the RUBI parent training manual to deliver content to parents, which included principles of the antecedent-behavior-consequence (ABC) model of behavior, antecedent management strategies, reinforcement strategies, planned ignoring, special play time, functional communication training, compliance training, and teaching strategies such as modeling and prompting. Therapists provided parents with individual workbooks that included homework worksheets, summaries of all sessions (Appendix B), and a behavior support plan (BSP). The BSP was updated on a weekly basis as new strategies were introduced to parents, and each update included the name of the strategy (e.g., “planned ignoring”), specific details (e.g., “parent will ignore child when they interrupt phone conversations by physically turning away, parent will not talk to the child, and parent will not look at the child”), and the date the strategy was introduced. Video vignettes, written vignettes,

and role plays were used during sessions to enhance parent understanding of the strategies discussed and provide opportunities to problem solve strategies as needed.

Therapists were directly supervised by the director of the RUBI clinic, a licensed psychologist, until they obtained clinical fidelity of the RUBI manualized content and were partially supervised thereafter (i.e., present in the parent training session for at least 27 minutes). To control for therapist variability, therapists were classified into two categories: licensed psychologists or trainees (i.e., graduate practicum students, master-level therapists, post-doctoral residents, and child psychiatry fellows). Therapists completed a fidelity checklist after each session to ensure all session components were completed. If any components remained due to time constraints, they were discussed with the supervising clinical psychologist and addressed in subsequent sessions.

Baseline data collection was completed during the intake session (T1), and additional data was collected at the midpoint of core session content (T2), at the end of treatment (T3), and at a 1-month follow up booster session (T4) for child disruptive behaviors and noncompliance. Parents were administered the ABC and HSQ questionnaires as a measure of disruptive behaviors and noncompliance. Additionally, a self-rated measure of parenting stress and parent rated measure of child anxiety was collected from a subset of caregivers at intake due to clinic data collection changes at T1 and a small subset of parents were re-administered these questionnaires at T3. Furthermore, an assessment of child cognitive functioning and clinical observation of the child were completed at T1. The ABC-I and HSQ are the only measures to be analyzed in the current study.

## Statistical Analyses

Multilevel modeling (also known as random effects and mixed modeling modeling) was used to model change over time for each of the two outcomes using the *R* lme4 package (Bates et al., 2015) and the lmerTest package (Kuznetsova et al., 2017). The modeling process involved two steps: 1) determining the best functional form of the mean growth trajectory across children using fit indices and likelihood ratio tests, and 2) testing the extent to which child sex (male vs. female), age (older vs. younger), treatment dosage (average or higher vs. less), and therapist provider education level (Ph.D. vs. graduate level) predicted children's trajectories.

**Providers**. Prior to modeling change over time, I investigated whether provider effects should be included in the modeling process. Preliminary analyses using an intercept-only 2-level model for each timepoint, with children nested in primary provider, showed no variance between providers (ICCs = 0). Further, $n = 5$ children had multiple providers over time. Given this information and given that provider education level was included as a predictor in the models, providers themselves were not included as a factor in the analyses.

**Varying assessment timepoints**. Because children varied in their treatment assessment intervals and as part of determining the best functional form of the growth trajectories, the four original timepoints (baseline, midtest, posttest, and follow-up) were initially coded and evaluated two ways: first, using the mean number of months between timepoints in the observed data and second, using the median number of months between timepoints. Linear and quadratic polynomial growth models with and without random slope effects were specified and estimated using full information maximum likelihood estimation to handle missing responses (assumed missing at random). Model results for each coding method were then compared sequentially using the chi-square likelihood ratio test (LRT) as well as the Bayesian Information Criterion

(BIC; lower values are better); those results indicated that a linear model (i.e., no bends in the trajectories) fit the data best. As well, comparison of BIC values between the two methods of coding time indicated that median interval lengths fit the data best. However, only $n = 9$ children in the sample (16%) were discovered to have any T2 (midpoint) data and there were convergence problems for models with quadratic random effects. To avoid unnecessary complexity and convergence issues, and because the preliminary analyses showed no significant quadratic effects, T2 was dropped from further analyses.

In short, for the final models, time was coded using the median interval width across the observed assessment timepoints, with baseline = 0 months, posttest = 10.1 months; and follow-up = 12.6 months. For each dependent variable (i.e., ABC-I and HSQ), three models were fit to the data as follows.

1. M1a: Linear polynomial change with random intercept and fixed slope
2. M1b: Linear polynomial change with random intercept and random slope, but keeping random factors uncorrelated
3. M1c: Linear polynomial change with random intercept and random slope, and allowing random factors to correlate

As before with the 4-timepoint models, the 3-timepoint model results were compared sequentially using the LRT and BIC to determine the best growth trajectory model for the data.

**Missingness.** As already noted, there were four timepoints originally measured: baseline, midtest, posttest, and follow-up (T1, T2, T3, and T4, respectively). All $N = 55$ children meeting study inclusion criteria had predictor information, but many children were missing data at one or more timepoints. However, because full information maximum likelihood estimation was used for estimating the growth models, fixed effects estimates were possible across all children who

had at least one timepoint measured. Specifically, *N* = 48 children had at least one ABC-I and *N* = 45 had at least one HSQ (the discrepancy between the two measures was because HSQ questionnaires were provided to be completed at home whereas ABC-I was completed at the clinic, and three families did not return at least one HSQ).

**Predictors**. After the best growth models for the data were established, predictors (age, sex, treatment dosage, and provider education status) were added as main effects (predicting the intercept, baseline) and as interactions with the linear growth term (predicting change over time). Sex was coded as male = 1 (0 = otherwise) and therapist education level was coded as doctorate = 1, 0 = otherwise. Due to significant right skew (which may be expected given the focus on older children in this study), age was dichotomized via median split with 1 = 103.5 months (8.6 years) or older (0 = otherwise). In a similar fashion, due to significant left skew of treatment session counts (dosage), the variable was also split at the median into 1 = 14 sessions or more (0 = otherwise) out of a total of 20 possible sessions. (Note: robustness checks using non-dichotomized age and session levels in the models did not substantively change results; however, the dichotomized predictors yielded better model fit and more normally distributed residuals.) For ease of interpretation, each predictor was then effect-coded for the models (0 recoded to –1). The final growth model with all predictors incorporated was as follows:

$$
\begin{aligned}
Y_{ij} = \gamma_{00} &+ \gamma_{01}\left(ChildAge \geq 8.6 years_{eff}\right)_j \\
&+ \gamma_{02}\left(ChildSex = Male_{eff}\right)_j \\
&+ \gamma_{03}\left(ProvEduc = Phd_{eff}\right)_j \\
&+ \gamma_{04}(TotSess \geq 14\_eff)_j \\
&+ \gamma_{10} Time_{ij} \\
&+ \gamma_{11} Time_{ij} * ChildAge\_eff_j \\
&+ \gamma_{12} Time_{ij} * ChildSex\_eff_j
\end{aligned}
$$

$$+ \gamma_{13} Time_{ij} * ProvEduc\_eff_j$$

$$+ \gamma_{14} Time_{ij} * TotSess\_eff_j$$

$$+ U_{0j} + U_{1j} Time_{ij} + R_{ij}$$

In the model above, the $i^{th}$ dependent variable score for the $j^{th}$ child is equal to the sum of the conditional baseline mean ($\gamma_{00}$), the unique effects of the set of predictors on baseline scores ($\gamma_{01} - \gamma_{04}$), the mean change in the dependent variable per month over the course of treatment and follow-up periods ($\gamma_{10}$), the unique effects of the set of predictors on change over time ($\gamma_{11} - \gamma_{14}$), the child-level residual error in baseline scores ($U_{0j}$), the child-level residual error in growth rates ($U_{1j}$), and the within-child residual error ($R_{ij}$). An alpha of .05, 2-tailed, was used for all tests. Total $R^2$ was computed using the *R* r2mlm package (Shaw et al., 2023) and data visualization was produced using the *R* ggplot2 package (Wickham, 2016).

# Chapter Four: Results

## Descriptive Statistics

Means, standard deviations, and zero-order correlations among all variables are given in **Table 1**. As can be seen from the means, the sample was equally split between children younger than 8.6 years of age and those who were older (*Range* = 7 – 13 years); as well, there were more boys ($n$ = 38; 79% of the sample) than girls ($n$ = 10; 21% of the sample). In terms of treatment predictors, over half of the children were treated by a provider holding a Ph.D. (60%), and most children had at least 14 treatment sessions between baseline and posttest (71%).

In terms of the correlation patterns between predictors and the dependent variables (columns labeled 1 – 4), the ABC-I baseline scores were significantly negatively correlated with age group (i.e., younger children had higher baseline scores) and were positively correlated (as a trend, $p \leq .10$) with being treated with 14 or more sessions. Although baseline HSQ scores were not correlated with age group, they were significantly correlated with receiving 14 or more treatment sessions.

Last and not surprisingly, ABC-I scores were positively correlated with each other across timepoints (columns labeled 5 – 7), as were HSQ scores (columns labeled 8 – 10), with the strongest correlations between posttest and follow-up timepoints. Only at baseline were the ABC-I and HSQ scores significantly positively correlated with each other, hinting that children's change over time in these two scales occurred differently.

## Growth Model Results

### *Research Question 1: What are the mean trajectories for ABC-I and HSQ from baseline to follow-up for children ages 7-13 years old with ASD and significant disruptive behaviors whose parents participated in a clinical-setting RUBI parent training program?*

As noted in the statistical analysis plan, children were treated and assessed at variable timepoints, and preliminary comparisons of linear growth models showed that using median rather than mean time interval coding was a better fit to the data based on the Bayesian Information Criterion (BIC). Next, using median time interval coding, chi-square Likelihood Ratio Tests (LRTs) were then used to determine the best fixed and random effects structure for the linear growth models. First, I compared a linear model with a random intercept only (fixed slope) to a linear model with both a random intercept and a random slope, but with uncorrelated random effects. Those results revealed no significant difference favoring the more complex model for either the ABC-I ($\chi^2(df = 1, N = 48) = 1.41, p = .235$) or the HSQ ($\chi^2(df = 1, N = 48) = 0.818, p = .366$). However, when the random intercepts and slopes were specified to be free to covary in a third model, the more complex third model was a significantly better fit compared to both the first and the second models; for ABC-I, the LRT *p*s = .041 and .025, respectively; for HSQ, the LRT *p*s < .001 for both.

The best-fitting model for the ABC-I (**Table 2**, first set of columns labeled Model 1) revealed that the baseline mean was 19.91 points and the mean growth rate was a decrease of 0.64 points per month from baseline to follow-up (all *p*s < .001). In other words, across a period of 12.6 months, the average estimated decrease was 8.06 points (a predicted follow-up score of 19.91 – 8.06 = 11.85 points, representing a decrease of 40%). The best-fitting model for the HSQ (**Table 2**, third set of columns labeled Model 1), revealed that the baseline mean was 3.78 points

and the mean growth rate was a decrease of 0.15 points/month. In other words, across a period of 12.6 months, the average estimated decrease was 1.80 points (a predicted follow-up score of 3.78 – 1.80 = 1.98 points, representing a decrease of 52%).

Last, as can be seen in the middle columns of **Table 1**, the random intercept estimates indicate a relatively high amount of variability at baseline: for the ABC-I, the random intercept estimated variance = 44.11 (*SD* = 6.64 points), which is 33% of the mean baseline estimate of 19.91 points. For the HSQ, the random intercept variance = 1.55 (*SD* = 1.24 points), which is 45% of the mean baseline estimate of 3.78 points. As well, the growth rate variances were also noisy. For the ABC-I, the growth rate variance was estimated to be 0.22 (*SD* = 0.47 points/month, which is 73% of the mean growth rate of –0.64) and for the HSQ, the growth rate variance was estimated to be 0.01 (*SD* = 0.10 points/month, which is 67% of the mean growth rate of –0.15). Further, it is notable that the correlation between the intercept and slope random effects were *r* = –.53 and –.75 for the ABC-I and HSQ, respectively (Table 2, middle set of rows). This indicates that children who started out higher on these scales were more likely to have lower growth rates, especially for the HSQ. **Figure 1** displays the pattern of model-predicted growth trajectories for the ABC-I (Panel A) and HSQ (Panel B).

***Research Questions 2-3: Which, if any, of the child and treatment-related factors predict ABC-I and HSQ trajectory parameters for these children?***

Although the model improvement was not statistically significant (LRT chi-square *p*s = .315 and .113 for ABC-I and HSQ, respectively), the set of child and treatment-related predictors did account for an additional 10% of variation in ABC-I scores and 11% of variation in HSQ scores (**Table 2**, fixed effect $R^2$ values shown in the bottom set of rows). With respect to individual predictor effects, Model 2 results for the intercept revealed that older children were

2.01 points lower than average on the baseline ABC-I (and 4.02 points lower than younger children; double the coefficient due to the use of effect-coding), and children who received 14 or more treatment sessions were 0.55 points significantly higher than average on baseline HSQ (1.10 points higher than children who received fewer sessions). A similar trend with respect to higher baseline being associated with greater treatment sessions was also observed for ABC-I (*Coeff* = 2.13, $p = .058$).

Last, no significant predictor effects were detected for growth rates ($p$s > .05). Put another way, there was no evidence that child age (within the band of 7–13-year-olds for this study; see **Figure 2**), child sex (**Figure 3**), treatment session dosage (**Figure 4**), or therapy provider education (**Figure 5**) had differential benefits on children's decreases from baseline to follow-up. This said, there was a slight trend for greater decreases in HSQ over time for children who participated in 14 or more sessions (*Coeff* = –0.03, $p = .230$).

# Chapter Five: Discussion

The purpose of the present study was to examine the efficacy of the RUBI parent training program with parents of children who were diagnosed with ASD and disruptive behaviors, and aged 7 to 13 years old, in a community clinical setting. This study had three primary objectives: first, to evaluate if parent participation in the RUBI parent training program decreased the presence of disruptive behaviors in children aged 7 to 13 years of age as measured by parent ratings on the ABC-I (child irritability) and HSQ (child noncompliance); second, to understand the effectiveness of the RUBI parent training program in a clinical setting with varied treatment dosages as compared to previous RUBI RCTs; and lastly, to understand the trajectory of change in child outcomes (irritability and noncompliance scores) from baseline to follow-up, and understand if any child, treatment, and provider characteristics were associated with the trajectory of change. Findings from this study have important implications for practice, highlighting the importance of using a primary parent mediated intervention (i.e., the RUBI parent training program) in clinical settings with children above the age of 7 years old.

## Question 1

The first research question aimed at finding the best fitting mean trajectory in change over time for the two child outcome measures (child irritability rating scores and child noncompliance rating scores) from baseline to follow up for participating families. The best functional form of the mean growth trajectory was identified by examining fit indices and likelihood ratio tests, which was a linear polynomial model with random intercept and random slope, while allowing random factors to correlate. The model predicted individual and mean trajectories depicting a decrease in child irritability and noncompliance scores over time from baseline (T1) to follow-up (T4).

The predicted mean trajectories show a 40% decline in mean child irritability (ABC-I) parent rating scores (**Figure 1, Panel A**) and a 52% decline in mean child noncompliance (HSQ) parent rating scores (**Figure 1, Panel B**). These findings of decreased child outcomes were slightly less than the findings reported by Bearss and colleagues (2015b), but followed a similar trend; specifically, Bears and colleagues found a 47.7% decline in ABC-I rating scores and a 55% decline in HSQ scores at follow up (24 weeks from baseline) for children under 7 years of age in their RCT. Thus, the findings from this study indicate that the RUBI parent training program helped decrease child disruptive behaviors (irritability and noncompliance) in children with diagnosed ASD and disruptive behaviors above the age of 7 years old. Moreover, Bearss and colleagues (2015b) reported their findings from a highly structured RCT with a regimented treatment dosage (e.g., 11 core sessions, two optional supplementary sessions, three booster sessions, and two home visit sessions) and exact follow up timepoint at 24 weeks post baseline. In comparison, the current study had a wide range of variability in both treatment dosage (e.g.,8 to 24 sessions for most, with an outlying participant who had over 50 sessions) and varied time from baseline (T1) to follow-up (T4; approximate range of 10 to 20 months). This variability in treatment dosage and treatment timeline is commonly seen in community clinical settings as opposed to research settings (Barkham & Mellor-Clark, 2003; Stahmer, 2007). Thus, this study provides evidence for the effectiveness of the RUBI parent training program decreasing disruptive behaviors when used with parents of children above the age of 7 years old who have diagnoses of ASD and disruptive behaviors in community clinical settings.

**Question 2**

The second research question examined the extent to which child age and child sex predicted trajectories for the child outcome measures, including baseline and growth. Child age

was a significant predictor for child irritability scores at baseline (ABC-I rating scale; $p = 0.05$); specifically, children older than 8.6 years of age had significantly lower ABC-I scores (4.02 points) at baseline (T1) compared to children between 7 to 8.5 years of age (**Figure 2**). This finding may be due to a variety of factors, such as natural maturation effects for the older children (8.6 to 13 years of age) versus the younger children (7 to 8.5 years of age), the child's verbal abilities (which were not examined in this study), and targets of intervention (i.e., the most problematic disruptive behaviors identified at baseline for each child using the RUBI parent training intake form, as seen in **Appendix A**). Varied disruptive behaviors may be more prevalent at specific age ranges, as reported by Brown and colleagues (2023) in that younger children with ASD had more instances of physical aggression versus more instances of verbal aggression in older children with ASD. The specific type of disruptive behavior was not analyzed in the current study, and this distinction may provide further information about the significance of child age predicting child irritability rating scores.

Child sex was not a significant predictor for either child irritability or noncompliance scores (**Figure 3**). This is not a surprising finding, as evidence suggests that male and female children with ASD tend to exhibit similar levels of aggressive behaviors in comparison to NT children (Brown et al., 2024; Kaat & Lecavalier, 2013; Kanne & Mazurek, 2011); specifically, NT males tend to exhibit more aggressive behaviors than NT females (Card et al., 2008). Thus, the findings of this study add to the support of current literature of no significant differences of disruptive behaviors exhibited by males and females with ASD between 7 to 13 years of age.

**Question 3**

The third research question examined the extent to which treatment dosage and treatment provider education level predicted trajectories for the child outcome measures, including baseline

and growth. A higher child noncompliance (HSQ) score was significantly associated with 14 or more therapy sessions ($p < 0.05$; in comparison to less than 14 therapy sessions; **Figure 4, Panel B**). While not statistically significant ($p = 0.10$), there a similar trend was observed for child irritability (ABC-I) scores, in that higher scores at baseline tended to be associated with more (14 or more) therapy sessions (**Figure 4, Panel A**). Thus, parents of children with higher rating scores of noncompliance, as measured by the HSQ, showed increased severity of disruptive behaviors and required more treatment sessions. This finding is not surprising, nor is the similar trend for higher rating scores for child irritability as measured by the ABC-I. This study did not assess which supplemental sessions were attended from the RUBI parent training program, and did not evaluate how many supplemental sessions were required for participants who had a higher treatment dosage; thus, the need for supplemental sessions (e.g., time out, token economy, sleep, etc.) may have influenced these findings and may have increased treatment dosage. Furthermore, this study did not examine any parent characteristics which may have influenced the severity of parent ratings on the two outcome measures and/or the number of treatment sessions attended. Extraneous variables, such as parent stress levels, parent knowledge about ASD and/or disruptive behaviors, and parent adherence to treatment may have influenced both parent rating scores or number of treatment sessions needed. For example, through additional sessions such as supplemental sessions (e.g., time out or sleep problems), or more than one session spent on a specific challenging topic (e.g., planned ignoring or prevention strategies).

Provider education level was not a significant predictor for either child irritability or noncompliance rating scores (**Figure 5**). This finding is similar to studies that reported no or minimal effects of training status (Anderson et al., 2016; Wampold et al., 2017) or limited effects of therapist experience over time (Goldberg et al., 2016) on intervention treatment outcomes.

This finding is promising for manualized parent mediated interventions, as clinicians of varied educational backgrounds (e.g., licensed psychologists at the doctoral level, psychiatrists with an MD, graduate students at master's level, master's level licensed therapists, etc.) have the potential to effectively deliver these interventions to more parents seeking support for their child(ren). Furthermore, more qualified clinicians to deliver manualized interventions can help decrease the long wait times for interventions that many families of children with ASD experience due to limited access to services (Gordon-Lipkin et al., 2016), which includes the availability of trained therapists and an increased demand for ASD services with rising prevalence rates.

**Limitations**

The present study had several limitations. First, the study had missing outcome measures from participants classified as completing treatment (i.e., eight core sessions of parent training); only $n = 5$ participants had data at all for timepoints, while $n = 27$ had data at three timepoints, and $n = 16$ had data at two timepoints; furthermore, $n = 7$ participants only had baseline data and could not be included in the analysis. Second, numerous unplanned dropouts from parent training decreased the final number of usable data for analysis. A larger sample size of participants who have completed at least eight core sessions and completed rating scales at all four timepoints would provide more statistical power. Third, casual inferences are limited for this study due to the lack of a control group; for example, having a wait-list control group or an alternative parenting intervention group (e.g., a psychoeducational intervention) would allow for making causal inferences about the impact of the RUBI parenting intervention on disruptive behaviors. Additionally, the original RUBI parent training RCT (Bearss et al., 2015b) and subsequent analyses (Iadarola et al., 2018) included additional outcome measures and parent predictors (e.g.,

parenting stress levels). A subset of the participants in this study also completed a questionnaire regarding parenting stress at baseline (T1), however, this questionnaire was not completed at the other timepoints (T2, T3, T4). Additional parenting stress data could provide further evidence for the efficacy of the RUBI parent training program in a clinical setting in comparison to a RCT, and provide a parent focused predictor for analysis in addition to child factors. This study relied on parent report for outcome measures and did not include any other assessment of child behaviors, which is a common limitation for studies evaluating the outcomes of parent mediated interventions and may lead to respondent or recall bias. The addition of a clinician-based evaluation of child disruptive behaviors may provide additional information that would not be influenced by recall bias. Finally, this study also used the clinical data of participants who had access to psychological services at a large hospital in the Pacific Northwest and may not be representative of all parents of children who have ASD and exhibit clinically significant disruptive behaviors. Nonetheless, these findings provide an opportunity for continued assessment of primary parent meditated interventions and their efficacy in wider clinical settings compared to rigorous randomized control trials.

**Implications for Research and Practice**

The current study has several implications for future practice. First, in regard to question one, this study supports the use of the RUBI parent training program for parents of children with ASD and disruptive behaviors between 7 and 13 years old in a community setting. This finding is substantial, as the evidence for RUBI parent training as a primary parent mediated intervention for reducing disruptive behaviors has been limited to children younger than 7 years of age to date. Further replications examining the effectiveness of the RUBI parent training program for reducing disruptive behaviors for children with ASD in clinical settings will be beneficial to

further generalize these findings to additional families. Specifically, more evidence can be gathered for the use of the RUBI parent training program in clinical settings if future research examines additional timepoints to more consistently monitor improvement over time, has larger sample sizes for more statistical power, includes a wait-list control group to infer causality, and includes clinician-based ratings to measure the reduction of disruptive behaviors improvement. For example, use of a tool such as the CGI-I as Bearss and colleagues (2015b) used in the RUBI RCT would allow for a more objective assessment of child behaviors compared to relying solely on parent ratings for these outcome measures.

With consideration of the significant finding for question two regarding less severe scores related to older child age at baseline, clinicians may choose to tailor treatments based on client age and specific type of disruptive behaviors exhibited to best support their clients. Replicating this study with a focus on the child's most severe type(s) of disruptive behavior (e.g., verbal aggression or destruction of property) and identifying the specific behavior's impact on scores while controlling for child age may provide more tailored treatment plans for participating parents in the future. Additionally, future replications with a larger sample size may provide more information about the efficacy of the RUBI parent training program in reducing disruptive behaviors when comparing outcomes by child age. For example, further analyses may help determine if there are differences in parent rating scale scores between the parent of a 9-year-old compared to an 11-year-old or to a 13-year-old.

As for the third research question examining treatment factors (i.e., treatment dosage and clinician education level), taking into consideration the severity of baseline scores and potential need for a higher treatment dosage may be valuable for treatment planning for both therapists and parents participating in parent training. Future replications of the current study with the

addition of parent factors (e.g., parenting stress levels, knowledge about ASD and/or behavioral management strategies, educational level, etc.) may be beneficial to further understand if certain parent characteristics may be linked to a need for more parental support and longer treatment timelines. This study also supports the use of the RUBI parent training program with therapists of various educational levels, which allows for the possibility of wider availability of trained therapists to help families with children diagnosed with ASD and disruptive behavior disorders.

## Conclusion

This study aimed to replicate and extend the current literature about the RUBI parent training program. Findings regarding the efficacy of RUBI parent training program were extended to an older age range of 7 to 13 years old in an outpatient clinical setting, while therapist education level and treatment dosage were assessed as well. The current study shows support for the use of the RUBI parent training program for parents of children with ASD and disruptive behaviors between 7 and 13 years of age in a clinical setting, with no therapist education level effects, older children (8.6 years to 13 years old) tended to have lower baseline scores, and higher rating scores at baseline tended to require higher treatment dosage over time. Future replications of this study will be beneficial to further augment these findings and provide additional information to help provide families with the support needed for their children with ASD and disruptive behaviors.

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## Appendix A: RUBI Intake Form

### RUBI PT INTAKE FORM

| Family Information | | | |
|---|---|---|---|
| Today's Date | | | |
| Clinician(s) present: | | | |
| Start Time | | End Time | |
| Family Members Present: | | | |
| Best Way to Contact Family: | | | |
| **Caregiver 1** Information | | | |
| First Name: | | Last Name | |
| **Caregiver 2** Information | | | |
| First Name: | | Last Name | |
| **Child's** Information | | | |
| First Name: | | Last Name | |
| Date of Birth *(YYYY-MM-DD)* | | Age | |
| MRN | | | |
| Ethnicity: | ☐ Hispanic or Latino ☐ Non-Hispanic or Latino | | |
| Race: | ☐ American Indian or Alaska Native ☐ Asian ☐ Black or African American ☐ Native Hawaiian or Other Pacific Islander ☐ White ☐ Other_____ | | |
| **Other Children in Family** | | | |
| Names and Ages | | | |
| **Other Family Information** | | | |
| What is the primary language spoken in the home? | | | |
| | | | |
| Are there any other languages spoken in the home? | | | |
| *If yes, please list:* | | | |
| NOTE whether interpreter services will be needed when working with the family | | | |
| ☐ Yes ☐ No | | | |

## School Information

| | | | |
|---|---|---|---|
| School Name | | School District: | |
| Grade | | Teacher's Name | |
| Classroom Placement | | IEP/504? | |
| Services Child Receives in School (e.g. speech, OT) | Service/ Intensity (hours/week) | | |

Does problem behavior occur at school?

Yes ☐ No ☐ Not Sure ☐ *If yes, LIST BEHAVIOR TOPOGRAPY, ANTECEDENTS, CONSEQUENCES:*

Are there any interventions that the school has tried or is currently using to decrease problem behavior?

Yes ☐ No ☐ Don't Know ☐ *If yes, DESCRIBE INTERVENTION STRATEGIES:*

## Medical/Psychological Information

| | |
|---|---|
| Does your child have any current medical/psychological diagnosis? | Yes ☐ No ☐ |

| Diagnosis | Date Received | Who provided this diagnosis? | Where was the diagnostic report completed? |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

*If the diagnosis was provided outside of the Center, please ask for a copy of the report*

| Does your child currently take any medications? | | |
|---|---|---|
| Yes ☐ No ☐ | | |
| If yes, please list the medication, type, dose, and benefits/negative effects of the medication you have noticed. | | |
| Medication Type | Dose | What benefits/negative effects have you noticed? |
| | | |
| | | |
| | | |
| | | |
| Please list any other medical problems we should be aware of: | | |
| | | |

## Other Treatment Information

| Are there any other therapists the child currently sees outside of school? Yes ☐ No ☐ Don't Know ☐ |
|---|
| *If yes, please DESCRIBE (provider name, type of service (e.g. OT, PT, speech), target of service, intensity)* |
| |

## Behavioral Services

| Are there any providers or therapists the family has seen or currently sees to address **problem behavior?** | |
|---|---|
| Yes ☐ No ☐ Don't Know ☐ | |
| *If yes, please DESCRIBE (provider name, length of service, target behaviors in treatment, intensity)* | |
| | |
| Did the therapy help with problem behavior? | Yes ☐ No ☐ Don't Know ☐ |

| Adaptive Behavior | | | | | |
|---|---|---|---|---|---|
| How does your child communicate? | | | | | |
| ☐ | Speaks in sentences | ☐ | Uses single words | ☐ | Makes sounds |
| ☐ | Sign Language | ☐ | Gestures (e.g., points or leads you by the hand) | | |
| ☐ | Picture System | ☐ | Augmentive Communication Device (e.g., Dynavox or Ipad) | | |
| ☐ | *Additional description of language skills:* | | | | |

| Does your child: Make sure to clarify if the child "CAN'T" do it vs. "WON'T" do it | |
|---|---|
| Understand simple instructions/commands (e.g., come here, put on your shoes)? | Yes ☐ No ☐ |
| Put on and take off clothes and shoes independently?<br>*Describe any "compliance" challenges here.* | Yes ☐ No ☐ |
| Have difficulty seeing (i.e., visually impaired)? | Yes ☐ No ☐ |
| Have difficulty hearing (i.e., hearing impaired)? | Yes ☐ No ☐ |
| Have difficulties eating/drinking (e.g., child is selective or refuses to eat/drink?<br>*If yes, GET DESCRIPTION OF FEEDING ISSUES:* | Yes ☐ No ☐ |
| Have difficulties going or staying asleep at night?<br>*If yes, GET DESCRIPTION OF SLEEP ISSUES:* | Yes ☐ No ☐ |
| Toilet trained during waking hours? | Yes ☐ No ☐ |
| Toilet trained during sleeping hours? | Yes ☐ No ☐ |
| *If yes to either, GET DESCRIPTION OF TOILETING ISSUES:* | |

| Problem Behavior | | |
|---|---|---|
| **Which behaviors are problematic for you and/or your child:** | | |
| Check if behavior is problematic | Behavior | |
| ☐ Hurts Others | ☐ Hits ☐ Pushes ☐ Scratches ☐ Pinches ☐ Kicks ☐ Bites<br>☐ Pulls hair ☐ Slaps ☐ Punches ☐ Hits with items | |
| ☐ Hurts Self | ☐ Scratches ☐ Pinches ☐ Bites ☐ Slaps ☐ Pulls hair ☐ Hits head<br>☐ Pokes Eye ☐ Other _____ | |
| ☐ Inappropriate Language | ☐ Curses ☐ Name Calls ☐ Threatens ☐ Teases<br>☐ Other _____ | |
| ☐ Toileting Accidents | ☐ Urinates outside of the toilet ☐ Bowel movements outside the toilet | |
| ☐ Inappropriate Sexual Behaviors | ☐ Exposing self in public ☐ Removes clothes in inappropriate places<br>☐ Masturbating in public places ☐ Touching others in inappropriate places | |
| ☐ Destructive Behaviors | ☐ Throws ☐ Slams ☐ Hits ☐ Kicks ☐ Breaks ☐ Tears/Rips<br>☐ Toys ☐ Furniture ☐ Walls ☐ Doors ☐ Clothing<br>☐ Other item(s) in such a way that you are concerned the item will be damaged. | |
| ☐ Has Tantrums | *If yes, please describe (i.e., how long, occurs with other problem behavior, etc.)*? | |
| ☐ Screams | ☐ Runs away in the community | ☐ Doesn't listen to directions |
| ☐ Cries | ☐ Plays with feces | ☐ Eats non-food items |
| ☐ Spits | ☐ Drops to the floor | ☐ Takes things from others |
| ☐ Other (please explain): | | |

| Of the problems you listed above, which are the MOST concerning /problematic for you? | |
|---|---|
| 1. | |
| 2. | |
| 3. | |
| 4. | |
| 5. | |

## BEHAVIOR DESCRIPTION

| BEHAVIOR | FREQUENCY/ DURATION | ANTECEDENTS | CONSEQUENCES | FUNCTION |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

How has it impacted your family, your routines (e.g., running errands, going to family gatherings)
With whom does this problem behavior occur (sibling, parent, teacher, peers)

| What else would you like for us to know? |
| --- |
| |

| BEHAVIOR OBSERVATION NOTES |
| --- |
| |

| RECORD REVIEW NOTES | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Date:** | | **Time Start** | | **Time End** | |
| | | | | | |

## Appendix B: RUBI Session List

**ACTIVITY SHEET** 1

| SESSIONS | SKILLS/ACTIVITIES |
|---|---|
| BEHAVIORAL PRINCIPLES | • Introduce overall treatment goals<br>• Introduce concepts of functions of behavior, antecedents and consequences of behavior |
| PREVENTION STRATEGIES | • Discuss antecedents to behavior problems and develop preventive strategies |
| DAILY SCHEDULES | • Develop a daily schedule and identify points of intervention (including use of visual schedules) to decrease behavior problems |
| REINFORCEMENT 1 | • Introduce concept of reinforcers – to promote compliance, strengthen desired behaviors and teach new behaviors |
| REINFORCEMENT 2 | • Introduce "catching your child being good"<br>• Teach play and social skills through child-led play |
| PLANNED IGNORING | • Explore systematic use of extinction (via planned ignoring) to reduce behavioral problems |
| COMPLIANCE TRAINING | • Introduce effective parental requests and the use of guided compliance to enhance compliance and manage noncompliant behaviors |
| FUNCTIONAL COMMUNICATION TRAINING | • Through systematic reinforcement, teach alternative communicative skills to replace problematic behaviors |
| TEACHING SKILLS 1 | • Using task analysis and chaining, provide tools to replace problem behaviors with appropriate behaviors and how to promote new adaptive, coping and leisure skills |
| TEACHING SKILLS 2 | • Teach various prompting procedures to use while teaching skills |
| GENERALIZATION & MAINTENANCE | • Generate strategies to consolidate positive behavior changes and generalize newly learned skills |
| SUPPLEMENTAL SESSIONS (AS NEEDED) | • Provide instructions on optional topics or review materials |
| HOME VISIT | • Observe the child in the natural environment<br>• Learn about the layout of the child's home<br>• Plan implementation of strategies |
| TELEPHONE BOOSTER CALLS | • Review implementation of intervention strategies<br>• Develop interventions for any newly emerging behavior concerns |

| SUPPLEMENTAL SESSIONS | CONTENTS |
|---|---|
| TOKEN ECONOMY SYSTEMS | This session provides parents with information on the proper use of token economies, star charts and point systems to promote positive behaviors in the home and community |
| IMITATION SKILLS | This session teaches parents fundamental skills for helping their child learn to imitate others |
| TIME OUT | This session provides information on the proper use of time out, how to problem-solve if issues arise, and how to develop and implement a time out plan at home |
| SLEEP PROBLEMS | This session provides information on how to address bedtime and sleep problems often observed in children with ASD, such as difficulties with bedtime routines, delayed sleep onset, night awakening, sleep association problems, and the child entering the parents' bed |
| FEEDING PROBLEMS | This session helps the parent address a range of feeding problems that are commonly seen in children with ASD, such as food selectivity, mealtime behavior problems, and overeating |
| TOILET TRAINING | This session helps the parent address a range of possible toileting issues such as diaper rituals, refusal to use the toilet, and nighttime toileting problems |
| CRISIS MANAGEMENT | This session provides an opportunity to problem-solve the management of dangerous child behaviors, family crises and pressing educational issues |

**Table 1**

*Descriptive Statistics and Zero-Order Correlations*

| Variable | *N* | *M* | *Var* | *(SD)* | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Child-Level Predictors* | | | | | | | | | | | | | | |
| 1. Child Age Status (1 = 8.6 years+) | 48 | 0.50 | 0.26 | (0.51) | -- | | | | | | | | | |
| 2. Child Sex Status (1 = Male) | 48 | 0.79 | 0.17 | (0.41) | .10 | -- | | | | | | | | |
| 3. Prov Educ Status (1 = Ph.D.) | 48 | 0.60 | 0.24 | (0.49) | .04 | -.21 | -- | | | | | | | |
| 4. No. Treat Sessions Status (1 = 14+) | 48 | 0.71 | 0.21 | (0.46) | .00 | .12 | -.14 | -- | | | | | | |
| *Dependent Variables* | | | | | | | | | | | | | | |
| 5. ABC-I Baseline | 47 | 20.00 | 58.06 | (7.62) | **-.29** | -.13 | .07 | .23 | -- | | | | | |
| 6. ABC-I Posttest | 44 | 13.35 | 47.33 | (6.88) | -.19 | -.16 | -.03 | .28 | **.45** | -- | | | | |
| 7. ABC-I Follow-up | 29 | 11.14 | 41.73 | (6.46) | -.18 | .04 | .23 | .10 | **.50** | **.79** | -- | | | |
| 8. HSQ Baseline | 45 | 3.78 | 1.93 | (1.39) | .00 | .11 | .08 | **.37** | **.64** | .16 | .31 | -- | | |
| 9. HSQ Posttest | 39 | 2.27 | 1.00 | (1.00) | .15 | .08 | .19 | .14 | .16 | **.57** | **.71** | .28 | -- | |
| 10. HSQ Follow-up | 30 | 1.91 | 1.35 | (1.16) | -.17 | .28 | .31 | .27 | .21 | **.56** | **.80** | .26 | **.77** | -- |

*Note.* ABC-I = Aberrant Behavior Checklist Irritability Scale rating score; HSQ = Home Situations Questionnaire rating score. All child- and treatment-related predictors dummy-coded. Pearson's *r* reported for zero-order correlations; values in boldface indicate significance at the .05, 2-tailed level.

**Table 2**

*Multilevel Growth Model Results*

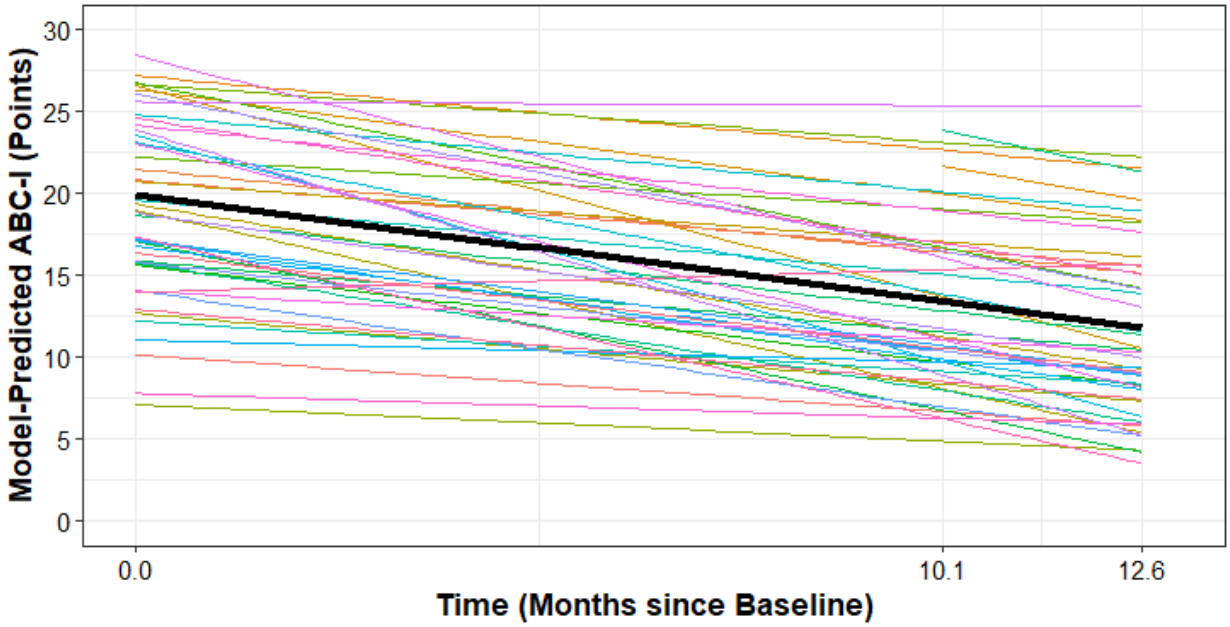
| *Fixed Effects* | ABC-I | | | | | | HSQ | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model 1 | | | Model 2 | | | Model 1 | | | Model 2 | | |
| | *Coeff* | *(SE)* | *p* | *Coeff* | *(SE)* | *p* | *Coeff* | *(SE)* | *p* | *Coeff* | *(SE)* | *p* |
| Intercept (Baseline) | **19.91** | **(1.08)** | **<.001** | **19.56** | **(1.34)** | **<.001** | **3.78** | **(0.20)** | **<.001** | **3.44** | **(0.25)** | **<.001** |
| Child Age Status (1 = 8.6 years+) | | | | **-2.01** | **(1.00)** | **.050** | | | | 0.02 | (0.19) | .926 |
| Child Sex Status (1 = Male) | | | | -1.12 | (1.25) | .377 | | | | 0.10 | (0.24) | .679 |
| Prov Educ Status (1 = Ph.D.) | | | | 0.68 | (1.05) | .520 | | | | 0.18 | (0.20) | .365 |
| No. Treat Sessions Status (1 = 14+) | | | | 2.13 | (1.10) | .058 | | | | **0.55** | **(0.21)** | **.012** |
| Linear Growth (Points/Month) | **-0.64** | **(0.90)** | **<.001** | **-0.64** | **(0.12)** | **<.001** | **-0.15** | **(0.02)** | **<.001** | **-0.15** | **(0.02)** | **<.001** |
| Child Age Status (1 = 8.6 years+) | | | | 0.05 | (0.09) | .604 | | | | -0.01 | (0.02) | .589 |
| Child Sex Status (1 = Male) | | | | 0.04 | (0.11) | .702 | | | | 0.02 | (0.02) | .479 |
| Prov Educ Status (1 = Ph.D.) | | | | -0.02 | (0.09) | .792 | | | | 0.01 | (0.02) | .559 |
| No. Treat Sessions Status (1 = 14+) | | | | -0.05 | (0.10) | .610 | | | | -0.03 | (0.02) | .120 |
| *Random Effects* | *Var* | *Corr* | | *Var* | *Corr* | | *Var* | *Corr* | | *Var* | *Corr* | |
| Intercept (Baseline) | 44.11 | | | 35.17 | | | 1.55 | | | 1.27 | | |
| Linear Growth (Points/Month) | 0.22 | -.53 | | 0.21 | -.52 | | 0.01 | -.75 | | 0.01 | -.77 | |
| Residual (within Child) | 11.41 | | | 11.42 | | | 0.31 | | | 0.31 | | |
| *Model Fit* | *Value* | | | *Value* | *p* | | *Value* | | | *Value* | *p* | |
| $R^2$ Fixed Effects | 0.20 | | | 0.30 | | | 0.33 | | | 0.44 | | |
| $R^2$ All Fixed and Random Effects | 0.82 | | | 0.82 | | | 0.85 | | | 0.85 | | |
| AIC | 784.40 | | | 791.10 | | | 346.80 | | | 349.90 | | |
| BIC | 801.20 | | | 830.10 | | | 363.30 | | | 388.20 | | |
| Deviance (-2LL) | 772.40 | | | 763.10 | | | 334.80 | | | 321.90 | | |
| Residual *df* | 114 | | | 106 | | | 108 | | | 100 | | |
| LRT Chi-square test | -- | | | 9.33 | .315 | | -- | | | 12.95 | .113 | |

*Note*. $N$ = 48 children for ABC-I and $N$ = 45 children for HSQ models. ABC-I = Aberrant Behavior Checklist Irritability Scale rating score; HSQ = Home Situations Questionnaire rating score. All child- and treatment-related predictors effect-coded. Time coded to reflect median intervals as follows: 0 = baseline, 10.1 = posttest, and 12.6 = follow-up. Models estimated using full maximum likelihood in *R* lme4; coefficient *t*-test *p*-values reported based on Satterthwaite *df* computed using *R* lmerTest, with significant *p*-values boldfaced at the .05, 2-tailed level.

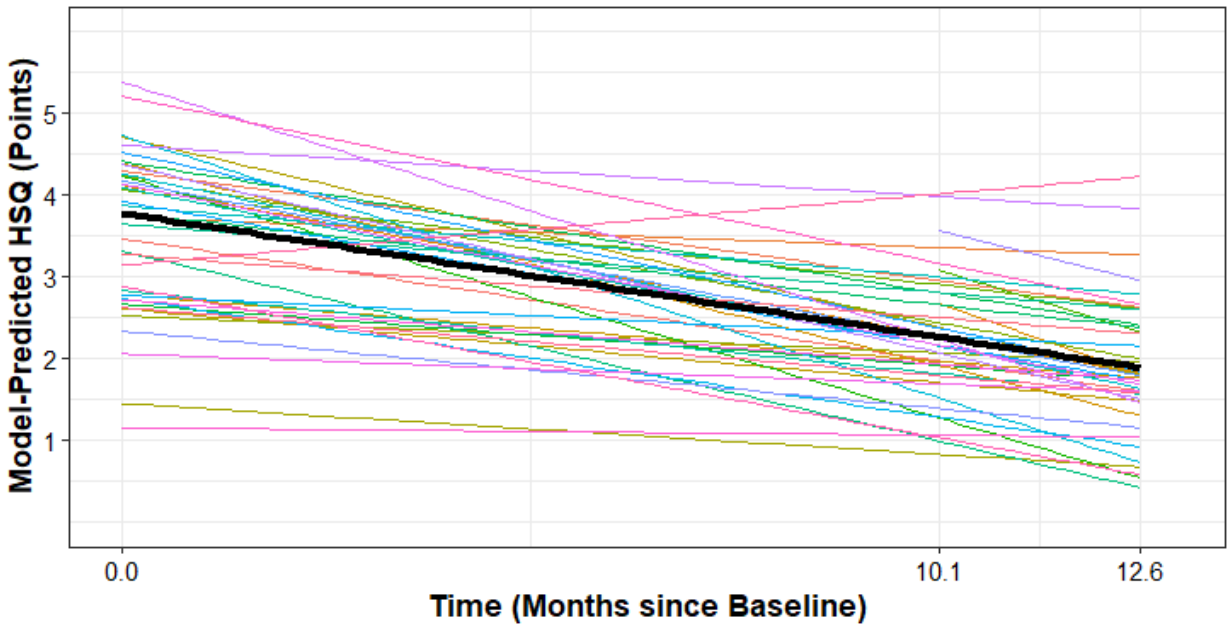
**Figure 1**

*Model-Implied Mean (Black) and Individual (Color) Trajectories, Paneled by Outcome*

**Panel A: ABC-I**




**Panel B: HSQ**

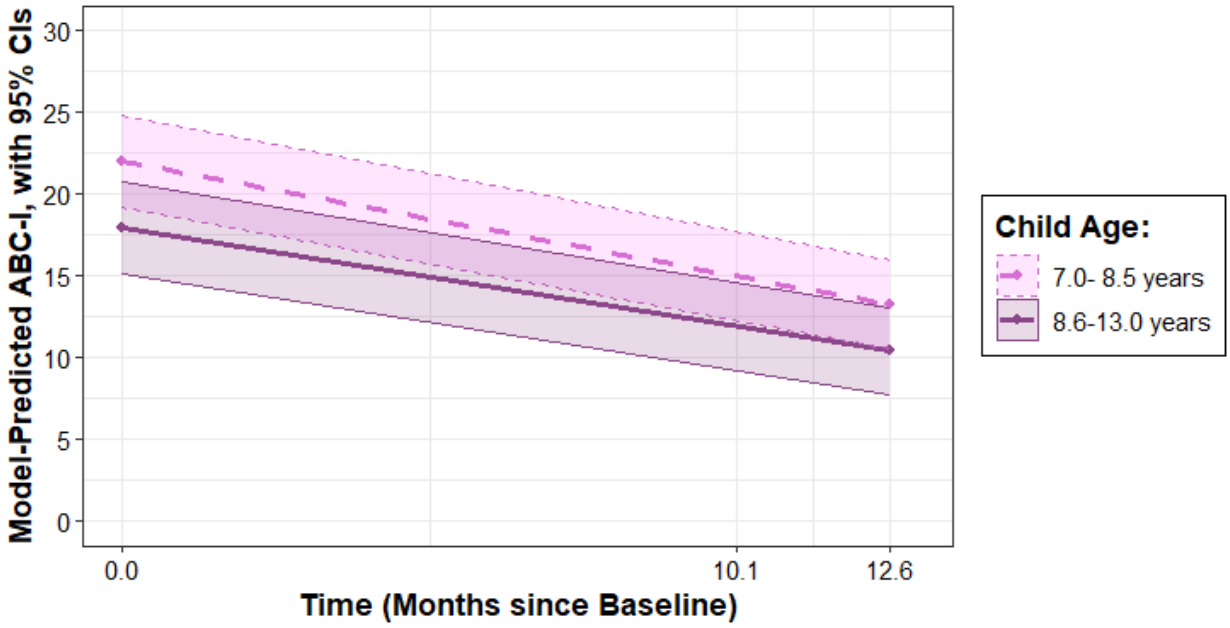



*Note.* $N = 48$ for ABC-I and $N = 45$ for HSQ.

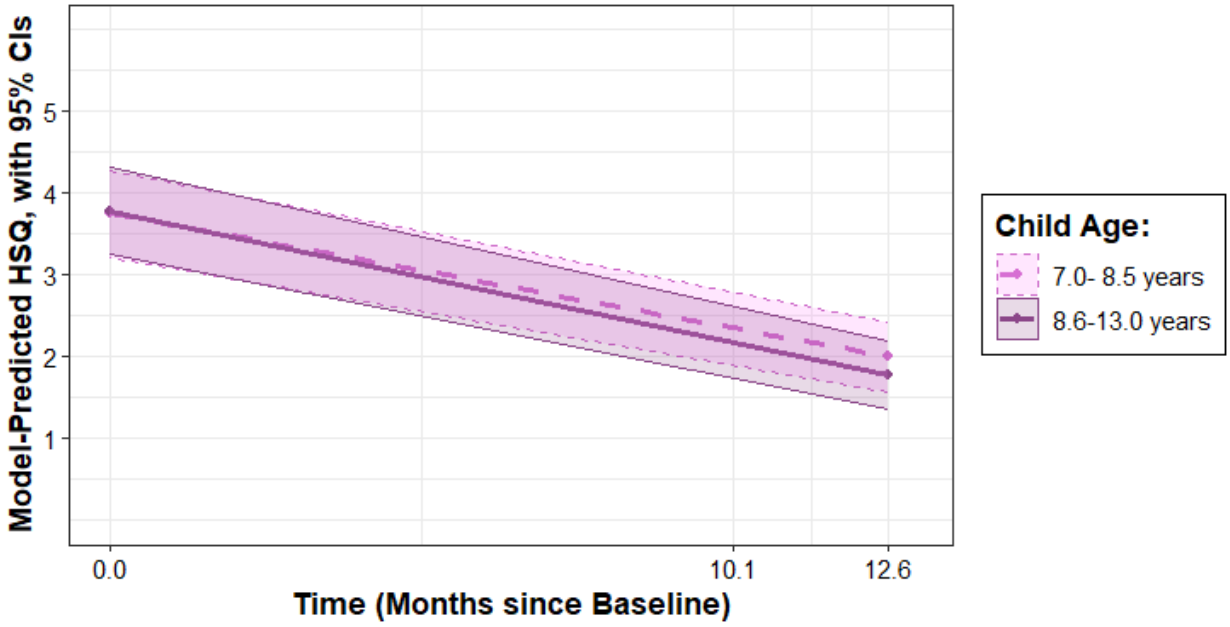
**Figure 2**

*Model-Implied Mean Trajectories by Child Age Status, Paneled by Outcome*

**Panel A: ABC-I**




**Panel B: HSQ**

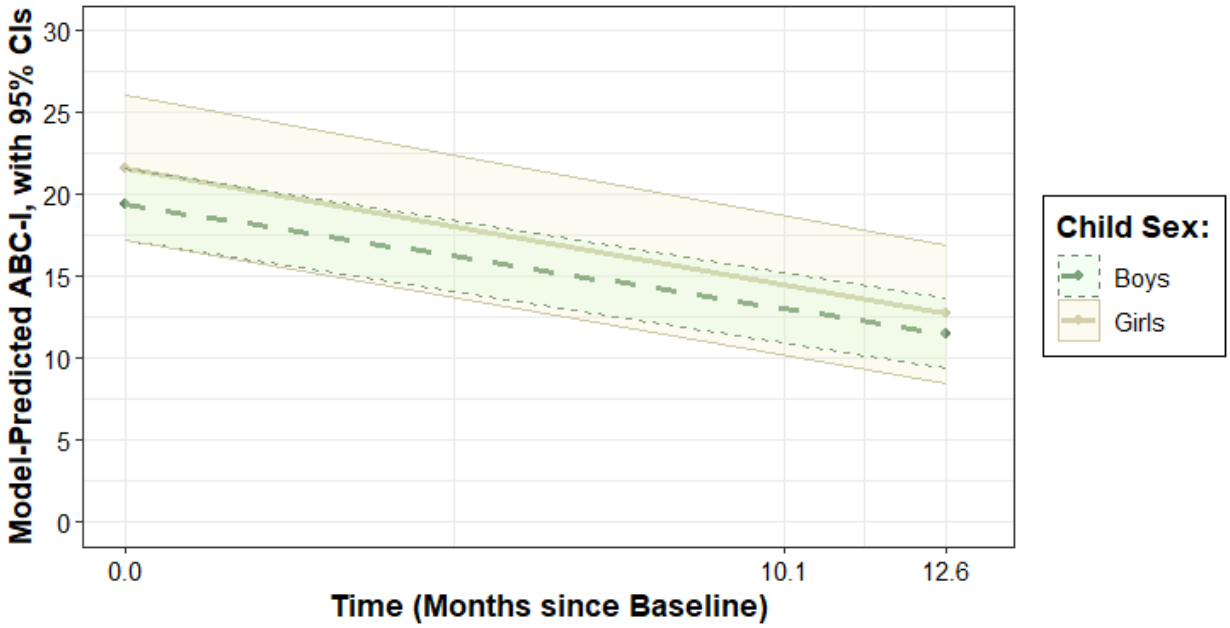



*Note.* $N = 48$ for ABC-I and $N = 45$ for HSQ. The only significant difference between older and younger ages was found at baseline for ABC-I.

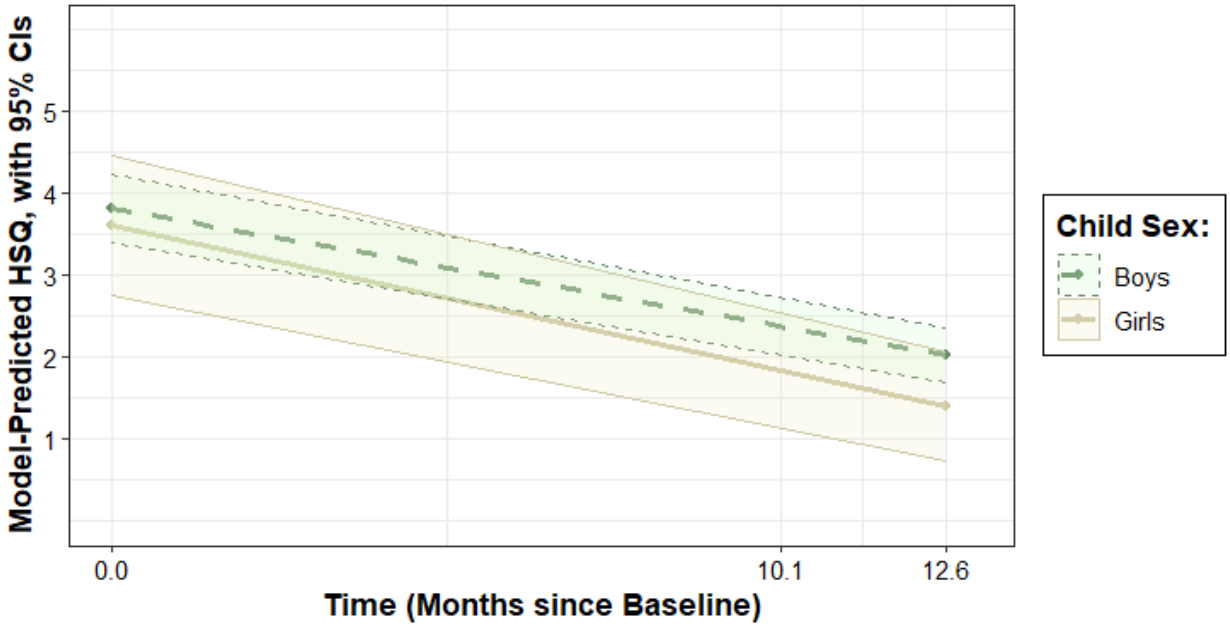
**Figure 3**

*Model-Implied Mean Trajectories by Child Sex Status, Paneled by Outcome*

**Panel A: ABC-I**




**Panel B: HSQ**

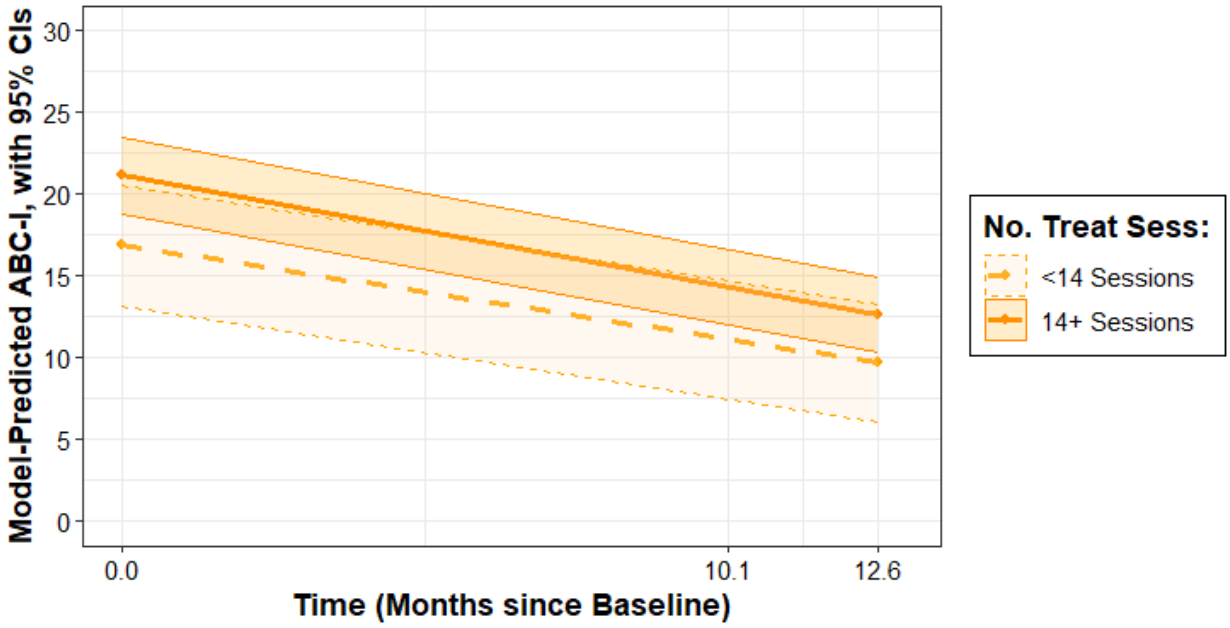



*Note.* $N = 48$ for ABC-I and $N = 45$ for HSQ. No significant differences between boys and girls at baseline or growth rates.

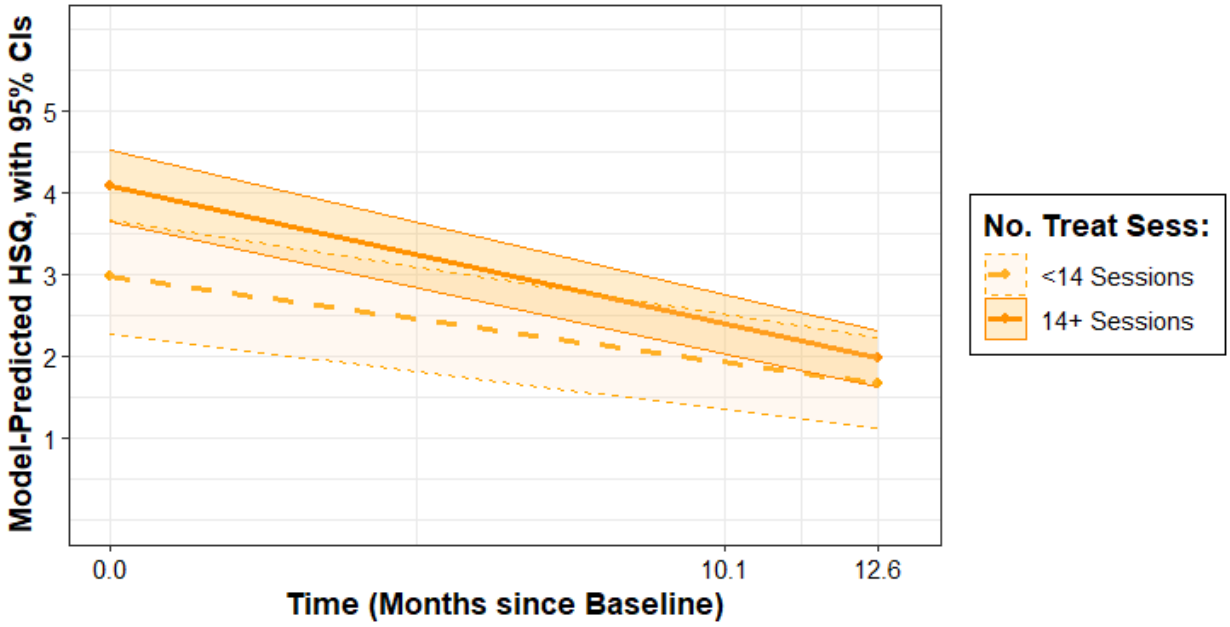
**Figure 4**

*Model-Implied Mean Trajectories by Therapy Treatment Sessions Status, Paneled by Outcome*

**Panel A: ABC-I**




**Panel B: HSQ**

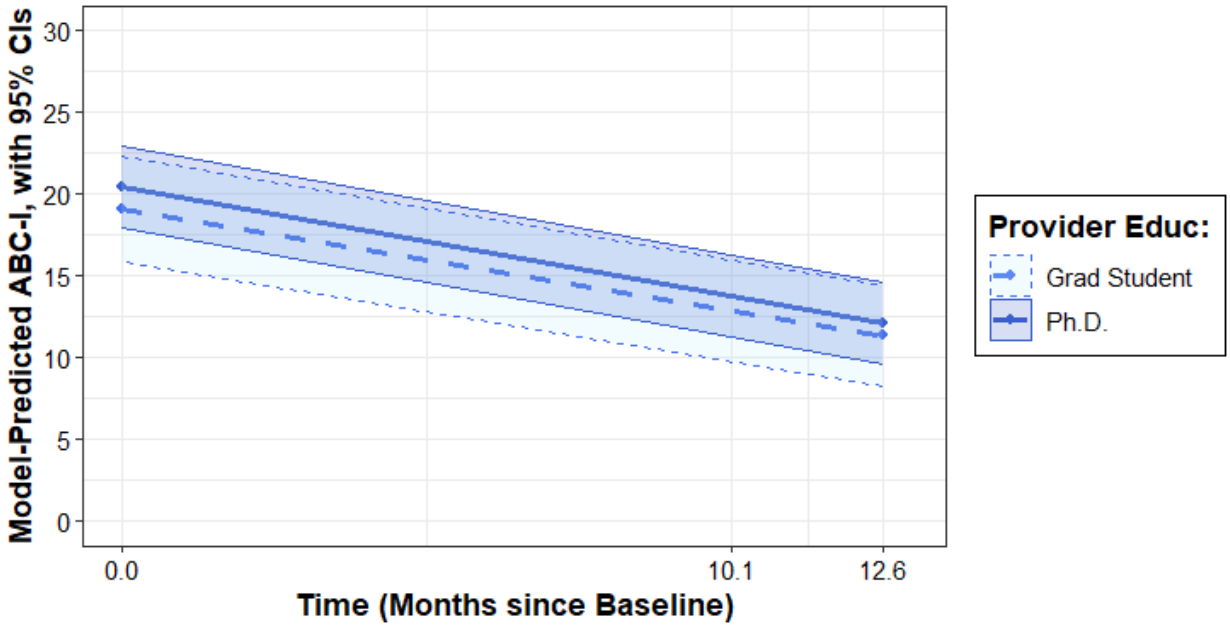



*Note.* $N = 48$ for ABC-I and $N = 45$ for HSQ. No significant differences between levels of therapy sessions at baseline or growth rates, although slight trend for higher baseline ($p = .058$) and greater decrease over time ($p = .120$) for children who participated in more sessions.

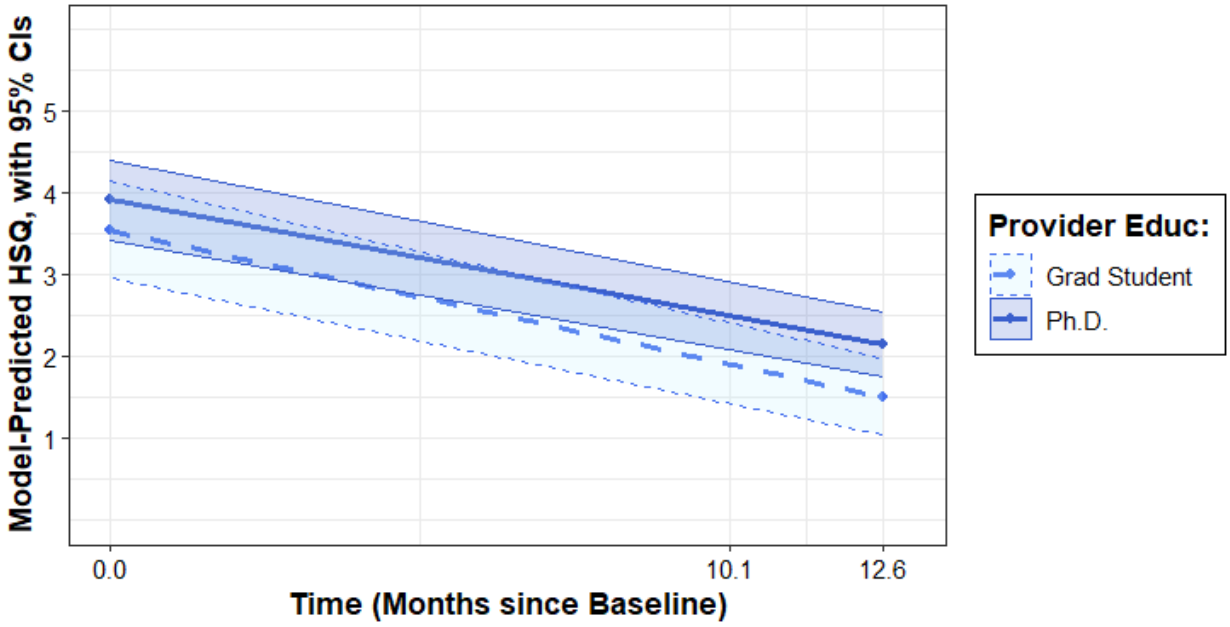
**Figure 5**

*Model-Implied Mean Trajectories by Therapy Provider Education Status, Paneled by Outcome*

**Panel A: ABC-I**




**Panel B: HSQ**




*Note.* $N = 48$ for ABC-I and $N = 45$ for HSQ. No significant differences between provider education levels at baseline or growth rates.