DOES EARLY INTERVENTION REDUCE THE RISK OF FUTURE EMOTIONAL AND BEHAVIORAL PROBLEMS IN CHILDREN WITH AUTISM SPECTRUM DISORDER

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Title of Study: DOES EARLY INTERVENTION REDUCE THE RISK OF FUTURE EMOTIONAL AND BEHAVIORAL PROBLEMS IN CHILDREN WITH AUTISM SPECTRUM DISORDER

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Abstract: **Objective:** Early Intensive Behavioral Intervention (EIBI) is the leading recommended treatment for children with Autism Spectrum Disorder (ASD). Children with ASD are at a substantially higher risk for developing symptoms associated with additional psychopathology compared to typically developing children. Currently, little is known about the utility of EIBI on symptoms of additional psychopathology. This study aimed to assess if EIBI would serve as a preventative treatment for the development of symptoms associated with additional psychopathology in a sample of young children with ASD. **Method:** This study was part of a larger multicenter, 2-year, two-arm randomized clinical trial (RCT) evaluating the effectiveness of Project DATA [Developmentally Appropriate Treatment for Autism] Toddler Model, an inclusive based EIBI for young child with ASD, as compared to Services as Usual (SAU). Fifty-one children between the ages of 20 and 35 months with an Autism Spectrum Disorder were assessed at pretreatment and approximately a year into service. Children's intellectual ability, level of ASD symptoms, and emotional and behavioral symptoms were assessed at both assessment points. **Results:** Groups were equivalent on all dependent variables at pretreatment. A one-way multivariate analysis of variance (MANOVA) did not reveal an overall treatment effect when groups were compared simultaneously across level of ASD symptoms, intellectual functioning, and emotional and behavior symptoms. Univariate analyses demonstrated that EIBI resulted in significantly higher child intellectual functioning compared to SAU at post. No significant differences for level of ASD symptoms or emotional or behavioral symptoms indicative of additional psychopathology were revealed between groups at post. **Conclusion:** EIBI appears to influence child intellectual functioning, but may not have an effect on other important areas of child well-being. The utility of EIBI for children with ASD and additional psychopathology is discussed. More research is needed to identify the impact EIBI has on children with ASD. Particular focus should be given to symptoms of additional psychopathology and emerging treatments for children with ASD.

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CHAPTER I

INTRODUCTION

The prevalence of Autism Spectrum Disorder (ASD) continues to rise at an alarming rate. Early identification of ASD has led to an increase in focus on the earliest intervention possible (Luyster et al., 2009). The toddler years are widely believed to be the best time to ameliorate and potentially prevent future and more debilitating symptoms of ASD (Ben Itzchak & Zachor, 2011; Dawson, 2008; Harris & Handleman, 2000; Wallace & Rogers, 2010). Substantial gains have been documented after young children receive Early Intensive Behavioral Intervention (EIBI; Reichow, 2012).

Up to 70% of individuals with ASD present with at least one additional psychological condition and approximately 40% present with two or more (APA, 2013; Kaat & Lecavalier, 2013; Simonoff, Pickles, Charman, Chandler, Loucas, & Baird, 2008). Emotional and behavioral symptoms indicative of additional psychopathology occur early in development, increase with age, and remain high through adolescence in those with ASD (Fodstad, Rojahn, & Matson, 2012; Konst & Matson, 2014; Maskey, Warnell, Parr, Couteur, & McConcachie, 2013; Midouhas, Yogaratnam, Flouri, & Charman, 2013; Siminoff et al., 2008). Emotional and behavioral problems impact school and residential placement, family stress, and use of antipsychotic medication (Lauderdale-Littin, Howell, & Blacher, 2013; McGill & Pynter, 2012; Storch et al., 2012).

Risk factors for the development of emotional and behavioral symptoms in children with ASD are mixed. The leading treatment for ASD is EIBI. It is widely believed that EIBI will reduce emotional and behavioral symptoms by improving child skill deficits associated with ASD or by specifically targeting challenging behavior within the comprehensive intervention. I am unaware of published research that assesses symptoms of additional psychopathology while children are receiving EIBI. Testing EIBI as a prevention model for future mental and behavioral health problems is greatly needed.

The purpose of this project was to assess if EIBI serves as a preventative treatment for the development of symptoms associated with additional psychopathology in young children with ASD. A review of research examining ASD, prevalence and risk factors associated with additional psychopathology and ASD, and EIBI is provided. Next, the current investigation is discussed followed by the results of the study. The scope and utility of EIBI for children with ASD is discussed along with ideas to maximize individual treatment protocols for children with multiple needs.

CHAPTER II

REVIEW OF THE LITERATURE

The prevalence of Autism Spectrum Disorder (ASD) continues to rise at an alarming rate. The Centers for Disease Control and Prevention (CDC, 2014) estimate that 1 in 68 children meet criteria for an ASD diagnosis. ASD presents with a range of complex social-emotional and behavioral difficulties and occurs four times as often in males than females (Kogan et al., 2007). It is neurodevelopmental in origin and thought to be present at birth (Lacroix, Guidetti, Roge, & Reilly, 2009; Li, Xue, Ellmore, Frye, & Wong, 2014; Niklasson, Rasmussen, Oskarsdottir, & Gillberg, 2009).

The presence of additional psychological conditions is common and has been consistently reported within research on ASD (Brereton, Tonge, & Einfeld, 2006; Gray, Keating, Taffe, Brereton, Einfeld, & Tonge, 2012). Individuals with ASD experience the full range of psychopathology with estimates as high as 70% of individuals presenting with at least one additional psychological condition and approximately 40% presenting with two or more (APA, 2013; Kaat & Lecavalier, 2013; Simonoff et al., 2008). LoVullo and Matson (2009) found the

prevalence of additional psychopathology occurs across the spectrum, occurring in individuals with either mild or severe symptoms of ASD. Emotional and behavioral symptoms indicative of additional psychopathology are present early in development (e.g., 12 months of age), increase

with age, and remain high through adolescence in those with ASD (Fodstad et al.,2012; Konst & Matson, 2014; Maskey et al., 2013; Midouhas et al., 2013; Siminoff et al., 2008).

Emotional and behavioral problems impact school placement and the ability for children to be included with typically developing peers (Lauderdale-Littin et al., 2013). The nature of these challenging behaviors may result in high-cost residential treatment and/or the use of antipsychotic medication (McGill & Poynter, 2012; Storch et al., 2012). Thus, the CDC has identified this as a public health challenge and called for early intervention to prevent later mental health and developmental disorders (Cordero et al., 2006).

Risk factors for the development of emotional and behavioral symptoms in children with ASD are mixed. Child intellectual functioning and language ability have not been consistently associated with additional psychopathology (Brereton et al., 2006; Simonoff et al., 2008). Some report that those with lower intellectual functioning have fewer symptoms of additional psychopathology (Murphy, Healy, & Leader, 2009; Witwer & Lecavalier, 2010) while others report more symptoms of externalizing behavior (McTiernan, Leader, Healy, & Mannion, 2011). Most report that lower intellectual functioning is associated with self-injurious behavior (McTiernan et al., 2011; Murphy et al., 2009).

Language ability is commonly associated with behavior problems in children with ASD (Park, Yelland, Taffe, & Gray, 2012). However, others have failed to find associations between language ability and behavior problems (Maskey et al., 2013) or have found that higher language abilities are associated with more symptoms of additional psychopathology (Witwer & Lecavalier, 2010). Additional risk factors for the development of emotional and behavioral problems that have been identified in the literature include family factors such as poverty, household chaos, low maternal warmth, and parent stress (Midouhas et al., 2013; Zaidman-Zait et al., 2014).

The advancing ability to identify children with ASD below the age of 3 has led to an increase in focus on the earliest intervention possible (Luyster et al., 2009). It is widely agreed

that early intervention is critical, as it is the best time to ameliorate and potentially prevent future and more debilitating symptoms associated ASD (Ben Itzchak & Zachor, 2011; Dawson, 2008; Harris & Handleman, 2000; Wallace & Rogers, 2010). Although a cure for ASD does not exist, substantial gains in some individuals have been documented after receiving Early Intensive Behavioral Intervention (EIBI) based on the principles of applied behavior analysis (Reichow, 2012). General consensus for effective models of EIBI has been overwhelmingly accepted within the field and are summarized below by Hayward, Gale, and Eikeseth (2009):

1) Treatments should be delivered in a natural setting, provided in high intensity, and include the entire family in treatment
2) Children's goals should be developmentally appropriate, individualized, and taught in an appropriate developmental and behavioral manner
3) Programs should imbed training in the implementation of advanced learning principles, incorporate skilled supervisors to oversee the intervention, and incorporate data and research into existing services

EIBI appears to be an efficacious intervention for toddlers with noted improvements in cognition, language, and adaptive behavior (Dawson et al., 2010; Zachor, Ben Itzchak, Rabinovich, & Lahat, 2007). More research is needed to assess whether EIBI models affect other important child and family outcomes, such as prevention of child emotional and behavioral symptoms.

Assessment of children with ASD is arduous. Multiple perspectives and ideally behavioral observations should be collected to best inform diagnostic evaluation and treatment recommendations (Holmbeck, Li, Schurman, Friedman, & Coakley, 2002; McClellan, Bresnahan, Echeverria, Knox, & Susser, 2009). Research suggests that parents and teachers agree that children with ASD are likely to meet criteria for an additional diagnosis (Kaat, Gadow, & Lecavalier, 2013; Kanne, Abbacchi, & Constantino, 2009). However, parent and teacher ratings differ. Teachers identify fewer psychiatric symptoms in children with ASD compared to parents

(Kanne et al, 2009). Kanne et al., (2009) suggests that the environmental context may be even more important to assess in children with ASD as behavior may differ depending on a number of factors, such as behavioral control, access to reinforcement, number of demands placed on the child, and/or caregiver burden.

Differential outcomes of those with ASD and additional psychopathology compared to those with ASD alone are hard to disentangle. The majority of children with ASD present with comorbidity (APA, 2013; Kaat & Lecavalier, 2013; Siminoff et al., 2008) and several studies fail to adequately assess for additional psychopathology or intellectual functioning. ASD increases the likelihood that individuals will need additional support to function in daily life (APA, 2013). The presence of additional psychopathology may create greater challenges above those caused by ASD alone and lead to poorer prognosis. There is a dearth of information on how comorbidity affects individuals with ASD and their families.

There is great interest in the prevention and treatment of emotional and behavioral problems in children with ASD (Cordero et al., 2006). However, there has not been a prevention study that solely targets children with ASD to my knowledge. Findings must be extrapolated from other populations which may reduce the meaningfulness of results within an ASD population.

For example, the conceptualization of how to prevent emotional and behavior symptoms in children with ASD tends to differ from that of children without developmental disabilities. Prevention programs designed for children who are typically developing tend to focus on parental behavior (e.g., parental warmth, appropriate discipline, positive reinforcement, differential attention) and the parent-child relationship (Posthumus, Raaijmakers, Maassen, Engeland, & Matthys, 2011). Meanwhile, programs for children with ASD tend to focus on children receiving comprehensive EIBI to ameliorate or reduce the symptoms of ASD. There appear to be two major assumptions in the field for preventing emotional and behavior symptoms in children with ASD. The first is that improving child skill acquisition will lead to a reduction in child behavior

problems and general improvement in emotional functioning. The second is that the comprehensiveness of EIBI will target and reduce symptoms of challenging behavior and emotional problems in children with ASD as part of treatment. Both assumptions need research to determine the accuracy.

The comprehensive and intensive nature of EIBI allows for many goals to be addressed concurrently. It is widely known that EIBI providers assist families with sleeping, eating, and toileting problems, as well as challenging behaviors (Williams, Matson, Beighley, Rieske, & Adams, 2014). Aspects of prevention are built into comprehensive EIBI. Strategies of Positive Behavior Support (PBS; Carr et al., 2002) are used. For instance, children may receive modified curricula and/or a schedule that maximizes preference and motivation. Reinforcement schedules may be implemented in the home and used in intervention to promote positive behavior and generalization of skills to the home. More research is needed to assess the emergence, course, and impact of emotional and behavioral symptoms in young children with ASD who receive EIBI. Increasing child abilities, reducing symptoms associated with ASD, building parental skill, and utilizing strategies from PBS are all likely to influence and improve emotional and behavioral outcomes in children.

Symptoms of additional psychopathology transcend the core deficits of ASD and are often considered a prime treatment need (Mannion & Leader, 2013; Pearson et al., 2006; Storch et al, 2012). Systematic research is needed to establish the utility of EIBI for non ASD symptoms. It is unclear if children who receive EIBI are less likely to develop additional psychopathology. I am unaware of published research assessing symptoms of additional psychopathology while children are receiving EIBI. Testing EIBI as a prevention model for future mental and behavioral health problems is greatly needed.

The current study assessed if EIBI would serve as a preventative treatment for the development of symptoms associated with additional psychopathology in a sample of young

children with ASD. The scope of EIBI for children with ASD is discussed along with ideas to maximize individual treatment protocols for children with multiple needs.

Hypotheses

EIBIs are designed to be comprehensive treatments that impact all areas of child development. To test whether EIBI produces meaningful differences in children with ASD, it was hypothesized that children with ASD who received EIBI would significantly differ from children with ASD who receive standard community early intervention services when simultaneously compared across a number of key outcomes (e.g., intellectual functioning, symptoms of ASD, emotional and behavioral symptoms).

A series of specific hypotheses followed to investigate the utility of EIBI. To replicate previous research on EIBI, the following were hypothesized:

1. Children who received EIBI would exhibit significantly higher intellectual functioning compared to children who received Services as Usual (SAU).
2. Children who received EIBI would have significantly fewer symptoms of ASD compared to children who received SAU.

Three additional hypotheses were made to investigate the utility of EIBI as a preventative treatment for symptoms associated with additional psychopathology.

3. Children who received EIBI would exhibit significantly fewer externalizing destructive behavior problems (e.g., symptoms of aggression and SIB) compared to children who received SAU.
4. Children who received EIBI would exhibit significantly fewer externalizing nondestructive behavior problems (e.g., symptoms of arousal and attention) compared to children who received SAU.
5. Children who received EIBI would exhibit significantly fewer internalizing behavior problems (e.g., fears and withdrawal) compared to children who received SAU.

CHAPTER III

METHODOLOGY

Participants

This study was part of a larger multicenter, 2-year, two-arm randomized clinical trial (RCT) evaluating the effectiveness of Project DATA [Developmentally Appropriate Treatment for Autism] Toddler Model, an inclusive-based EIBI for young children with ASD, as compared to Services as Usual (SAU; Part C and B of the Individuals with Disabilities Education Act and/or community based services at the discretion of the caregiver). Approval for the project was obtained through the University of Oklahoma Health Science Center and the University of Washington. Seventy children aged 20 to 35 months with ASD were recruited. Inclusion and exclusion criteria for the current study were that participants had to be enrolled in the larger project and have completed assessments points between 9 and 15 months from baseline. This resulted in a final sample of 51 of the original 70. Of the 51, 32 (63%) were assigned the EIBI group and 19 (37%) to SAU within the randomization of the original sample. Given the high frequency of assessment intervals (e.g., every three months), not all families were able to complete each assessment point. In these cases, preceding or following assessment points were selected. If participants had 9-month and 15-month assessment points, the latter were used within

analyses. Nine participants did not have 12-month assessment points. Five of nine had completed 15-month assessment points and four had 9-month assessment points that were used in the analyses.

Basic child demographic information is presented in table 1. The majority of the sample was male. The sample was diverse in terms of identified race, with the largest proportion Caucasian in both groups. Age at baseline ranged from 20 to 35 months with the mean age of 27 months in both groups. Average length of treatment exposure in both groups was 13 months. The majority of children lived with two parents (72%). Family income varied across each group from less than $25,000 to over $200,000. Thirty-one percent of the participants made $49,999 or less. Reported parental education was split equally within and between groups with half the sample reporting a bachelor's degree or higher. Maternal age ranged from 24 to 43 with the mean age 32.72 (24.91).

Materials

Informed Consent

Parents signed an informed consent, which provided information about the purpose, risks, and benefits of the study. Parents had the option to refuse to participate in the study if they wished.

Demographics Questionnaire

Parents were asked to complete a demographic/background questionnaire designed specifically for the study. The form included the participant's age, child's age, relationship to the child (i.e., biological parent, step-parent, or adopted parent), race/ethnicity, yearly household income, years of education completed, marital status, and type and quantity of treatment received for their child.

Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, DiLavore, & Risi, 2002)

The ADOS was used to classify the sample with ASD and to evaluate baseline equivalence of ASD symptoms. The ADOS is a clinician-administered behavioral observation measure. It is widely accepted as the gold-standard diagnostic tool for assessing the presence of ASD. The validity and reliability of the ADOS has been widely demonstrated across children of all ages and developmental level (Gray, Tonge, & Sweeney, 2008). The diagnostic algorithm from the manual was used to determine whether an individual met the cutoff criteria for ASD. Module 1 and Module 2 were used based on the language ability of the participant. Higher scores indicate more abnormality. Cronbach's alpha for the diagnostic algorithm is moderate to high (Lord et al., 2002). Sensitivity and specificity range from 1.00 - .85 and 1.00 - .89 (Gray et al., 2008; Lord et al., 2002).

Brief Infant-Toddler Social and Emotional Assessment (BITSEA; Briggs-Gowan & Carter, 2006)

The BITSEA was used in the current study to evaluate the level of emotional and behavior problems at baseline in the sample. The BITSEA is a screening measure of socio-emotional problems and competence delays in children between 12-36 months of age. The BITSEA is a 42-item parent-report. Items are scored on a three-point likert scale (e.g., 0 = Not True/Rarely; 1 = Somewhat True/Sometimes; 2 = Very True/Often). The BITSEA consists of two scales, the Problem Behavior Scale (31 items with 9 ASD specific items) and the Competency Scale (11 items with 8 ASD specific items). Higher scores on the Problem Scale indicate a greater level of emotional and behavioral problems. Lower scores on the Competency Scale indicate a greater level of developmental problems. Children with ASD have lower scores on the Competency Scale than other children (Karabekiroglu, Briggs-Gowan, Carter, Rodopman-Arman, & Akbasa, 2010). The internal consistency for Problem and Competency scales was moderately acceptable in this sample, Cronbach's alpha = .84 and .72, respectively. Intraclass Correlations for test-test reliability are good, (ICC = .87) and agreement between parents were high (ICC = .68) (Briggs-Gowan, Carter, Irwin, Wachtel, Domenic, & Cicchetti, 2004). The BITSEA has also been used as a screening measure for ASD with sensitivity and specificity of

.90 (Carter et al., 2005). The BITSEA Problem Scale is highly correlated with internalizing and externalizing behavior problems (Karabekiroglu et al., 2010). Karabekiroglu et al., (2010) reported significantly higher scores in a group of children with disruptive behavior disorders, indicating the ability of the BITSEA to be used as a screening measure for challenging behavior.

Mullen Scales of Early Learning (MSEL; Mullen, 1995)

The MSEL was used in the current study to assess the developmental and intellectual ability of participants. The MSEL is a standardized clinician-administered assessment of child ability. It consists of five scales: Gross Motor, Fine Motor, Visual Reception, Receptive Language, and Expressive Language. The current study used a raw score composite derived from summing individual item scores from the Fine Motor, Visual Reception, Receptive Language, and Expressive Language scales. Higher scores indicate greater developmental ability. The Mullen is normed for children 2 days to 69 months of age. The original standardization included 1,849 children. Test-retest reliability was stable ranging from .82 to .99.

Pervasive Developmental Disorder Behavior Inventory (PDD-BI; Cohen & Sudhalter, 2005)

The PDD-BI was used to assess the level of ASD symptoms and emotional and behavior problems in the participants. The PDDBI is a 188-item parent-report measure for children 2 to 12 years of age. It was developed to assess treatment progress in children with ASD. The PDDBI is based on age norms for children with ASD. The original normed sample consisted of 369 children with ASD. Item responses are on a four-point likert scale (e.g., 0 = Does not show behavior, 3 = Usually/Typically shows behavior) with higher scores indicating greater symptoms. The current study utilized a raw score composite (e.g., PDDBI ASD) derived from the Repetitive, Ritualistic, and Pragmatic Problems Scale as a measure of ASD symptom severity; the raw score of the Arouse Scale as a measure of hyperactivity; the raw score of the Fear Scale as a measure of internalizing problems; and the raw score of the Aggression Scale as a measure of externalizing behavior problems. Raw scores were used to increase sensitivity and to test between-group differences. Higher scores indicate greater level of symptom endorsement. Test–retest reliability

is high (Cohen, Schmidt-Lackner, Romanczyk, & Sudhalter, 2003). Internal consistency on each scale is adequate to good (.73 -.97; Cohen & Sudhalter, 2005). The internal consistency in this sample was good, Cronbach's alphas ranged from = .88 to .91.

Procedures

Experimental Design

This study was part of a two-arm randomized clinical trial (RCT) evaluating the effectiveness of Project DATA [Developmentally Appropriate Treatment for Autism] Toddler Model, an inclusive-based EIBI for young children with ASD, as compared to Services as Usual (SAU; Part C and B of the Individuals with Disabilities Education Act and/or community based services at the discretion of the caregiver). Project DATA Toddler Model is an empirically supported program designed for children 1 to 5 years old and includes all of the widely accepted components of effective EIBI programs outlined by Hayward et al., (2009). Further details are described below. Families were contacted for interest in participating and consented to participate in the research study. Families were scheduled to conduct a baseline assessment consisting of the ADOS, BITSEA, and the MSEL after they consented for treatment. Caregivers were compensated for their time with a $25 dollar WalMart card for each assessment point. Children were assigned to treatment condition and reassessment occurred every three months on selected measures including the MSEL. The BITSEA was administered once every three months until a child turned three. The PDDBI was administered after a child's third birthday and continued every three months over the course of the study. The current project used baseline assessment and data points collected 9 to 15 months after baseline for all analyses.

Treatments

Project DATA (Developmentally Appropriate Treatment for Autism) for Toddlers

Project DATA has been described elsewhere (see Boulware, Schwartz, Sandall, & McBride, 2006; Schwartz, Sandall, McBride, & Boulware, 2004). Project DATA for toddlers is an inclusive-based EIBI program designed for young children (i.e., 1-3 years) with an ASD.

Project DATA for toddlers centers around five major components: 1. High-Quality, Inclusive Early Childhood Program; 2. Extended Instructional Time; 3. Increased Technical and Social Support for Families; 4. Coordination of Family Negotiated Services; and 5. Systematic Transition planning.

Treatment consists of 22 hours of intervention a week. Children take part in a fully inclusive classroom with typically developing peers six hours a week or two days a week. Children take part in nine hours of one-to-one instruction that includes aspects of typical classroom routines that are completed on peer group days (e.g., circle time, snack, recess, arts and crafts) as well as directed instruction on selected programs (e.g., discrete trial training). Every week parents receive a two-hour home visit. Home visits provide an opportunity for caregivers to learn the skills used to treat their child. The home visit is multipurpose including the promotion of generalization of child target skills, providing family support, assisting with transitions (e.g., start of kindergarten), and assisting with other aspects of child development (e.g., toilet training; outings). Parents conduct five hours of intervention (e.g., incidental teaching, discrete trial training) with their children each week in order to maximize the generalization, maintenance, and practice of skills. Parents also attend six, one-hour trainings on selected topics that involve aspects of ASD (e.g., creating an Individualized Education Program, Functional Behavior Analysis, Feeding issues in ASD). Incidental teaching and aspects of PBS (e.g., preference, reinforcement schedules, daily activities schedules) are used throughout the intervention to support child growth and maximize positive behavior.

Services as Usual

Children in the SAU condition receive services that are offered in their community and their state's early intervention program (Part C). Families are given an Individual Family Service Plan (IFSP). Part C typically involves a range of service from 1 to 8 hours a month. Services are provided by speech and language pathologists, occupational therapists, or child development

specialists. Caregivers and the therapist develop mutual goals for the child. Therapists teach the caregiver to implement skills to reach the goals on the IFSP.

Outliers and Excluded Data. Each of the independent and dependent variables were screened for univariate outliers, defined as scores of greater than three standard deviations above or below the group mean. This procedure revealed no outliers. Two participants did not have post MSEL scores and were excluded from univariate analyses using the MSEL.

CHAPTER IV

RESULTS

Mean baseline data is presented in Table 2. Group equivalence testing at baseline on measures of ASD symptoms, emotional and behavior problems, and intelligence were conducted. Two-tailed, independent samples *t*-tests for ADOS Module 1 (n=45), BITSEA Problem Behavior Scale, BITSEA Competency Scale, and MSEL raw score composite all failed to reach significance. Statistical analysis of ADOS Module 2 were not conducted due to only six participants receiving the module. Visual inspection revealed between-group equivalence. Thus, groups were equivalent prior to intervention.

A one-way multivariate analysis of variance (MANOVA) was conducted to test the hypothesis that there would be an overall treatment effect when groups were compared simultaneously across level of ASD symptoms, intellectual functioning, and emotional and behavior symptoms. The level of ASD symptoms was obtained from the PDDBI ASD scale, intellectual functioning was obtained from the raw score composite on the MSEL, and the emotional and behavioral symptoms were obtained separately from the Arouse, Aggression, and Fears subscale raw scores on the PDDBI. Prior to conducting the MANOVA, a series of Pearson product-moment correlations were performed between all of the dependent variables in order to

test the MANOVA assumption that the dependent variables would be correlated with each other in the moderate range (i.e., .20 - .60; Meyers, Gampst, & Guarino, 2006).

Table 3 presents the meaningful pattern of correlations, suggesting the appropriateness of a MANOVA. Box's Test of Equality of Variance was not significant (p = .299). Thus, the covariance matrices between the groups were assumed to be equal for the purposes of the MANOVA. Results from the MANOVA demonstrated a non-significant multivariate effect, Hotelling's $T(5,43) = 1.254$, $p = .301$, $\eta^2 = 1.27$. These results suggest that EIBI does not result in significantly better outcome compared to SAU when simultaneously compared across level of ASD symptoms, intellectual functioning, and emotional and behavior symptoms.

Although the MANOVA was not significant, exploratory univariate analyses were conducted to test previous findings reported from EIBI along with novel assessment of the emotional and behavioural symptoms for those receiving EIBI and SAU. If the MANOVA were significant, the alpha level for a set of t tests on the dependent variables would have been controlled (Hummel & Sligo, 1971). Thus, the following analyses are considered to be more liberal tests with higher probability of committing a type 1 error as they are strictly performed for exploratory purposes.

Table 4 summarizes the results of the following univariate analyses. The first two analyses were run to replicate previous research on EIBI. It was predicted that children who received EIBI would exhibit significantly higher intellectual functioning compared to children who received SAU. A one-tailed independent-samples t-test was conducted to compare the level of intelligence from the post MSEL in children in the EIBI and SAU conditions. As hypothesized, there was a statistically significant difference in post MSEL scores for EIBI (M = 112.32, SD = 31.53) and SAU (M = 93.78, SD = 28.48) conditions; $t(47) = 2.06$, $p = .023$, one-tailed, $d = .617$. These results suggest that children who receive EIBI achieve higher intellectual functioning compared to children in SAU.

It was predicted that children in the EIBI condition would have fewer ASD symptoms compared to children in the SAU condition. A one-tailed independent-samples *t*-test was conducted comparing PDDBI ASD scores in children in the EIBI and SAU conditions. There was not a statistically significant difference in scores for EIBI ($M = 58.19$, $SD = 25.69$) and SAU ($M = 58.63$, $SD = 30.31$) conditions; $t(49) = .06$, $p = .478$, one-tailed, $d = .016$. These results suggest that EIBI and SAU perform equally at targeting level of ASD symptoms.

Three additional hypotheses were analyzed to investigate the utility of EIBI as a preventative treatment for symptoms associated with additional psychopathology. Specifically, it was predicted that children who received EIBI would exhibit significantly fewer externalizing destructive behavior problems (e.g., symptoms of aggression and SIB), externalizing nondestructive behavior problems (e.g., symptoms of arousal and attention), and internalizing behavior problems (e.g., fears and withdrawal) compared to children who received SAU. Analyses utilized the following PDDBI raw score scales: Aggression, Arouse, and Fears. Results are reported in table 4. No significant differences were found between children in the EIBI and SAU condition suggesting that EIBI and SAU perform equally in impacting symptoms associated with additional psychopathology. Thus, the hypotheses that EIBI would serve as a preventative treatment for emotional and behavior symptoms associated with additional psychopathology was not supported.

CHAPTER V

DISCUSSION

The current study assessed the relative efficacy of EIBI as a preventative treatment for the development of symptoms associated with additional psychopathology in a sample of young children with ASD. Children either received EIBI or community SAU. Prior to treatment, children in each group were comparable on measures of intellectual functioning, symptoms of ASD, and emotional and behavioral symptoms. Children were reassessed approximately one year later on the same variables to determine whether the EIBI group was superior to SAU. Children who received EIBI and children who received SAU were not distinguishable from each other when assessed across all outcome variables simultaneously. This suggests that children receiving EIBI and children receiving SAU exhibited similar levels on at least some child outcomes.

To explore the utility of EIBI, specific outcomes were examined individually to determine if children who received EIBI were superior to children who received SAU after a year of treatment. As expected, children receiving EIBI had significantly higher levels of intellectual functioning compared to children receiving SAU. However, children receiving EIBI and children receiving SAU did not differ on levels of ASD symptoms and emotional and behavioral symptoms.

This study adds to the overwhelming support that children who receive EIBI obtain higher scores on intellectual functioning compared to children who receive SAU. Specifically,

the current study is in line with Reichows's (2012) review of five recent meta-analyses on EIBI which produced mean medium to large effect sizes on measures of intellectual functioning. Improving intellect is important as it impacts educational placement, long-term functioning, and communication abilities (White, Scahill, Klin, Koenig, & Volkmar, 2007).

Previous research supports that EIBI improves cognition, language, and adaptive behavior in young children (Dawson et al., 2010; Zachor et al., 2007). Few studies have assessed ASD-specific symptoms, and those that do have often failed to show change (Dawson et al., 2010). Children in both groups scored similarly both before and after treatment on two separate measures of ASD symptoms. Therefore, the most plausible interpretation based on previous research is that EIBI and SAU do not result in ASD symptom change. Two alternative conclusions are also possible. One is that children in both groups had reduced ASD symptoms. The second, though potentially less likely is that ASD symptoms increased in both groups. Unfortunately, the measures used to assess ASD symptoms were different at pre and post, so it is not possible to analyze symptom change in the current project.

Improvement in language and increased cognitive ability may improve how individuals with ASD relate with others. However, there is greater need to focus on core and underlying symptoms of ASD that may not be directly targeted within existing EIBI (Kasari, Freeman, Paparella, Wong, & Gulsrud, 2005). Researchers have begun to develop focused treatment components specifically targeting core ASD symptoms within broader comprehensive EIBI (Kasari, Freeman, & Paprella 2006). My study supports that strategies to target ASD symptoms are needed to influence ASD-specific symptoms above those accounted for by change within EIBI and SAU.

To my knowledge, this is the first study to assess the relative efficacy of a comprehensive EIBI as a preventative treatment for the development of symptoms associated with additional psychopathology in a sample of young children with ASD. Similar to the discussion on ASD symptoms, children who received EIBI and SAU had virtually identical risk for emotional and

behavior symptoms that are indicative of additional psychopathology following a year of treatment. It is possible that children in both groups had decreased risk. Unfortunately, testing change in risk is not possible in the current project due to difference in pre- and post-measurement tools.

Previous research has found that the majority of those with ASD present with additional psychopathology (Simonoff et al., 2008). Research supports that emerging psychopathology can be distinguished as early as 12 months of age in children with ASD (Fodstad et al., 2012). This is important as few studies have assessed for additional psychopathology in young children. Early emergence indicates that had EIBI had an impact on emotional and behavioral symptoms that was different than SAU, it would have been plausible to measure an effect. However, it may also be true that children with ASD are at increased risk for the development of symptoms of additional psychopathology as they age (Fodstad et al, 2012). More research is warranted to determine whether EIBI targets symptoms or prevents the later occurrence of symptoms associated with additional psychopathology. Similar to targeting ASD-specific treatments within broader based EIBI, other treatment components may be needed to prevent symptoms associated with additional psychopathology.

Strengths and Limitations

There are several noted strengths of the current study. First, the gold-standard measurement tool for assessing ASD in young children was utilized for children to qualify for the study. Further, the use of randomized assignment greatly strengthened the methodology and conclusions that could be drawn from the data. The inclusion of pre- and post-treatment measures greatly enhanced the conclusions that could be drawn. Finally, it is noted that outcomes were assessed a year into the larger study making it is plausible to demonstrate a treatment effect at a year. More time and/or treatment may be needed to fully realize the benefits of EIBI on

children's long-term functioning, including symptoms associated with additional psychopathology.

Despite the relative strengths, the study also has a number of noted weaknesses that could be improved in the future. First, pre- and post-treatment measures differed for symptoms associated with ASD and emotional and behavioral problems. It is noted that only parent-report was collected at post-treatment. It would be informative in the future to have a mix of parent and teacher ratings, as well as behavioral observations at pre- and post-intervention that could potentially identify changes in children over time. Finally, as is common in large and timely research interventions, one must comment on the post-treatment differences between the EIBI and SAU groups. Several participants were excluded from the present study due to the quantity of missing data in 9- to 15-month assessment periods. The SAU group had a higher exclusion rate than the EIBI group. It is not possible to account for the differential group size, though speculation could provide insight for why families may have been more likely to have missing data later in the study. Families receiving SAU may have been less motivated to participate in data collection as they were assigned to receive community treatment which was significantly different in intensity and quantity of service from the group receiving EIBI. Additionally, data were collected in three-month intervals which increased parental demand. Individuals in the experimental group were actively attending onsite programs whereas families in the SAU condition had to break routine to come in for assessment. Future studies should consider retention strategies when having frequent assessment periods and when families are receiving starkly different interventions.

Clinical Implications and Directions for Future Research

The leading treatment for ASD is EIBI. EIBI is known to have a profound positive impact on children's developmental trajectory (Reichow, 2012). Despite the overwhelming evidence that EIBI improves child development, it is still not widely available in many

communities. Effective early intervention is needed to ensure children can reach their maximum potential. Supporting widespread implementation of EIBI has the potential to reduce later costs by providing individuals skills that will reduce need for living assistance in adulthood.

Although substantial strides have been made, a cure for ASD still does not exist. It is important to understand the scope and utility of EIBI to best serve children's overall well-being. While children may have stark improvements in certain areas as a result of EIBI, symptoms of psychopathology appear unchanged in comparison to children receiving SAU. Children and families should be routinely screened and referred to appropriate providers should additional psychopathology emerge. Families may also benefit from certain preventative services.

Research in the treatment of ASD is at a pivotal point. Experts have indicated that a singular treatment modality is inadequate for this population (National Research Council, NRC, 2001; Schreibman, 2000). Systematic research is needed to examine the heterogeneity of the spectrum in combination with treatment services. Collaboration among families and professionals working with those impacted by ASD has led to a call for synergistic treatments based on individual factors (Bregman, 2012; Schreibman, Dufek, & Cunningham, 2011). Questions of when to implement certain treatment, to whom to deliver certain treatments, and guidelines for individualizing treatment protocols or *packages* (i.e., multiple treatments provided sequentially or in combination) have been raised within the literature (Schreibman et al., 2011; Stahmer, Shreibman, & Cunningham, 2011). Questions that address optimal frequency and intensity of services and individual response differences that may mediate or moderate treatment are greatly needed (Granpeesheh, Dixon, Tarbox, Kaplan, & Wilke, 2009; Rogers & Vismara, 2008; Wolery & Garfinkle, 2002).

Technological advancements in understanding individual treatment responses are making headway (Stahmer et al., 2011). For instance, brief, targeted interventions such as Joint Attention Symbolic Play Engagement and Regulation (JASPER) have been applied within larger treatment programs and produced large effects on social symptoms associated with ASD.

Further, children with ASD and additional psychopathology have responded positively to short-term psychotherapy originally designed for typically developing children (Bearss, Johnson, Handen, Smith, & Scahill, 2013; Whittingham, Sofronoff, Sheffield, & Sanders, 2014). Particular focus on family factors such as poverty, household chaos, low maternal warmth, and parent stress are needed given the reciprocal nature between parental factors and child behavior within those with ASD (Midouhas et al., 2013; Shawler & Sullivan, in press; Zaidman-Zait et al., 2014). Research would benefit from understanding how EIBI and treatments designed for additional psychopathology affect one another.

Conclusion

It is hoped the current study has contributed to gaps within the treatment literature for children with ASD. I hope that it will serve as a stepping-stone for future research in this area. Overall, the study supported existing literature, demonstrating that EIBI improves children's development associated with intellectual functioning. The current study highlights the importance of assessing the utility of EIBI. While individual states are continually increasing mandates and funding for EIBI, it is vital to understand what impacts such treatments will have on child well-being. This study highlights the importance of routine assessment of additional psychopathology early in life and referral to specialized services in addition to EIBI if individuals present with additional psychopathology.

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APPENDICES

APPENDIX A

COMPLETE LITERATURE REVIEW

Autism Spectrum Disorder

The prevalence of Autism Spectrum Disorder (ASD) continues to rise at an alarming rate. The Centers for Disease Control and Prevention (CDC, 2014) now estimate that 1 in 68 children meet criteria for an ASD diagnosis. ASD presents with a range of complex social-emotional and behavioral difficulties and occurs four times as often in males than females (Kogan et al., 2009). It is neurodevelopmental in origin and thought to be present at birth (Lacroix, Guidetti, Roge, & Reilly, 2009; Li, Xue, Ellmore, Frye, & Wong, 2014; Niklasson, Rasmussen, Oskarsdottir, & Gillberg, 2009).

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) defines ASD as having two broad symptom clusters (American Psychiatric Association, 2013). The first involves deficits in social interaction and communication, and the second involves restricted or repetitive patterns of behavior, interests, or activities (American Psychiatric Association, 2013). Deficits in social interaction and communication include symptoms such as problems with social reciprocity, difficulties developing and understanding social relationships, and poor integration of nonverbal and verbal communication (APA, 2013). Symptoms of restricted or repetitive patterns of behavior, interests, or activities include oral, motor, and behavioral stereotypy (e.g., echolalia, hand flapping, lining up objects); ritualized and inflexible behaviors and routines; fixated interests; and abnormal reaction to sensory input or tactile information in the environment (APA, 2013).

Individuals must have persistent deficits in social communication and interaction across contexts and two or more symptoms within the restricted or repetitive behavior domain in order to meet criteria for an ASD diagnosis (APA, 2013). Additionally, the symptoms must be present in early development but may not be apparent until social demands exceed an individual's

capabilities (APA, 2013). In addition to the core deficits of ASD, approximately 50 to 70% of individuals with an ASD also have a co-occurring intellectual disability (ID) that should be documented at the time of diagnosis (APA, 2013; Fombonne, 2003, 2005; LaMalfa, Lassi, Bertelli, Salvini, & Placidi, 2004; Matson & Shoemaker, 2009).

Recognition and Standard Treatment of ASD

The age at which ASD is recognized and diagnosed continues to improve (Zwaigenbaum, Bryson, & Garon, 2013). Advances in diagnostic techniques have allowed identification of ASD as early as 12 to 18 months of age (Kleinman et al., 2008; Kuban et al., 2009; Matson et al., 2009a; Matson et al., 2009b). The American Academy of Pediatrics recommends the regular screening for ASD at 18 months (Johnson & Myers, 2007). The advancing ability to identify children with ASD below the age of 3 has led to an increase in focus on the earliest intervention possible (Luyster et al., 2009).

Early intervention is critical as it is widely agreed that it is the best time to ameliorate and potentially prevent future and more debilitating symptoms of ASD (Ben Itzchak & Zachor, 2011; Dawson, 2008; Harris & Handleman, 2000; Wallace & Rogers, 2010). Additionally, early intervention may also reduce the susceptibility of future emotional and behavioral symptoms exhibited by many with ASD. The Autism Speaks formed the Toddler Treatment Network in 2007 and are now starting to publish their work (Siller et al., 2014)

Early Intensive Behavioral Intervention. A cure for ASD does not exist. However, substantial gains in some individuals have been documented after receiving Early Intensive Behavioral Intervention (EIBI) based on the principles of applied behavior analysis (Reichow, 2012). A crossroads for intervention research began after Lovaas (1987) documented 49% of his participants who received EIBI were mainstreamed into elementary school classrooms and had large improvement in intelligence scores. A replication of Lovaas' original work has been conducted with similar and promising results (Smith, Groen, & Wynn, 2000). Since this time,

EIBI has continued to lead to improvements in the lives of younger and younger children with ASD.

Reichow (2012) reviewed five recent meta-analyses on EIBI for children with ASD. He calculated the weighted mean effect size for IQ and adaptive behavior to range from g = .38-1.19 and g = .30-1.09 respectively. Collectively, several tested and efficacious EIBI models have been developed and improve impairments associated with ASD (for review and prior meta-analyses, see Matson & Konst, 2013; Odom, Boyd, Hall, & Hume, 2010; Peters-Scheffer, Didden, Korzilius, & Sturmey, 2011; Warren, McPheeters, Sathe, Foss-Feig, Glasser, & Veenstra-VanderWeele, 2011). Rogers and Vismara (2008) discussed the growing number of EIBI treatments and determined that several "brand name" therapies exist. Although different "brands" exist, a general consensus for effective models of EIBI has been overwhelmingly accepted within the field. Hayward, Gale, and Eikeseth (2009) summarize these widely accepted components of effective EIBI programs. They include:

4) Treatments should be delivered in a natural setting, provided in high intensity, and include the entire family in treatment
5) Children's goals should be developmentally appropriate, individualized, and taught in an appropriate developmental and behavioral manner
6) Programs should imbed training in the implementation of advanced learning principles, incorporate skilled supervisors to oversee the intervention, and incorporate data and research into existing services

Treatment for the youngest children with ASD continues to advance. Schertz, Reichow, Tan, Vaiouli, and Yildirim (2012) identified 20 peer-reviewed experimental studies on ASD largely occurring before the third year of life. They identified six group comparison studies and 14 single-case design studies and evaluated the research rigor and future directions for research. The review concluded that the studies produced small to large effect sizes on the outcomes in question. The studies to date often lack replication, fail to use common measures across studies,

and need improvement on defining and distinguishing treatment practices. Despite the need for improvement, Schertz et al., (2012) conclude that the majority of studies evaluated used strong to acceptable levels of research rigor. For example, Dawson et al., (2010) conducted a randomized control trial (RCT) of the Early Start Denver Model (ESDM) with 48 toddlers (18-30 months of age at entry) with ASD. In a two-year treatment span, the ESDM group demonstrated a 17.6 point improvement in intelligence scores compared to only a 7 point increase from baseline in the control group. Further, adaptive behavior trajectories for the ESDM group were more similar to typically developing children as compared to the control group whose adaptive behavior scores continued to decline over time (Dawson et al., 2010). This was the first RCT to use a comprehensive EIBI for infants and toddlers with ASD. The findings were consistent with the overview of the five meta-analyses that have been conducted on EIBI in older children (Reichow, 2012).

There are other comprehensive EIBI models developed for toddlers with ASD. Zachor, Ben Itzchak, Rabinovich, and Lahat (2007) assessed an EIBI model compared to an eclectic-developmental approach in 39 toddlers with ASD using a two-group design. The EIBI model was rooted solely in the principles of applied behavior analysis and included discrete trial training, incidental teaching techniques, and naturalistic based learning opportunities. The eclectic intervention utilized principles from several approaches including developmentally-oriented philosophies and behavioral approaches. Each group received services for eight hours a day in a center-based program that utilized similar preschool routines. Children in the study were matched by age, autism severity, and cognitive level and had a confirmed diagnosis of ASD. Treatment group was selected based on participants' residence, and no pretreatment group differences were found between groups. The EIBI group (n=20) achieved significantly greater gains in language and communication scores on the Autism Diagnostic Observation Schedule (ADOS) compared to the eclectic group. Differences on the reciprocal social interaction domain of the ADOS neared significance (p = .07) between groups with the EIBI group having greater

improvement. Zachor et al., (2007) concluded that behavioral based EIBI programs were superior to eclectic treatment models for young children with ASD.

EIBI appears to be an efficacious intervention for toddlers with noted improvements in cognition, language, adaptive behavior, and symptoms associated with the deficits of ASD. Comprehensive EIBI models for toddlers demonstrate similar results to EIBI models for school-age children. More research is needed to assess whether EIBI models affect other important child and family outcomes, such as prevention of emotional and behavioral symptoms.

Parent Implemented EIBI. The major purpose of this article is on EIBI models that are largely delivered by agents (e.g., teachers, therapists, interventionists) other than caregivers. Parent involvement in EIBI is strongly encouraged across all evidenced-based models (National Research Council, 2001). Parents have many opportunities to expand and generalize skills to their children throughout the day. In most EIBI for young children, parents are expected to employ teaching opportunities for their children throughout the week. Parent-implemented EIBI can produce similar results to other EIBI implementation models (e.g., school or clinic-based, home-based managed by agencies; Sallows & Graupner, 2005). However, there is some concern that parent-implemented models are not the best choice for all families (Stahmer et al., 2011). As a whole, parent-implemented models tend to be less effective than other implementation methods (see Strauss, Mancini, & Fava, 2013 for synthesis of meta-analyses) and come with a different list of challenges (Siller et al., 2014). While parent-implemented models of EIBI can be effective, it is important to assess family variables that may influence the utility of this treatment modality.

Additional Psychopathology in Populations with Autism Spectrum Disorder

The risk for the development of additional psychopathology is high for those with ASD. Matson and Nebel-Schwalm (2007) define comorbidity, dual-diagnosis, or additional psychopathology as the co-occurrence of two or more disorders within an individual. Growing evidence supports the conceptualization of psychopathology as defined in the DSM for individuals with ASD (Gadow, DeVincent, & Schneider, 2008; Gadow, DeVincent, & Pomeroy,

2006; Witwer & Lecavalier, 2010). The presence of comorbid psychological conditions is common and has been consistently reported within research on ASD (Brereton, Tonge, & Einfeld, 2006; Gray, Keating, Taffe, Brereton, Einfeld, & Tonge, 2012). Individuals with ASD experience the full range of psychopathology with estimates as high as 70% of individuals presenting with at least one additional psychological condition and approximately 40% presenting with two or more (APA, 2013; Kaat & Lecavalier, 2013; Simonoff et al., 2008). LoVullo and Matson (2009) found the prevalence of additional psychopathology to occur across the spectrum, occurring in both individuals with mild and severe symptoms of ASD. The presence of additional psychopathology within those with ASD is pervasive and chronic, persisting through adolescence (Simonoff et al., 2013). Thus, the CDC has identified the public health challenge and called for early intervention to prevent later mental health and developmental disorders (Cordero et al., 2006).

The issue of additional psychopathology within ASD has been infrequently addressed in past research (American Academy of Child & Adolescent Psychiatry, 2013; Matson & Nebel-Schwalm, 2007). Focus on comorbidity is needed as symptoms associated with additional psychopathology can produce adverse effects that transcend the core symptoms of ASD (Mannion & Leader, 2013; Storch et al., 2012). Common co-occurring disorders include other neurodevelopmental disorders (e.g., Attention-Deficit/Hyperactivity Disorder [ADHD], disruptive or conduct disorders (e.g., Oppositional Defiant Disorder [ODD], Conduct Disorder[CD]), depressive disorders, and anxiety disorders (APA, 2013; Boylan, Georgiades, & Szatmari, 2010; Leyfer et al., 2006, Simonoff et al., 2008, Totsika, Hastings, Emerson, & Lancaster, 2011).

Specific prevalence rates of additional psychopathology in those with ASD vary by sample though high rates tend to occur. For instance, Kaat and Lecavalier (2013) reviewed 55 peer-reviewed studies from 2000-2012 that assessed prevalence rates of disruptive or conduct disorders within samples of children with ASD. Prevalence estimates varied from 4% to 37% for

ODD and 1% to 10% for CD. Combined, approximately one in four children with ASD met criteria for a disruptive behavior disorder. The prevalence rate for ADHD has been documented as high as 50% in referred samples (Gadow et al., 2006). Leyfer et al., (2006) documented 31% of children with ASD met full clinical criteria for ADHD, and the rate rose to 55% when subsyndromal cases that caused child impairment were included. Similarly, prevalence rates of anxiety disorders (e.g., Generalized Anxiety Disorder, Obsessive Compulsive Disorder, and Social phobia) exceed 30%, much higher than that of the general pediatric population (de Bruin, Ferdinand, Meester, de Nijs, & Verheij, 2007; Leyfer et al., 2006; Muris, Steerneman, Merckelbach, Holdrinet, & Meesters, 1998).

The high prevalence of comorbid conditions is evident in those with ASD. Evidence suggests that emotional and behavioral symptoms occur early in development in those with ASD (Fodstad, Rojahn, & Matson, 2012; Konst & Matson, 2014). However, there is a dearth of empirical information regarding the onset and occurrence of emotional and behavioral symptoms associated with additional psychopathology in young children (< age 5) with ASD (Matson & Tureck, 2012). It is imperative to assess symptoms of developmental psychopathology regularly as the trajectory of emotional and behavioral problems increases through early childhood and remains higher for children with ASD compared to children with typical development and children with other developmental delays (Fodstad et al., 2012; Konst & Matosn, 2014; Maskey, Warnell, Parr, Couteur, & McConcachie, 2013; Midouhas, Yogaratnam, Flouri, Charman, 2013).

Challenging Behavior as a Precursor to Future Psychopathology

Emotional and behavioral symptoms have often been labeled as challenging behavior (e.g., disruptive behavior problems, problem behaviors, or aberrant behaviors) in young children with ASD. Emerson defines the term challenging behavior as a "cultural abnormal behavior(s) of such intensity, frequency or duration that the physical safety of the person or others is likely to be placed in serious jeopardy, or behavior which is likely to seriously limit use of, or result in the person being denied access to, ordinary community facilities (2000, p.3)." Several individuals

with ASD emit challenging behaviors (Lecavalier, 2006; Matson & Nebel-Schwalm, 2007). The debilitating symptoms likely impact all areas of child development. Individuals with ASD appear to be more at risk for the development of challenging behavior compared to those with intellectual disability alone (Holden & Gitlesen, 2006).

Noncompliance, oppositional behavior, and aggression are among the most prevalent challenging behavior problems reported by parents of children with ASD (Baker & Feinfield, 2003). Further, challenging behaviors such as hyperactivity, destructiveness, self-injurious behavior, and stereotypies commonly occur in those with ASD across the lifespan (Matson & Nebel-Schwalm, 2007; Smith & Matson, 2010). Parents and teachers often consider challenging behaviors of equal or greater importance to the core symptoms of ASD due to the debilitating nature that the symptoms may have on health, safety, learning, and social relationships (Pearson et al., 2006).

The prevalence of challenging behaviors in those with ASD is high, with one study documenting prevalence rates above 90% (McTiernan, Leader, Healy, & Mannion, 2011). The presence of challenging behavior is likely to vary depending on the definition used in assessment. For instance, McTierman et al., (2011) included stereotyped behaviors within their definition of challenging behavior. Ninety-two percent of the sample exhibited stereotyped behavior. Although stereotyped behaviors are included as a core deficit of ASD, the frequency in which it occurs is often deemed a challenging behavior that needs separate and perhaps more focused intervention. Despite possible inflation in prevalence rates based on definition, McTieman et al., (2011) found rates of self-injurious behavior and aggression to be 48.9% and 56.3%, respectively. Only 6.3% of the sample did not meet the criteria for having challenging behavior. Thus, challenging behaviors as a whole are a major issue that most agree deserve widespread attention.

Fodstad et al., (2012) conducted one of the largest studies to date utilizing a cross-sectional analysis to assess the emergence of challenging behaviors in toddlers with ASD (n = 297) and typically developing toddlers (n = 327). Toddlers were split into four age groups based

on convenience (i.e., 12-18 months, 19-25 months, 26-32 months; 33-39 months). Toddlers with ASD presented with greater frequency and magnitude of aggressive/destructive behaviors, stereotypic behaviors, and self-injurious behaviors across each age group compared to the typically developing controls. Within-group analyses of those with ASD revealed that younger children presented with less frequent aggressive/destructive behaviors and stereotypic behaviors compared to those in the older age ranges. Aggressive/destructive behaviors and stereotypic behaviors continued to escalate as children aged, with the highest level of problems occurring in the oldest age group (i.e., 33-39 months). The occurrence of self-injurious behavior fluctuated, though there was a general increase after 25 months of age. Differential emergence of challenging behavior can be seen as early as 12 months of age in those with ASD compared to typically developing controls (Fodstad et al., 2012).

Comorbidity with ASD may result in greater symptom impairment. Konst, Matson, and Turygin (2013) assessed 347 children and categorized them into three groups based on diagnoses. Diagnostic groups included children with ADHD only (n = 42), ADHD with comorbid ASD (n = 49), and ASD without comorbid ADHD (n = 256). They assessed for tantrum behaviors between groups. The ADHD with comorbid ASD group demonstrated significantly higher rates of tantrum behavior than the ADHD only and ASD only groups.

Challenging behaviors have been demonstrated to impact educational intervention, social-emotional development, and family well-being for those with ASD (Brereton, Tonge, & Einfeld, 2006; Hartley, Sikora, & McCoy, 2008; Lecavalier, 2006). Such interactions are likely to result in suboptimal long-term outcomes for children with ASD. Investigating possible buffering agents for symptoms of additional psychopathology is needed in order to best inform treatment. Given the push for comprehensive EIBI for toddlers with ASD, research would benefit from understanding whether comprehensive EIBI programs reduce the likelihood of the emergence of emotional and behavioral symptoms that are indicative of additional psychopathology.

Child Development and the Emergence of Emotional and Behavioral Symptoms

Rapid growth occurs during infancy and toddlerhood. Uneven patterns of development frequently occur. The establishment of the scientific study of developmental psychopathology noted these patterns and has been the leading framework for childhood assessment for the past 40 years. Stroufe and Rutter (1984) first defined developmental psychopathology as "the study of the origins and course of individual patterns of behavioral maladaptation (p. 18)." They highlight that development is not a series of linear additions, but instead is an adaptive process that includes causal processes based on the environment and the developmental level of the individual (Rutter & Sroufe, 2000). Thus mental age, developmental level, and personal experiences should be considered when determining whether a child is demonstrating behaviors that are or are not expected.

Broad timeframes for achieving developmental milestones are present. The complex patterns of development constrain the ability to accurately assess intellectual abilities in children below the age of 24 months (Anastasi & Urbina, 1997). Cognitive ability, developmental milestones, and emotional and behavioral control are intertwined in young children. Skills may rapidly shift from absent to present and/or vary across developmental domains (e.g., being able to talk in 2-3 word sentences, but fail to copy simple shapes). Thus, assessment of young children can be arduous. The stability of intelligence improves as children mature, however is still only moderately predictive throughout the preschool years (for review see Bradley-Johnson, 2001). Predicting developmental and behavioral profiles is magnified within those with ASD as changes can be even more pronounced and occur frequently through the preschool years (Hedvall, Westerlund, Fernell, Holm, Gillberg, & Billstedt, 2014). Therefore, reassessment across a range of developmental areas is needed to accurately track and inform treatment.

Just as developmental milestones have average ranges that are deemed within normal limits, emotional and behavioral manifestations do as well. A behavior at one time point may be within normal limits but considered maladaptive at another. For instance, it is common for

infants to have a startle response to a loud noise and cry due to an inability to regulate one's emotion or communicate. However, a toddler may exhibit a startle response to the same noise, but no longer cry because improved regulation skills acquired through development. If loud noises continued to cause dysregulation in toddlers and children, it would be considered abnormal as the developmental period to gain those skills is outside the range that most acquire it.

Development and ASD. Children with ASD may be more apt to develop maladaptive patterns of behavior or maintain less mature behaviors as their mental age and developmental level may lag behind their chronological age. For example, the presence of separation anxiety and fear of strange people in young children should subside as children mature. Symptoms associated with separation anxiety and fear may remain in older children with ASD if they have not mastered the developmental skills obtained by others (e.g., concept of time, safety, security, object permanence, etc.). The behavior would be considered outside the range of normal based on chronological time, but the occurrence of behaviors associated with fears would be expected if a child's mental age and developmental level are delayed. As children grow in size and mature in strength, behaviors that were once manageable (e.g., crying, flopping) may become more difficult (e.g., running out of the house, kicking and hitting) to manage. The behaviors may than be classified as a problem due to the health and safety concerns of the child.

The inherent social difficulties within ASD frequently result in similar delayed developmental trajectories. A prime example is language difficulties. Core symptoms of ASD include difficulties in children being able to express and understand verbal and nonverbal behavior (APA, 2013). Park, Yelland, Taffe, and Gray (2012) found that preschoolers with ASD were more apt to have difficulty with receptive language skills compared to children with other developmental delays and typically developing children. Low receptive language was associated with social, daily living skills, and behavior problems in children with ASD. Further, children with ASD may have difficulty understanding another person's intentions and desires (e.g., "theory of mind;" Baron-Cohen, Leslie, & Frith, 1985). As a result of not mastering these

important social and developmental skills, children with ASD frequently exhibit challenging or undesirable behaviors such as temper tantrums, noncompliance, self-injury, and/or aggression (Gadow, Devincent, Pomeroy, & Azizian, 2005; Lecavalier, 2006). Proper assessment (e.g., functional assessment; Iwata, Dorsey, Slifer, Bauman, & Richman, 1994) and intervention plans should be conducted and developed to address the unique needs of the individual and circumstance.

It is unclear how the outcomes associated with EIBI (e.g., cognitive, language, adaptive behavior) impact the development or likelihood of emotional and behavioral symptoms exhibited by many children with ASD. Research to date suggests that many individuals with ASD go on to develop comorbid conditions beyond those subsumed by ASD symptomatology. EIBI is suggested for all individuals with ASD. Developmental psychopathology is in its infancy in ASD research. Individual characteristics and symptoms associated with the emergence of additional psychopathology deserve careful attention within the literature. Prime research questions have yet to be asked about the utility of EIBI to prevent future mental and behavioral health outcomes.

Individual Factors Involved in the Emergence of Emotional and Behavior Symptoms in ASD. Research is rather mixed on individual characteristics that may make individuals with ASD more susceptible to develop challenging behaviors or have comorbid psychopathology. For instance, McTiernan, Leader, Healy, and Mannion (2011) found that lower IQ was a significant predictor of the frequency of aggression, self-injurious behavior (SIB), and stereotypy. However, Witwer and Lecavalier (2010) found that those with IQ scores below 70 had fewer comorbid disorders and lower levels of emotional and behavioral symptoms compared to those with higher IQ scores. While, Murphy, Healy, and Leader (2009) documented those with lower intellectual ability had more severe SIB, they found no association between intellectual ability and aggression or SIB. Other studies have failed to demonstrate a correlation between IQ and comorbid psychopathology (Brereton et al., 2006. Simonoff et al., 2008).

Maskey, Warnell, Parr, Couteur, and McConachie (2013) assessed 863 children aged 2-18. Nearly half of the sample was under the age of six. They found that language ability did not significantly differentiate the frequency of temper tantrums, aggression, anxiety, and fears in their sample. Meanwhile, Witwer and Lecavalier (2010) reported higher language ability was associated with greater rates of symptom endorsement and comorbid diagnosis of ODD and GAD. Age, gender, school type, and hours of intervention, have been assessed and failed to predict levels of emotional and behavioral symptoms (Murphy, Healy, & Leader, 2009; Maskey et al., 2013).

Family Factors Involved in the Emergence of Emotional and Behavior Symptoms in ASD. A wealth of research exists on the environmental factors that influence emotional and behavioral well-being in children who are typically developing. Much less is known about similar factors in families that have a child with ASD. Although refuted now, Bettelheim (1967) claimed that ASD was caused by poor parenting, not genetic or other environmental factors. The consequences of this claim may have dissuaded research on family factors that may relate to the development of emotional and behavioral symptoms that do not relate to ASD per se. Recently, increased attention on family factors has reemerged within research on ASD investigating how environmental factors may relate to non-ASD specific symptoms (Meirsschaut, Warreyn, & Roeyers, 2011; Osborne & Reed, 2010; Smith, Greenberg, Seltzer, & Hong, 2008; Wan et al., 2012).

Midouhas, Yogaratnam, Flouri, and Charman (2013) assessed family factors associated with additional symptoms of psychopathology in 209 families that had a child with ASD. The sample was collected from a population-based cohort study of families in the United Kingdom. Data were collected across four time points, of which three were utilized in the analysis. Data were collected when the children were three, five, and seven years old. Family poverty was linked to an increase in internalizing and externalizing behavior problems. Household chaos was associated with higher levels of externalizing behavior problems, whereas maternal warmth was

associated with improvements in externalizing behavior problems. Maternal warmth, involvement, and household organization did not reduce the association of poverty on child symptoms of psychopathology. Midouhas et al., (2013) hypothesize that families in poverty have less access to intervention services leading to higher rates of psychopathology. They conclude that treatment services should target maternal warmth and household chaos especially in families with low income to reduce the potential of additional psychopathology in children with ASD.

There is overwhelming evidence that parents of a child with ASD are more stressed compared to caregivers with typically developing children and children with other medical and developmental delays (see Hayes & Watson, 2013 for meta-analytic review). Few longitudinal studies have assessed the impact of parental stress on children with ASD. One study assessed the stress of 184 families with a child with ASD over a four-year period (Zaidman-Zait et al., 2014). They demonstrated that stress that involved personal characteristics (e.g., depression, isolation) predicted child externalizing and internalizing behavior problems over the reporting period. A bidirectional effect between child behavior and parent stress was found between parenting stress related to other aspects of parenting. Therefore, certain parenting characteristics that stem from the stress of feeling alone and isolated may evoke children to exhibit more problem behaviors over time.

Totsika, Hastings, Emerson, Lancaster, Berridge, and Vagenas (2013) assessed 132 families from the population-based cohort study used in the Midouhas et al., (2013) project. Similar to Zaidman-Zait et al., (2014), Totiska et al., (2013) found that parental stress, physical health limitations, and lower life satisfaction are risk factors for the development of child behavior problems. However, early child behavior problems may not be associated with later maternal stress (Totiska et al., 2013).

Environmental Context: Parent and Teacher Discrepancy of Child Behavior

Assessment of children is arduous as previously described. Multiple perspectives and ideally behavioral observations should be collected to best inform diagnostic evaluation and

treatment recommendations (Holmbeck, Li, Schurman, Friedman, & Coakley, 2002; McClellan, Bresnahan, Echeverria, Knox, & Susser, 2009). Research suggests that parents and teachers agree that children with ASD are likely to meet criteria for an additional diagnosis (Kaat, Gadow, & Lecavalier, 2013; Kanne, Abbacchi, & Constantino, 2009). However, parent and teacher ratings differ. Teachers identify fewer psychiatric symptoms in children with ASD compared to parents (Kanne et al, 2009). Kanne et al., (2009) suggests that the environmental context may be even more important to assess in children with ASD as behavior may differ depending on a number of factors such as behavioral control, access to reinforcement, number of demands placed on the child, and/or caregiver burden.

Anecdotal evidence suggests that children with ASD can be focused and participate in school, but once home may need resting or break periods. Children are likely to behave differently depending on the structure of the environment. Children spend a significant amount of time at home compared to school, and parents have multiple responsibilities and roles. Therefore, providing consistent structure and routine with embedded reinforcement of appropriate behavior can be difficult for parents. Thus, parents may be more apt to see different behaviors than teachers.

Assessment should take into consideration where impairment exists. For instance, Kaat et al., (2013) demonstrated that parents' and teachers' report suggested that 60% and 49% of children, respectively, met the clinical cutoff for ADHD. However, if both informants' reports were taken into consideration, 82% of children met clinical cutoff. Kaat et al., (2013) suggest that relying on one informant is likely to underrepresent the true impairment and prevalence of a disorder. EIBI is commonly delivered by someone other than a child's parent. Parents play a vital role in EIBI. Assessing EIBI influence on child psychopathology is needed. Parental endorsement of behavior will help researchers understand the extent to which child behavior change in the classroom or clinic may generalize to the home environment.

Outcomes and Treatments of Additional Psychopathology within ASD

Differential outcomes of those with ASD and additional psychopathology compared to those with ASD alone are hard to disentangle. The majority of children with ASD present with comorbidity (APA, 2013; Kaat & Lecavalier, 2013; Siminoff et al., 2008) and several studies fail to adequately assess for additional psychopathology or intellectual functioning. ASD increases the likelihood that individuals will need additional support to function in daily life (APA, 2013). The presence of additional psychopathology may create greater challenges above those caused by ASD alone and lead to poorer prognosis. There is a dearth of information on how comorbidity affects individuals with ASD and their families.

Educational and Living Placement. Intellectual ability and social functioning are predictive factors for educational placement for children with ASD (White, Scahill, Klin, Koenig, & Volkmar, 2007). Challenging behaviors may result in children participating in more restrictive environments or attending private schools (Lauderdale-Littin, Howell, & Blacher, 2013). Challenging behaviors that continue into adulthood may result in individuals being placed in high-cost residential treatment centers (McGill & Poynter, 2012).

Medication Use. Medication management in children with ASD is common. Approximately 50% of children with ASD are prescribed medication for managing behavioral and/or mood symptoms (Aman, Lam, & Van Bourgondien, 2005; Mandell, 2008). Medication is effective for treating irritability and agitation (e.g., aggression, severe tantrums, self-injury) in those with ASD (Arnold et al., 2012; McCracken et al., 2002; McDougle et al., 2005; Pandina et al., 2007). The antipsychotic medications risperidone and aripiprazole have been approved for those with ASD by the food and drug administration.

Antipsychotic medication may have adverse side effects such as weight gain and fatigue. Such side effects may preclude individuals with ASD from full participation in typical daily activities. Children with comorbid ASD and disruptive behavior disorder are more likely to be prescribed antipsychotic medication compared to those with a dual diagnosis of ASD and an anxiety disorder (Storch et al., 2012). Adults with ASD may be prescribed antipsychotics for

"pestering staff," a behavior that may not truly warrant such level of treatment (Tsakanikos, Costello, Holt, Sturmey & Bouras, 2007). Risks, benefits, and alternative treatments should be thoroughly examined prior to prescribing medications to those with ASD.

Prevention of Challenging Behavior and Secondary Psychopathology

There is great interest in the prevention and treatment of emotional and behavioral problems in children with ASD (Cordero et al., 2006). However, there has not been a prevention study that solely targets children with ASD to my knowledge. Findings must be extrapolated from other populations which may reduce the meaningfulness of results within an ASD population.

Petrenko (2013) reviewed prevention and treatment programs that have been used for children with developmental disabilities. Individuals with ASD were included in some of the samples. The studies all used a parenting training format. Given the established links between parenting behavior and child behavior (Hinshaw, 2002; Patterson, 1976), BPT models have widely been used to target the prevention of emotional and behavior symptoms.

Petrenko (2013) located only one study that used a prevention model. The study focused on 2- to 5-year-olds with mixed developmental disabilities. The study (McIntrye, 2008) adapted a version of the Incredible Years (Webster-Stratton et al., 2001) BPT and utilized a wait-list control design. Thirty-nine percent (N=49) of the sample had ASD (n=19). Parents met in a group format for two-and-a-half hours a week for 12 weeks. McIntye (2008) demonstrated that the Incredible Years treatment group had an overall reduction of total behavior problems and internalizing child behavior problems compared the standard care group. Negative parenting behaviors were also reduced in the treatment group. No differences in externalizing behavior problems emerged post-treatment. Outcomes did not differ based on developmental disability (e.g., ASD versus other developmental disability).

Prevention programs using BPT may reduce child behavior problems in children with ASD compared to standard care. However, it is unclear whether the emergence of symptoms was

influenced or whether those with clinical levels of behavior problems were included or excluded in the sample. Preventative intervention may aim for participants to maintain normal levels of behavior or it may target a reduction in symptoms that are considered at-risk for becoming a clinically significant problem. Longitudinal research and detailed inclusion and exclusion criteria are needed to make future advances in prevention trials for children with ASD.

The conceptualization of how to prevent emotional and behavior symptoms in children with ASD tends to differ from that of children without developmental disabilities. Prevention programs designed for children who are typically developing tend to focus on parental behavior (e.g., parental warmth, appropriate discipline, positive reinforcement, differential attention) and the parent-child relationship (Posthumus, Raaijmakers, Maassen, Engeland, & Matthys, 2011). Meanwhile, programs for children with ASD tend to focus children receiving comprehensive EIBI to ameliorate or reduce the symptoms of ASD. There appear to be two major assumptions in the field for preventing emotional and behavior symptoms in children with ASD. The first is that improving child skill acquisition will lead to a reduction in child behavior problems and general improvement in emotional functioning. The second is that comprehensiveness of EIBI will target and reduce symptoms of challenging behavior and emotional problems in children with ASD as part of treatment. Both assumptions need research to determine the accuracy.

The comprehensive and intensive nature of EIBI allows for many goals to be worked on concurrently. It is widely known that EIBI providers assist families with sleeping, eating, and toileting problems, as well as challenging behaviors (Williams, Matson, Beighley, Rieske, & Adams, 2014). Aspects of prevention are built into comprehensive EIBI. Strategies of Positive Behavior Support (PBS; Carr et al., 2002) are used. For example, children may receive modified curricula and/or a schedule that maximizes preference and motivation. Reinforcement schedules may be implemented in the home and used in intervention to promote positive behavior and generalize skills to the home. More research is needed to assess the emergence, course, and impact of emotional and behavioral symptoms in young children with ASD who receive EIBI.

Increasing child abilities, reducing symptoms associated with ASD, building parental skill, and utilizing strategies from PBS are all likely to influence and improve emotional and behavioral outcomes in children.

Summary

There is a dearth of research on the prevention of additional psychopathology in young children with ASD (American Academy of Child & Adolescent Psychiatry, 2013; Matson & Nebel-Schwalm, 2007). As many as 70% of those with ASD present with additional psychopathology (APA, 2013; Kaat & Lecavalier, 2013; Siminoff et al., 2008). Symptoms of additional psychopathology transcend the core deficits of ASD and are often considered a prime treatment need (Mannion & Leader, 2013; Pearson et al., 2006; Storch et al, 2012).

Emotional and behavioral symptoms indicative of additional psychopathology occur early in development, increase with age, and remain high through adolescence in those with ASD (Fodstad et al., 2012; Konst & Matson, 2014; Maskey, Warnell, Parr, Couteur, & McConcachie, 2013; Midouhas, Yogaratnam, Flouri, Charman, 2013; Siminoff et al., 2008). Emotional and behavioral problems impact school placement and the ability for children to be included with typically developing peers (Lauderdale-Littin, Howell, & Blacher, 2013). The nature of these challenging behaviors may result in high-cost residential treatment and/or the use of antipsychotic medication (McGill & Pynter, 2012; Storch et al., 2012).

Risk factors for the development of emotional and behavioral symptoms in children with ASD are mixed. Child intellectual functioning and language ability have not been consistently associated with additional psychopathology (Brereton et al., 2006; Simonoff et al., 2008). Some report that those with lower intellectual functioning have fewer symptoms of additional psychopathology (Murphy et al., 2009; Witwer & Lecavalier, 2010) while others report more symptoms of externalizing behavior (McTiernan et al., 2011). Most report that lower intellectual functioning is associated with SIB (McTiernan et al., 2011; Murphy et al., 2009).

Language ability is commonly associated with behavior problems in children with ASD (Park et al., 2012). However, others have failed to find associations between language ability and behavior problems (Maskey et al., 2013) or have found that higher language abilities are associated with more symptoms of additional psychopathology (Witwer & Lecavalier, 2010). Additional risk factors for the development of emotional and behavioral problems that have been identified in the literature include family factors such as poverty, household chaos, low maternal warmth, and parent stress (Midouhas et al., 2013; Totiska et al., 2013; Zaidman-Zait et at., 2014).

The leading treatment for ASD is comprehensive EIBI. EIBI improves intellectual functioning, language ability, and adaptive functioning with research demonstrating medium-to-large effect sizes (see Strauss Mancini, SPC Group, & Fava, 2013 for synthesis of meta-analyses). Two major assumptions within comprehensive EIBI for the prevention of emotional and behavioral symptoms in those with ASD exist.

1. Improving child skill acquisition leads to a reduction of emotional and behavioral problems.
2. EIBI targets and reduces emotional and behavioral problems as part of treatment.

Given the research on child language ability and intellectual functioning, it is unclear to what extent increasing child skill acquisition may influence emotional and behavioral functioning. Aspects of prevention are built into comprehensive EIBI. Strategies of Positive Behavior Support (PBS; Carr et al., 2002) are commonly used to prevent challenging behavior and promote health development. Most EIBI programs are largely conducted by agents other than the parents. While parents are highly involved in EIBI, it is unclear whether emotional and behavioral symptoms exhibited during treatment sessions generalize to interactions with the parents. On average, teachers identify fewer emotional and behavioral symptoms for children with ASD than parents (Kanne et al, 2009). I am unaware of research that assess symptoms of additional psychopathology while children are receiving EIBI. Testing EIBI as a prevention model for future mental and behavioral health problems is greatly needed.

APPENDIX B

TABLES

Table 1
Demographic Information for EIBI and SAU groups

	EIBI (n = 32)	SAU (n = 19)
Characteristic	Demographic, n (%)	
Male	28 (88%)	16 (84%)
Caucasian	12 (38%)	8 (42%)
Non-Caucasian	11 (34%)	4 (21%)
Unidentified Race	9 (28%)	7 (37%)
Age at Baseline (mos.) *M* (*SD*)	27.97 (3.71)	27.24 (3.63)
Age at Post (mos.) *M* (*SD*)	41.52 (3.52)	40.86 (3.63)
Length of Treatment (mos.) *M* (*SD*)	13.16 (1.81)	13.05 (2.45)

Table 2
Baseline Scores for EIBI and SAU groups

	EIBI (n = 32)	SAU (*n* = 19)	
Variable	*M (SD)*		*p*-value
ADOS Module 1	16.72 (3.74)	16.53 (4.83)	.874
BITSEA CS	9.57 (2.96)	9.78 (4.36)	.842
BITSEA PS	18.90 (8.73)	16.56 (8.47)	.367
Baseline MSEL	70.22 (20.07)	62.58 (19.06)	.187

Note: ADOS = Autism Diagnostic Observation Schedule; BITSEA CS = Brief Infant-Toddler Social and Emotional Assessment Competency Scale; BITSEA PS = Brief Infant-Toddler Social and Emotional Assessment Problem Scale; MSEL = Mullen Scales of Early Learning

Table 3
Pearson Product Moment Correlations for Dependent Variables

Variable	*PDDBI ASD*	*Post MSEL*	*PDDBI Arouse*	*PDDBI Fear*
Post MSEL	.011	-		
PDDBI Arouse	.683**	-.278*	-	
PDDBI Fear	.412**	.276*	.247*	-
PDDBI Aggression	.587**	.049	.649**	.432**

Note: PDDBI = Pervasive Developmental Disorders Behavior Inventory; MSEL = Mullen Scales of Early Learning
*$p < .05$. **$p < .01$

Table 4
Post Scores for EIBI and SAU groups

	EIBI (n = 32)	SAU (n = 19)		
Variable	*M (SD)*		*p*-value	*d*
Post MSEL	112.32 (31.53)	93.78 (28.48)	.023*	.617
PDDBI ASD	58.19 (25.69)	58.63 (30.31)	.478	.016
PDDBI Arouse	18.81 (8.50)	18.05 (7.78)	.376	.093
PDDBI Fear	18.31 (12.93)	18.53 (9.72)	.476	.019
PDDBI Aggression	18.37 (11.53)	18.11 (11.26)	.468	.023

Note: PDDBI = Pervasive Developmental Disorders Behavior Inventory; MSEL = Mullen Scales of Early Learning
*$p < .05$.

APPENDIX C

REFERENCES FOR COMPLETE LITERATURE REVIEW

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Oklahoma State University Institutional Review Board

Request for Determination of Non-Research or Non-Human Subject

Federal regulations and OSU policy require IRB review of all research involving human subjects. Some categories of research are difficult to discern as to whether they qualify as human subject research. Therefore, the IRB has established policies and procedures to assist in this determination.

1. Principal Investigator Information

First Name: Paul	Middle Initial: M	Last Name: Shawler
Department/Division: Psychology		College: Arts and Sciences
Campus Address: 116 N Murray, Stillwater OK		Zip+4: 74078
Campus Phone: 405-744-6823	Fax: 405-744-6067	Email: Paul.shawler@okstate.edu
Complete if PI does not have campus address:		
Address:		City:
State:	Zip:	Phone:

2. Faculty Advisor (complete if PI is a student, resident, or fellow) ☐ NA

Faculty Advisor's name: Maureen A. Sullivan		Title: Associate Professor
Department/Division: Psychology		College: Arts and Sciences
Campus Address: 116 N Murray Stillwater, OK		Zip+4: 74078
Campus Phone: 405-744-6823	Fax: 405-744-6067	Email: Maureen.sullivan@okstate.edu

3. Study Information:

A. Title

Does Early Intervention Reduce the Risk of Future Emotional and Behavioral Symptoms in Children with Autism Spectrum Disorder

B. Give a brief summary of the project. (See instructions for guidance)

The project will utilize archival, de-identified data, from an existing data set at the University of Oklahoma Health Sciences Center (OUHSC). The project at OUHSC has an existing approved IRB where all data is housed and analyzed. The researchers at Oklahoma State University do not have access to any identifying participant information and the PI is a student researcher who was hired on as a research assistant at OUHSC where all activities were conducted. The purpose of the archival study is to assess whether children with Autism Spectrum Disorder who participated in an intensive early intervention program had reduced emotional and behavioral problems compared to a community as usual group a year after they had entered services. A one-way multivariate analysis between two groups will be used to interpret the data. The current study is archival in nature and therefore does not actively deliver service. The original data at OUHSC originate from a Randomized Control Trial of two treatments. The standard care services included Part C services (SoonerStart) funded through the Individual with Disabilities Education Act. The experimental condition utilized a treatment consisted of a school-based program that included 22 hours of direct service a week to the child and family.

Oklahoma State University Institutional Review Board

Request for Determination of Non-Research or Non-Human Subject

C. Describe the subject population/type of data/specimens to be studied. (See instructions for guidance)

The current project utilizes de-identified data from an IRB approved study at OUHSC. Subjects in the archival data set include data from parents of children with Autism Spectrum Disorder who are 16-42 months of age. Children in the archival dataset will be included in the current project if they have baseline data and data 9-15 months after entering one of the two treatments from the original study.

4. **Determination of "Research".**
One of the following must be "no" to qualify as "non-research":

A. Will the data/specimen(s) be obtained in a systematic manner?
☒ No ☐ Yes

B. Will the intent of the data/specimen collection be for the purpose of contributing to generalizable knowledge (the results (or conclusions) of the activity are intended to be extended beyond a single individual or an internal program, i.e. widely or universally applicable)?
☐ No ☒ Yes

5. **Determination of "Human Subject".**
A. Does the research involve obtaining information about living individuals?
☐ No ☒ Yes
If no, then research does not involve human subjects, no other information is required.
If yes, proceed to the following questions.

All of the following must be "no" to qualify as "non-human subject":

B. Does the study involve intervention or interaction with a "human subject"?
☒ No ☐ Yes

C. Does the study involve access to identifiable private information?
☒ No ☐ Yes

D. Are data/specimens received by the Investigator with identifiable private information?
☒ No ☐ Yes

E. Are the data/specimen(s) coded such that a link exists that could allow the data/specimen(s) to be re-identified?
☒ No ☐ Yes
If "Yes," is there a written agreement that prohibits the PI and his/her staff access to the link?
☐ No ☐ Yes

6. **Signatures**

Signature of PI Paul Stewart **Date** 10/12/15

Signature of Faculty Advisor Maureen A. McClure **Date** 10/14/15
(If PI is a student)

Based on the information provided, the OSU-Stillwater IRB has determined that this project does not qualify as human subject research as defined in 45 CFR 46.102(d) and (f) and is not subject to oversight by the OSU IRB.

Oklahoma State University Institutional Review Board

Request for Determination of Non-Research or Non-Human Subject

☐ Based on the information provided, the OSU-Stillwater IRB has determined that this research does qualify as human subject research and **submission of an application for review by the IRB is required.**

Dr. Hugh Crethar, IRB Chair

10·20·15
Date

VITA

Paul Michael Shawler

Candidate for the Degree of

Doctor of Philosophy

Thesis: DOES EARLY INTERVENTION REDUCE THE RISK OF FUTURE EMOTIONAL AND BEHAVIORAL PROBLEMS IN CHILDREN WITH AUTISM SPECTRUM DISORDER

Major Field: Psychology

Biographical:

Education:

Completed the requirements for the Doctor of Philosophy major at Oklahoma State University, Stillwater, Oklahoma in July, 2016.

Completed the requirements for the Master of Science in your major at Oklahoma State University, Stillwater, Oklahoma in May, 2013.

Received Bachelor of Science degree in Psychology from West Virginia University, Morgantown, West Virginia in 2008.

Experience:

Graduate Student Research Assistant and Clinician
OSU Child Behavior Research Lab and Child Study Center
Oklahoma State and Oklahoma University Health Sciences Center

Professional Memberships:

Student Affiliate of the American Psychological Association
Student Affiliate of the Association for Advancement of Behavior & Cognitive Therapy
Student Affiliate of the American Professional Society on the Abuse of Center

Publications

Shawler, P.M., & Sullivan, M.A. (in press). Parental stress, discipline strategies, and child behavior problems in families with young children with Autism Spectrum Disorder. *Focus on Autism and Developmental Disabilities.*