

CHILD DIRECTED INTERACTION TRAINING FOR YOUNG CHILDREN WITH
AUTISM SPECTRUM DISORDERS: THE IMPACT ON CHILD LANGUAGE, SOCIAL
SKILLS, ADAPTIVE SKILLS, AND PROBLEMATIC BEHAVIORS

By

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To my parents, who have provided so much support and guidance during this process

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LIST OF ABBREVIATIONS

ASD	Autism Spectrum Disorder
CDIT	Child Directed Interaction Training
IT	Immediate Treatment Condition
PCIT	Parent-Child Interaction Therapy
PDI	Parent Directed Interaction
WL	Waitlist Control Condition

Abstract of Dissertation Presented to the Graduate School
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**CHILD DIRECTED INTERACTION TRAINING FOR YOUNG CHILDREN WITH
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SKILLS, ADAPTIVE SKILLS, AND PROBLEMATIC BEHAVIORS**

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This study examines an application of an evidence-based treatment that teaches parents specific skills to produce language, behavioral, and social gains in young children with Autism Spectrum Disorders (ASDs). Parent-Child Interaction Therapy (PCIT) integrates concepts from social learning theory, traditional play therapy, and attachment theory to treat a range of externalizing and internalizing problems. The evidence base for applications of the Child Directed Interaction Training (CDIT) component of PCIT has shown promise as a powerful focal treatment for ASD to address the multifaceted symptoms of the disorder through the mechanism of the parent-child relationship. The specific aims of this study are to determine whether CDIT improves verbal, adaptive, and behavioral functioning in children with ASD at immediate post-treatment assessment (Aim 1) and 6-week follow-up assessment (Aim 2), as well as overall improvement across assessments (Aim 3).

Thirty children between the ages of 3 and 7 years who met diagnostic criteria for a DSM-IV diagnosis of an ASD participated with their caregivers. Assessments included observational measures of ASD symptomatology, language and adaptive skills, parent-

report measures of social behaviors, and observations of total child verbalizations during a child-led play situation with mother-child dyads. Families were randomized to an immediate treatment (IT) condition or a waitlist (WL) condition. Treatment included 8 weekly sessions of manualized CDIT. Families completed their second assessment at Week 12 (for the IT group this occurred one week following the conclusion of treatment) as well as a 6-week follow-up assessment following treatment. Primary outcomes at post-treatment (Assessment 2) were compared to WL families using analysis of covariance strategies. The results indicate that caregiver implementation of CDIT skills improves disruptive behavior and social awareness compared to the waitlist control. The gains made during treatment were maintained from post-treatment to 6-week follow-up. Implications include access to a time-limited and minimally time-constraining intervention for improving the disruptive behavior and social awareness of children with ASD that may improve future intervention outcomes with this vulnerable population of young children.

CHAPTER 1 BACKGROUND

Description of Autism Spectrum Disorders

The definition of Autism Spectrum Disorders (ASDs) commonly includes Autistic Disorder, Asperger Syndrome, and Pervasive Developmental Disorder, Not Otherwise Specified (PDD-NOS) (Bishop, Luyster, Richler, & Lord, 2008). Core symptoms of ASDs, as defined by the American Psychiatric Association (APA, 2000, p. 69), include “severe and pervasive impairment in several areas of development: reciprocal social interaction skills, communication skills, or the presence of stereotyped behavior, interests, and activities” with symptoms evident prior to age 3 years and often comorbid with Intellectual Disorders (ID; also known as Mental Retardation). Associated social deficits are present in attachment, social imitation, joint attention, orienting to social stimuli, face perception, and emotional perception and expression, while language delays are marked by echolalia, atypical prosody, pragmatic impairments (understanding the semantic aspects of language), and few gestures (Klinger, Dawson, & Renner, 2003). Within the DSM diagnostic criteria, Autism Spectrum Disorders (ASDs) have a complex presentation of social skills deficits, communication delays, and restricted interests that often manifest in disruptive behavior and relational problems. Because of this high degree of complexity in the presenting symptoms of ASD, it is important that treatments for ASD target the multifaceted nature of the disorder.

Treatments for Autism Spectrum Disorders

To date, Lovaas’s Applied Behavior Analysis (ABA; Dunlap, Kern-Dunlap, Clark, & Robbins, 1991) or Discrete Trial Training (DTT; Maurice, Green, & Luce, 1996) is the only psychosocial treatment that has been classified as evidence-based for the

treatment of Autism Spectrum Disorders (Rogers & Vismara, 2008). ABA treatment stresses the importance of applying behavioral principles to increase appropriate social and communicative behaviors with reward and to decrease maladaptive behaviors (such as aggressive or self-stimulatory behaviors) with ignoring, punishment, and shaping (Lovaas, 1987). Involvement in Lovaas's Young Autism Project (YAP; Lovaas, 2003) begins with one year of highly structured, manualized Discrete Trial Training followed by a gradual emphasis on naturalist instruction. Discrete Trial Training occurs in a one-on-one interaction that is directed by a trained therapist. The therapist gives the child short and clear instructions and follows through with carefully planned procedures to prompt the child to follow instructions or to provide immediate reinforcement of a correct response (Lovaas, 2003; Campbell, Herzinger, & James, 2008). Lovaas's (1987) initial research findings have been replicated by a variety of researchers using well-designed randomized controlled trials (Lovaas & Smith, 2003; Eldevik, Eiset, Jahr & Smith, 2006; Rogers & Vismara, 2008) that support ABA's efficacy in improving intelligence in children with autism.

Although ABA is the only evidence-based treatment for children with Autism Spectrum Disorders, ABA may not be suitable for all children and families. Traditional ABA treatment is extremely time-intensive, with time requirements that range from a 12 hours a week to 40 or more hours a week, with a duration ranging from a few months to 2 years, across several environments via collaborative efforts from parents and professionals (Rogers & Vismara, 2008). Access to treatment at this time is limited for families with low parental education, racial or ethnic minority status, or residence in

nonmetropolitan areas (Thomas, McLaurin, & Morrissey, 2007). Families may lack the funding or time availability to provide this treatment to their children.

In addition, there are not enough professionals with sufficient training and experience to provide high-quality, intensively supervised treatment to children and families who do not have access to an autism research center. Parents have tried to remedy this problem in the past by recruiting paraprofessional therapists to be trained to provide the intervention (Lovaas & Smith, 2003). Unfortunately, research findings have indicated that child outcomes were much less favorable in a parent-initiated intervention, with child intelligence demonstrating no notable improvement during treatment (Bibby, Eikseth, Martin, Mudoford, & Reeves, 2001). Even if a child were able to receive sufficient ABA treatment by a professional, the current research supports ABA as evidence-based only for improving child intelligence. Research has not supported ABA as evidence-based for addressing the other challenges faced by children with ASD including elements of autistic symptomatology (particularly difficulties with social and communicative functioning), co-morbid psychological and psychiatric difficulties, difficulties with adaptive functioning, and higher-than-average disruptive behaviors. Parents may prefer a treatment that targets these other areas of functioning.

Naturalistic Teaching Strategies

Other treatment approaches have been developed to integrate behavioral mechanisms into naturalistic teaching strategies that draw from developmental theories. Naturalistic teaching refers to providing an opportunity for a child to learn or use a skill in a natural setting (like playtime) so that it can be generalized more easily to other contexts (Boutot, 2009). Because children with ASDs have difficulty generalizing skills that they have learned, they benefit from learning a skill in the context that is most often

used. For example, children with ASD may benefit from learning play or communication skills in a play or interpersonal environment with caregivers and friends. Unfortunately, children with ASD are unmotivated to respond to complex social and environmental stimuli (Rogers & Vismara, 2008) and therefore are unlikely to engage spontaneously in play activities with caregivers or peers. As a result, they may miss out on opportunities to learn language and social skills and to generalize these abilities to other environments. Naturalistic strategies focus on making play interactions more rewarding for children with ASD by incorporating behavioral reinforcement and rewards (positive parenting strategies) into child-led play interactions. Allowing the child to lead the interaction with little parent interference or correction is considered instrumental to optimizing the learning experience (Boutot, 2009).

Pivotal Response Treatment (PRT; Koegal et al., 1999) is a child-led, naturalistic teaching strategy designed for children with ASD that uses a developmental framework and behavioral principles to increase a child's motivation to participate in communicative and social situations. In contrast to treatments aimed at teaching specific focal skills, PRT focuses on addressing "pivotal areas," which are believed to produce improvement in areas other than those specifically targeted (Koegal, Koegal, Harrower, & Carter, 1999). These "pivotal areas" include "responsivity to multiple cues," "child motivation," "child self-management," and "child self-initiations" (Baker-Ericzen, Stahmer, & Burns, 2007). For example, if child motivation to interact with caregivers is increased, the child may independently increase his or her own learning opportunities. PRT encourages children to initiate learning events and to benefit from naturally-occurring rewards and consequences (Baker-Ericzen, Stahmer, & Burns, 2007). It has been shown that

treatment responders to PRT exhibited a greater interest in toys, are more tolerant of social proximity to others, engaged in lower rates of non-verbal self-stimulation, and display higher rates of verbal self-stimulation (Rogers & Vismara, 2008). In general, PRT has demonstrated improved language, social, adaptive functioning, and play skills in children with ASD (Koegal, Koegal, Harrower, & Carter, 1999; Koegal, Koegal, Shoshan, & McNerney, 1999), as well as decreased levels of disruptive behaviors. Other popular models that maintain an emphasis on naturalistic strategies include “Floortime” or Developmental, Individual-difference, Relationship-based model (DIR; Greenspan, 1992; Greenspan & Wieder, 1999; Wieder & Greenspan, 2006) and Treatment and Education of Autistic and Related Communication Handicapped Children (TEACCH; Mesibov, 1994; Schopler, 1994; Schopler & Reichler, 1971). All of these treatments focus on enhancing child motivation to engage in socialization and using behavioral principles within the context of the caregiver-child interaction.

Despite anecdotal evidence that existing naturalistic treatment strategies do lead to improvements in language and social interactions, sufficient research has not been conducted to establish these treatments as “evidence-based.” Reviews of various behavioral interventions for children with ASDs point to limitations in methodology and statistical design (Levy, Kim, & Olive, 2006; Wheeler, Blaggett, Fox, & Blevins, 2006; National Research Council, 2001). Suggested guidelines for researching psychosocial interventions for children with ASD were developed in 2007 (Smith et al.), and included four distinct recommended phases of program development: (a) formulation and systematic application of a new intervention technique; (b) developing a manual and research plan for evaluation of the intervention across sites; (c) randomized clinical

trials (RCTs); and (d) community effectiveness studies. However, the number of true experimental design studies remains limited (Howlin, Magiati, & Charman, 2009). The lack of strong designs, independent replications, or peer-reviewed data keeps many well-known autism treatments from meeting criteria as evidence-based. For example, PRT in particular appears to have a relatively strong research backing based on single-subject designs, but the lack of randomized controlled trials prevents this treatment's efficacy from being adequately evaluated (Rogers & Vismara, 2008). In addition, many treatments for ASD are not manualized (such as TEACCH), and the implementation of these treatments varies in replicability and quality at different sites (Helt, M., Kelley, E., Kinsbourne, M., Pandey, J., Boorstein, H., Herbert, M., et al., 2008).

A review of studies that implemented naturalistic developmental intervention approaches (Wetherby & Woods, 2008) distinguished only five studies (Aldred, Green, & Adams, 2004; Drew et al., 2002; Kasari, Freeman, & Paparella, 2006; McConachie, Randle, Hammal, & LeCoureur, 2005; Yoder & Stone, 2006) that met the Smith et al. (2007) criteria for using a randomized controlled experimental group design, included children age 3 years or younger, and used social communication as a measure of outcome. Despite the limited nature of the research on naturalistic strategies, promising findings suggested that developmental interventions with low-intensity (sometimes as little as an hour a week) and that include clinician-delivered and parent training programs can improve social communication outcomes relatively quickly (in as few as 6 weeks) (Wetherby & Woods, 2008). In addition to the possibility that helping children improve social, communicative, and adaptive functioning, naturalistic strategies could also help caregivers to reduce child disruptive behaviors in young children with ASD.

Parental positive attention to appropriate behaviors that are incompatible with negative behaviors has been shown to result in decreased negative behaviors and increased in targeted desired behavior (Boggs & Eyberg, 2008). Helping parents to use operant conditioning strategies outside of the clinical environment is instrumental to generalizing and maintaining child behavior changes (Brookman-Frazee, Stahmer, Baker-Ericzen, & Tsai, 2006). However, very few studies of treatments for children with ASD have explicitly targeted parenting practices with regard to externalizing behavior problems; instead, clinicians have taught parents to search systematically for the functions of disruptive behaviors without drawing attention to the parent-child dynamic (Brookman-Frazee, Stahmer, Baker-Ericzen, & Tsai, 2006). Future studies need to explore accessible early intervention treatments for ASDs that include parent-implemented components, especially for families of low socioeconomic status and diverse cultural background. An intervention designed to improve the communicative, social, behavioral, and adaptive functioning of children through a sociobehavioral mechanism such as the parent-child relationship may be key to affecting change for children with ASD.

Parent-Child Interaction Therapy

Parent-Child Interaction Therapy (PCIT) is an evidence-based treatment for young children with disruptive behavior. PCIT has also been found effective for treating parent-child dyads in other diagnostic populations (e.g., child abuse, separation anxiety disorder, disruptive behaviors of children with intellectual delays) (Chaffin et al., 2004; Bagner & Eyberg, 2007; Pincus, Choate, Eyberg, & Barlow, 2005). The Child Directed Interaction (CDI) phase of PCIT allows parents to teach appropriate social behaviors (communication, sharing) through the behavioral principle of operant conditioning (Harwood & Eyberg, 2006). During CDI, parents learn to follow the child's play by

providing positive attention for appropriate behaviors and ignoring inappropriate behaviors (Harwood & Eyberg, 2006) while at the same time fostering a close and rewarding parent-child relationship. This use of differential social attention teaches children to increase behaviors that are more likely to receive positive parental attention (Boggs & Eyberg, 2008). In CDI Training, therapists observe and coach parents, via digital audio-visual transmission from the observation room, to use the CDI skills while interacting with their child in a playroom. This method of real-time cueing and reinforcing caregivers' skill in the application of differential social attention with their child leads to rapid skill acquisition and child behavior change (Shanley & Niec, 2010). The CDI component of PCIT has been found effective in increasing parent-child attachment (Neary & Eyberg, 2002) and decreasing child disruptive behaviors (Harwood & Eyberg, 2006) in populations of children without developmental delay.

PCIT research efforts initially focused on children with oppositional defiant disorder; children with ASDs were routinely screened from the studies and referred to other treatment. However, PCIT components may be therapeutic for young children with ASD because the conceptual foundation of PCIT emphasizes naturalistic strategies and incorporates both the parent-child relationship and behavior analytic conceptualizations of change. In recent years, PCIT has shown potential promise as a focal treatment for ASD by increasing compliant behaviors and decreasing aggressive behaviors of children with ASDs (Masse, McNeil, Wagner, & Chorney, 2008). Like the PRT approach previously described, PCIT identifies caregivers as having an important role in implementing their child's treatment. Additionally, PCIT combines naturalistic and behavioral approaches by using child-led activities to improve the parent-child

relationship and enhance social and communicative learning. This treatment involves parents as providers of differential reinforcement, imitation, and natural motivators to encourage desired behaviors in children with ASDs, such as increased verbalizations and social reciprocity.

Theoretical Underpinnings of the Use of Child Directed Interaction Component for Children with Autism Spectrum Disorders

The Child Directed Interaction component of PCIT may be effective as an intervention for young children with ASDs. Because the emphasis of CDI is to build attachment between caregiver and child and the CDI can be tailored to support appropriate child speech and play behaviors with praise, reflection, imitation, description and the expression of enjoyment (Eyberg, 1982), children may increase their language skills and repertoire of play behaviors. Due to deficits in social and communicative abilities, children with ASD often interact less frequently with parents and peers than typically developing children and therefore miss out on important experiences that lead to the acquisition of social and communicative skills (Greenspan & Wieder, 1999; Mesibov, Shea, & Schoper, 2004). The results of a 16-year longitudinal study demonstrated that children of parents who “synchronized” their behavior to their child’s behaviors and interests (essentially allowing the child to lead the play and following along with positive attention) had children with significantly better communication skills than children of parents who did not engage as actively with the children during play (Siller & Sigman, 2002). CDI Training, which similarly encourages and trains caregivers to follow their child’s lead and make play enjoyable for the child, may have correspondingly positive outcomes. Studies of other parent-implemented treatments for young children with ASD have found improved child communicative behavior and

enhanced parent-child interaction (McConachie & Diggle, 2005). For example, parent implementation of naturalistic strategies was correlated with a significant increase in functional child verbalizations at post-treatment assessment compared to a control group (Nefdt, Koegel, Singer, & Gerber, 2010). The combination of a rewarding, child-centered social interaction and the use of the consistent behavioral principles seen in CDI would be expected to result in prosocial, language, adaptive and behavioral improvements following treatment.

The effect of CDI Training (CDIT) alone on children with ASD has not been extensively studied. An adaptation of PCIT examining the effect of treatment among 19 children with high-functioning ASD demonstrated a significant pre-post increase in shared positive affect in the parent-child relationship after the CDI phase of PCIT (Solomon, Ono, Timmer, & Goodlin-Jones, 2008). CDI training was also examined in a pilot study of 11 children with ASD designed to evaluate verbal language acquisition and prosocial interactions following treatment (Abner, 2008). Children showed decreased externalizing behavior as well as increased frequency of prosocial verbalizations and overall frequency of words spoken.

Maintenance of Treatment Gains and PCIT

Parent-Child Interaction Therapy has been associated with long-term gains in children with disruptive behavior disorders. In a study examining child outcomes 3 to 6 years post-PCIT, Hood and Eyberg (2003) found that children not only maintained their behavioral gains but also improved their behavior over time. In a study evaluating Triple P Positive Parenting Program, another widely-disseminated program for children with disruptive behaviors, young children with Autism Spectrum Disorders maintained significantly reduced behavior problems at 6-months post-treatment (Whittingham, K.,

Sofronoff, K., Sheffield, J., & Sanders, M., 2008). The maintenance of gains in PCIT and other parenting programs may be due to parental adherence to behavioral skills learned in treatment; without continued parental adherence, children might return to previous maladaptive behaviors. Moore and Symons (2009) evaluated patterns of parental adherence to treatment recommendations in the population of children with ASDs and found that parents were significantly more likely to adhere to behavioral treatment recommendations that asked them to reinforce their child's positive behaviors as opposed to those that asked them to punish negative behaviors (Moore & Symons, 2009). These results suggest that CDIT, which focuses on reinforcing appropriate behaviors, may also promote adherence.

Study Objectives and Hypotheses

This study examines the effects of CDI Training (CDIT) on the verbal, social, adaptive and behavioral functioning in children with ASD. Child skill acquisition was assessed through direct observation of parent-child interactions using a standardized laboratory situation and multiple measures to evaluate child functioning. Study objectives and aims are as follows:

Aim 1

To determine whether CDIT improves verbal, adaptive, prosocial and behavioral functioning in children with ASD at immediate post-treatment assessment (Time 2 Assessment) when compared to a Waitlist control group.

Hypothesis 1.1

Children in the immediate treatment (IT) group will demonstrate significantly fewer behavior problems than the WL control group at the Time 2 Assessment.

Hypothesis 1.2

Children in the IT group will demonstrate significantly greater improvements in receptive and expressive language as compared to the WL control group at the Time 2 Assessment.

Hypothesis 1.3

Children in the IT group will demonstrate significantly greater improvements in prosocial behavior as compared to the WL control group at the Time 2 Assessment.

Hypothesis 1.4

Children in the IT group will demonstrate significantly greater improvements in adaptive functioning as compared to the WL control group at the Time 2 Assessment.

Aim 2

To determine whether the expected gains from CDIT continue to be present at 6-week follow-up to treatment.

Hypothesis 2.1

Six weeks following CDI Training completion, children will maintain behavioral outcomes from post-treatment.

Hypothesis 2.2

Six weeks following CDI Training completion, children will maintain receptive and expressive language outcomes from post-treatment.

Hypothesis 2.3

Six weeks following CDI Training completion, children will maintain prosocial behavior outcomes from post-treatment.

Hypothesis 2.4

Six weeks following CDI Training completion, children will maintain adaptive functioning outcomes from post-treatment.

Aim 3

To determine whether CDIT training improves verbal, adaptive, prosocial and behavioral functioning in children with ASD from pre-treatment to the 6-week follow-up.

Hypothesis 3.1

Children will demonstrate significantly reduced behavior problems from the pre-treatment assessment to the six-week Time 3 Assessment.

Hypothesis 3.2

Children will demonstrate significant improvements in receptive and expressive language from the pre-treatment assessment to the six-week Time 3 Assessment.

Hypothesis 3.3

Children will demonstrate significant improvements in prosocial behavior from the pre-treatment assessment to the six-week Time 3 Assessment.

Hypothesis 3.4

Children will demonstrate significant improvements in adaptive functioning from the pre-treatment assessment to the six-week Time 3 Assessment.

CHAPTER 2 METHOD

Participants

Participants were 30 families of children with ASDs, with 15 families in the Immediate Treatment Condition and 15 families in the Waitlist Control Condition. Children in the study were mostly boys (80%), with a mean age of 5 years, 11 months ($SD = 1.34$). Participants were recruited from the University of Florida Psychology Clinic (33%), the University of Florida Psychiatry Clinic (17%), other research studies (10%), pediatricians (10%), recruitment materials (7%), tutors (3%), speech therapists (7%), occupational therapists (3%), schools (3%), and other (7%). Racial-ethnic composition was 87% Caucasian, 0% African American, 7% multiracial, 0% Asian and 7% Hispanic. Primary caregivers were all mothers. Primary caregivers' education level was as follows: 3% did not complete high school, 13% graduated high school, 33% attended some college or technical school, 23% graduated college, and 28% completed some graduate education. Child ASD diagnoses were 40% Autistic Disorder, 7% Asperger's Syndrome, and 53% Pervasive Developmental Delay, Not Otherwise Specified (PDD NOS).

Of the 15 families in the Immediate Treatment Condition who completed the 8 sessions of CDIT, 43% of primary caregivers met CDI graduation criteria. Seventy percent of assigned homework was completed by primary caregivers. Secondary caregivers were involved in 72% of treatment cases and participated in treatment in 45% of sessions. Of secondary caregivers who participated, 67% were fathers and 33% were stepfathers. See Table 2-1 for child and family demographic information.

The following criteria for child participants was required for study inclusion: (a) Diagnosis of ASD based on a previous diagnosis by a healthcare professional confirmed by the administration of the CARS2 at the Time 1 pre-treatment assessment; (b) Cognitive functioning at the 3-year-old level on tests of non-verbal functioning; (c) Ability to speak 3 intelligible words or word approximations (incomplete/incorrectly spoken words that have the meaning of words); (d) Age between 3 years 0 months and 7 years 11 months; (e) Stability on their medications or other interventions one month prior to treatment and throughout the duration of their study participation. Due to the high comorbidity of ASD and Intellectual Disorder (ID) diagnoses, in combination with the known effectiveness of PCIT with children diagnosed ID (Bagner & Eyberg, 2007), children with dual diagnoses of ASD and ID were not excluded from the study. The self-selected Primary Caregiver was required to have unimpaired intellectual functioning (a cognitive functioning equivalent standard score of at least 75) and to attend all sessions (one CDIT Teach Session and 7 CDIT Coaching Sessions) and assessments. Primary caregivers were required to have unimpaired cognitive functioning so that they would be able to learn the skills presented and generalize them to novel situations. Families were considered “drop-outs” if they did not attend the 8 required treatment sessions and the assessments. Children with a history of severe sensory impairment (e.g., deafness), or families with suspected abuse or crisis requiring out-of-home placement during the study were excluded from study participation. Inclusion and exclusion criteria can be found in Diagram 1.

Attrition

Nine families who met inclusion criteria and were randomized to a treatment condition did not attend their Time 2 assessment and were considered drop-outs. Of

those 9 families, only 2 families had completed 1 or more treatment sessions; the rest of these families stopped participation before their first session. Of the 9 families that did not return for their Time 2 assessment, five families had been randomized to the WL condition and 4 were randomized to the IT condition. Children of this subset were mostly boys (67%), with a mean age of 6 years, 11 months ($SD = .94$). Racial-ethnic composition was 56% Caucasian, 11% African American, 11% Asian and 22% Hispanic. ASD composition was 33% Autistic Disorder and 68% Pervasive Developmental Delay, Not Otherwise Specified (PDD NOS). Primary caregivers' education level was as follows: 11% did not complete high school, 11% graduated high school, 44% attended some college or technical school, 22% graduated college, and 11% completed some graduate education. Participants were recruited from the University of Florida Psychology Clinic (44%), the University of Florida Psychiatry Clinic (22%), other research studies (11%), and schools (22%).

Among the 7 participants who did not return after completing their pretreatment assessment but before receiving treatment, reported reasons for dropout included the following: starting a new medication or treatment (22%), family dynamic changes (22%), financial difficulties (11%) and unknown (44%). Only 2 families in the Immediate Treatment group dropped out of the study after initiating treatment. In one case, a primary caregiver was in the midst of a difficult divorce. In the other case, the child demonstrated improvements in school and the family decided that treatment was no longer necessary. See Table 2-2 for child and family demographic information. A chart of treatment flow is also provided to show the flow of participants throughout the study. See Figure 2-1.

Measures

A list of all measures and a chart of when each measure was collected can be found in Diagram A-2.

Demographic and Background Questionnaire

A parent questionnaire provided descriptive information about the child and family including sex, age, race/ethnicity, occupation, education level, and medical history. See Figure C-1 for the Demographic and Background Questionnaire.

Phone Screener

Initial phone screening occurred during the first phone contact that potentially interested participants made to us. If caregivers indicated interest in participating, specific inclusion/exclusion criteria were also evaluated by the screener, including symptoms of ASD from the *DSM-IV-TR* (APA, 2000). Caregivers verbally presented with a checklist of symptoms of ASD and were asked to answer “yes/no” to whether their child met specific criteria. Children were required to meet criteria for ASD based on this checklist to be scheduled for a pre-treatment assessment. See Figure B-1 for the Phone Screener.

Semi-structured Interview

A semi-structured clinical interview was conducted with the caregiver at the pre-treatment Time 1 Assessment to gather information on the child’s sociobehavioral, family, and treatment history. See Figure D-1 for the Semi-structured interview.

The Childhood Autism Rating Scale ,Second Edition (CARS2; Schopler, Reichler, & Renner, 1988; Schopler, Bourgondien, Wellman,& Love, 2010)

The CARS is a 15-item observational screener developed to identify children with ASDs while distinguishing them from children with developmental disabilities without a

cormorbid ASD. Assessors observe the child and then rate the child on 15 items of behavior. Internal consistency of .94 and 1-year test-retest reliability of .88 have been reported (Schopler et al., 1988). Inter-rater reliability ranged from a correlation coefficient of .55 (Level and Consistency of Intellectual Response) to .93 (Relation to People), with an average inter-rater reliability of .71. The second edition of the CARS (the CARS2) keeps the original format of the CARS and adds a form for evaluating children with High Functioning Autism and a parent-report questionnaire to aide diagnosis. The Standard Version is equivalent to the original CARS and appropriate for children younger than 6 years old and those with communication difficulties or below-average estimated IQs. The High Functioning Version is appropriate for verbally fluent children 6 years of age and older, with IQ scores above 80. The assessor selects which survey to complete based on child characteristics. The CARS2 was used as an observational measure at the Time 1 Assessment to confirm ASD diagnosis.

Peabody Picture Vocabulary Test-Third Edition (PPVT-III: Dunn, 1997)

The PPVT-III is a well-standardized measure of receptive language in individuals age 2.6 years and older. This instrument is offered in two parallel forms— IIIA and IIIB—for reliable testing and retesting. Reliability coefficients are as follows: Internal consistency (Alpha: .92 to .98), Split-half: (.86 to .97), Alternate-form (.88 to .96), and Test-retest (.91 to .94). The PPVT-III has an average correlation of .69 with the OWLS Listening Comprehension scale and .74 with the OWLS Oral Expression scale. Its correlations with measures of verbal ability are: .91 (WISC-III VIQ), .89 (KAIT Crystallized IQ), and .81 (K-BIT Vocabulary). The PPVT-III was used to assess children's level of receptive language and to track children's receptive language development at all assessments. The child was randomly be assigned either form A or

form B at the Time 1 Assessment. At the Time 2 Assessment, the child was tested using the other form. At the Time 3 Assessment, children were tested with the first form again. For the child's primary caregiver, a standard score of 75 or higher on form A was also required for study inclusion for someone who has not obtained the equivalent of a 2-year college degree.

Vineland Adaptive Behavior Scales, Second Edition (Vineland-II; Sparrow, Balla, & Cicchetti, 1984; Sparrow Cicchetti,, & Balla, 2005).

The Vineland-II is comprised of a semi-structured interview that assesses personal and social skills in children from birth through 18 years, 11 months. The Parent/Caregiver form covers the same content as the Survey Interview, but uses a rating scale format. The Vineland-II covers 5 domains: Communication, Daily Living Skills, Socialization, Motor Skills, and a Maladaptive Behaviors Index. Internal consistency coefficients for the Survey Form ranged from .83-.94. Test-retest reliability for domains was .83 to .90; with an Adaptive Behavior Composite of .88. The Vineland-II also demonstrated strong construct and concurrent validity. It can be used to track progress after treatment completion. The Vineland-II Parent/Caregiver form was administered at all major time points to track progress in adaptive behaviors across time points.

Differential Abilities Scale, Second Edition (DAS-II; Elliott, 2007).

The DAS-II is a brief, comprehensive measure of ability that is designed to measure the cognitive strengths and weaknesses in individuals between the ages of 2 years 6 months and 17 years 11 months across a broad range of developmental levels. A non-verbal cognitive functioning score can be attained for children with very little language, thus making it appropriate for children with ASD who may not have sufficient

expressive abilities to complete other measures of cognitive functioning. The DAS-II is divided into two main testing batteries: The Early Years battery and the School-Age battery. All children were tested with the Early Years battery. The Early Years core battery includes verbal, nonverbal, and spatial reasoning subtests appropriate for ages 2:6 through 6:11. The battery is divided into two levels: children ages 2:6–3:5 and 3:6–6:11. The children were administered four core subtests to obtain the General Cognitive Abilities (GCA) composite score and children ages 3:6–6:11 take six core subtests which contribute to the GCA composite score. Although these subtests focus on ages 2:6-6:11, the DAS-II can also be used to assess children ages 7:0–8:11 who are suspected of having cognitive delay. Testing usually takes 20-30 minutes and the subtests can be given in any order to enhance child cooperation. The DAS-II was conducted at pre-treatment to assess the child's level of intellectual functioning and to contribute to a screener of comorbid ID. Children were required to complete two tests of non-verbal reasoning at the 3-year-old level to be included in the study. Children with cognitive functioning below the 3-year-old level as measured by the DAS-II were excluded from the study.

Social Responsiveness Scale (SRS: Constantino & Gruber, 2005; Constantino et al., 2000)

The SRS is a 65-item rating scale that measures the severity of autism spectrum symptoms as they occur in natural social settings, such as interactions with parents or peers, for children 4 to 18 years old. The items are rated on a 4-point Likert scale ranging from “not true” to “always true” and informants are asked to consider the last 6 months. This parent-completed measure takes approximately 15 to 20 minutes and provides a clear picture of a child's social impairments, assessing social awareness,

social information processing, capacity for reciprocal social communication, social anxiety/avoidance, and autistic preoccupations and traits. In addition to a Total Score reflecting severity of social deficits in the autism spectrum, the SRS generates scores for five Treatment Subscales: Social Awareness, Social Cognition, Social Communication, Social Motivation, and Autistic Mannerisms. The SRS standardization sample was composed of more than 1,600 children from the general population. Norms are separated by rater (i.e., parent, teacher) and by the rated child's gender. Test-retest stability ranged from .77 to .85 for parent ratings; mother-father interrater reliability was .91. Validity was examined for the SRS in terms of discriminant validity, concurrent validity, structural validation, and factor analytic studies. The SRS was administered to the parents of all children over 4 years old at each of the three assessments. Cronbach's Alpha at pretreatment for this sample was 0.84.

Eyberg Child Behavior Inventory (ECBI; Eyberg & Pincus, 1999).

The ECBI is a 36-item parenting scale of disruptive behavior. The ECBI Intensity Scale measures the frequency with which disruptive behavior occurs, and the Problem Scale measures how problematic the child's behavior is for the parent. The Intensity and Problem scales yield test-retest reliability coefficients of .80 and .85 across 12 weeks and .75 and .75 across 10 months, respectively (Funderburk, Eyberg, Rich, & Behar, 2003). Psychometric examination of the ECBI with children with MR referred for treatment of behavior problems found these children received lower scores on both scales than nondelayed children referred for treatment of behavior problems (Cone & Casper-Beliveau, 1997). Their scores were significantly above normative means, however, supporting the use of these scales for measuring outcome in this population. In our study, the ECBI was completed weekly by the primary caregiver to assess

treatment progress and was used as a measure of treatment outcome. Cronbach's Alpha at pre-treatment for this sample was 0.91 for the Frequency scale and 0.83 for the Problem scale.

Dyadic Parent–Child Interaction Coding System (DPICS; Eyberg, Nelson, Duke, & Boggs, 2004).

The DPICS is a behavioral observation coding system that measures the quality of parent-child social interaction during three 5-minute standard situations that vary in the degree of parental control (i.e., child-led play, parent-led play, and clean-up). The convergent and discriminative validity of the DPICS categories have been extensively documented, and the psychometric data are summarized in the DPICS manual (Eyberg et al., 2004). The DPICS were administered to all caregivers and children at all major assessments, as well as during the first 5-minutes of the parent-child interaction of CDIT sessions. The total verbalizations of the child as measured by DPICS categories was calculated by summing all child codes across DPICS categories. DPICS coding sessions were video-taped to ensure reliability of coding, and coding reliability observations is in progress. Kappa = 0.66.

Word Count (Abner, 2008)

Word Count was defined as the number of intelligible words spoken by the child in a 5-minute period during the child-led-play DPICS situation to measure expressive language. To be included in the frequency count, words had to be distinct and separate from one another, but could be repeated words. In a previous study, 92% inter-rater reliability was obtained. Samples of the child's Word Count were coded from the same 5-minute DPICS coding sessions as indicated in the DPICS description in the above section. Thus, Word Count sessions were also video-taped to ensure reliability of

coding. Coding reliability observations is in progress. Inter-rater reliability will be calculated when reliability coding is complete. Kappa=0.13.

Treatment Integrity

PCIT All therapy sessions were videotaped, and 30% of the session tapes from each family were randomly selected and checked for integrity using the treatment manual session integrity checklists. Twenty-seven percent of the checked tapes were again randomly selected and checked independently by a second coder to provide an interobserver reliability estimate. Integrity coding is still in progress, and treatment sessions for 11 of the 15 families have been coded. For these 11 families, accuracy was 98% with treatment protocol, and percent agreement interrater reliability was 97% (range = 90-100%).

Experimental Design

Half of the 30 family sample (n=15) was randomized to immediate treatment (IT) condition and started CDIT treatment at Week 2 (1 week after the initial assessment). The other 15 families were randomized to the waitlist (WL) condition, and began CDIT treatment at Week 13 (12 weeks after the initial assessment; see Diagram A-3).

Major assessments were conducted at three time points for participants in both the IT and WL conditions. The Time 3 Assessment for the IT condition served as their 6-week follow-up assessment and it served as the post-treatment assessment for the WL condition (see Diagram A-3). Each individually-conducted assessment included a measure of language skills (receptive and expressive); parent-report measures of child and family functioning, child adaptive functioning, child disruptive behaviors; and observations of child social behaviors within the context of parent-child interactions with the self-identified primary caregiver. The Time 1 assessment also included interviews

with the caregiver(s), parent-report demographic form, ASD symptom screener (CARS2), and intelligence assessment for children and caregivers (DAS-II and PPVT-III). During treatment, weekly parent ratings of child behavior, child Word Count, and observations of parent-child interaction were collected to guide treatment. The Assessment and Treatment Timeline is presented in Diagram A-3.

Procedure

Phone Screening

Initial phone screening occurred during the first phone contact that potentially interested participants made to us. This pre-screening was used to collect basic identifying information including name, contact information, age, and whether the child has previously received a diagnosis of ASD by a mental health professional. The family was informed of study procedures, time requirements, wait-list design, and inclusion and exclusion criteria. If caregivers indicated interest in participating, specific inclusion/exclusion criteria were also evaluated by the screener, including symptoms of ASD from the *DSM-IV-TR*. Eligible families were scheduled for a Time 1 Assessment during this phone conversation.

The Major Assessments

Time 1 assessment

The Time 1 assessment is the first of the major assessments and was completed prior to treatment. The Time 1 assessment visit was devoted to completing the informed consent process, determining if the family met all study inclusion criteria, and then obtaining baseline information.

Informed consent. A trained assessor met each family to complete the informed consent process. During this process, the assessor reviewed the limits of confidentiality

and the purposes of the study, its methods and procedures, risks and benefits, treatment options outside the study, requirements of participation, and remuneration available. The assessor also reviewed parental expectations, experience, and knowledge related to ASD and provided a summary of available evidence regarding ASD treatments for preschoolers and reviewed community treatment standards, covering risks, side effects and potential benefits, treatment options outside the study, requirements of participation, random assignment to treatment or waitlist group, remuneration available to study participants, and the right to withdraw at any time without penalty. The assessor explained that some families would not begin treatment for 12 weeks. All participants in the study were told during the informed consent process that if they or their child reported child abuse to the researchers, or if the researchers observed evidence of child abuse or abusive behavior at any time during this study, the researchers would be required by law to report this information to the appropriate agents and agencies. Key personnel and research assistants answered any questions the caregivers had, and informed consent was documented by written signature of the caregiver participant and the signature of the personnel obtaining the consent before any measures were collected.

For families with secondary caregivers participating, secondary caregivers signed a separate informed consent document. Child assent was not obtained due to the children's age and likely inability to understand what is involved in the research, as well as potential benefits to participants, other children with ASD, or society as a whole. Parents were asked to sign the consent form indicating their willingness to participate. Parents were provided with a copy of the informed consent to take home with them to

examine at their leisure. If the parents did not wish to postpone treatment for 12 weeks if they were randomized to the WL condition, they were excluded from the study and referred elsewhere for treatment. If the family wished to complete PCIT, they were referred to PCIT providers in the Psychology Clinic or the community.

Other information obtained. Following the informed consent process, parents completed the Demographic Questionnaire. They participated in a semi-structured interview with the assessor to evaluate specific questions and concerns and treatment goals. The assessor administered the PPVT-III and the DAS-II to the child while the parents completed the ECBI, the Vineland-II, the Social Responsiveness Scale and other forms. The parents also completed the DPICS parent-child interaction observations for CDI (requiring 10 minutes per parent), at which time child wordcount was obtained. Primary caregivers that had not obtained a 2-year college degree completed the PPVT-III. When all the measures were complete, the assessor reviewed with the parent any missing or incorrectly completed items. The assessor discussed the results with the family. Families that did not meet study criteria were referred elsewhere as appropriate. Families did not receive monetary reimbursement for the first major assessment.

Time 2 and time 3 assessments and 6-week follow-up assessments

Time 2 Assessments were completed by both the IT and the WL group after the IT group has completed treatment. The Time 3 Assessment was completed by the IT group 6 weeks after the Time 2 Assessment. The Time 3 Assessment was completed by the WL group after this group completed treatment. These assessments are identical to one another and similar to the pre-treatment assessment except that the interview,

PPVT-III for parents and DAS-II were not administered. Families were paid \$10 for each of the post-treatment assessments.

Randomization

After 2 families had completed the Time 1 assessments, they were randomly assigned to one of two treatment conditions: (a) *Immediate Treatment (IT)* or (b) *Waitlist (WL)*. A stratified approach was used to ensure that both treatment conditions were similar in terms of the severity of autistic symptomatology with equivalent numbers of children with Autistic Disorder, Asperger's Disorder, and PDD-NOS in the IT and the WL groups. A stratified approach was used as follows: There were three different lists of ID numbers. Each list corresponded with an ASD Diagnosis: Autistic Disorder, Asperger's Syndrome, and PDD-NOS. Prior to treatment, three ID numbers were randomly pre-assigned to either the WL or the IT condition. After the child received an ASD diagnosis, the family was randomly assigned an ID number from the list specific to that diagnosis. The child was placed in the treatment group that has been pre-selected to correspond with the ID number. For example, if a child received a diagnosis of Asperger's Disorder, his family would be randomly assigned an ID number from the "Asperger Disorder list." This number would already be associated with a treatment condition. No random number was used more than once. Assignment was always made in the order participants signed their informed consent form, thus controlling for lag time in the two treatment conditions. The families were informed by the project coordinator by telephone of their treatment group assignment, therapists' names, and approximate treatment start date.

Treatment

Core features of PCIT

PCIT has similarities to other parent training approaches for children with externalizing behavior, but may be distinguished by five core features. First, both the child and parents are involved in treatment, and treatment progress is determined by changes in their interactions. The second core feature is extensive *in vivo* coaching of parents during parent-child play situations, enabling shaping of parents' behaviors directly, and the child's behaviors via the parent. The third core feature of PCIT is its emphasis on responsive parenting by shaping nurturant parenting and related nonverbal communication skills in the early phase of treatment. A fourth core feature is *in vivo* training of the discipline procedure in clinic sessions until parents achieve competency and are able to use the procedures independently. Finally, PCIT is assessment driven, and treatment continues until the treatment goal criteria are met. Sessions are guided by observational data collected in the first 5 minutes of the parent-child interaction, and the family reviews a summary sheet of these weekly data at the end of each session to evaluate their progress toward the mastery criteria, determine targets for homework practice, when to move from one treatment phase to the next, and provide one of the criteria for termination.

Application of PCIT

The application of PCIT in this study was in many ways unchanged from traditional PCIT. Individual PCIT sessions were conducted once a week and were approximately 75 minutes in length. The first session was devoted to building rapport and orienting the family to the therapy process. Typically, the Child-Directed Interaction phase is the first phase of treatment preceding the Parent-Directed Interaction discipline phase. The

principles and skills of the interactions were presented in the first teaching session to the parents alone, using modeling and role-play. Coaching sessions followed in which parents took turns being coached interacting with their child or observing and coding skills of their spouse. Parents were asked to practice the skills during daily home play sessions with their child (5 minutes each day). Coaching focused on helping the parents to obtain mastery of the specific CDI skills during the 5-min coding interval at the start of the session (i.e., 10 behavioral descriptions; 10 reflections; 10 labeled praises; and fewer than 3 commands, questions, or criticisms).

Adaptation of PCIT for the purposes of this research

In this specific sample, coaching was tailored to focus on helping parents to implement the skills to address to the needs of their specific child in an effort to improve language, adaptive, and prosocial functioning and to decrease disruptive behaviors. Further, the study investigated the potency of CDI Training (CDIT) alone as it impacts the parent-child relationship and level of ASD symptomatology (e.g., stereotypic behaviors, imitative skills, eye contact, etc.).

Because the focus of this research is on CDIT skill acquisition, the second phase of treatment, the Parent-Directed Interaction (PDI) phase was not taught. Seven coaching sessions of CDIT were completed whether or not the parent obtained mastery of skills within the seven sessions. In standard PCIT, parents move on the second phase of treatment when they obtain CDIT Mastery Criteria, as CDIT skills continue to be coached and honed within PDI. However, clinical experience has demonstrated that some families may reach mastery criteria for CDIT in the first or second session of treatment. We did not want to penalize parents who learn the skills more quickly by denying them important sessions of coaching and learning to tailor this skill set to their

specific ASD child. For this reason, although CDIT mastery was encouraged and not all parents reached this standard, all parents received the same number of treatment sessions.

Statistical Analysis

Data analysis was conducted using the Statistical Package for the Social Sciences 17.0 (SPSS®). Preliminary statistical analyses and specific analyses for each hypothesis are detailed below.

Data was screened to ensure univariate normal distribution prior to statistical analyses using a number of indicators. Normality assumptions were first assessed with descriptive statistics and boxplots. Values of kurtosis and skewness were also considered, and z-score values at or above 2.58 were selected as cut points to indicate a significantly non-normal distribution. Finally, Kolmogorov-Smirnov and Shapiro-Wilk tests were used (Field, 2005). Using these multiple indicators, significantly non-normal distributions were analyzed using non-parametric statistical tests to preserve integrity of data points in a small sample.

Descriptive statistics, including means and standard deviations of the DPICS total child verbalizations, ECBI (Intensity and Problem scales), PPVT-III, Wordcount, Vineland-II (Composite, Social, and Maladaptive Behavior Index Scales), and the Social Responsiveness Scale, and demographic variables were reported. The Outcome Measures Breakdown is presented in Diagram 4 in Appendix A.

For hypotheses 1.1 to 1.4, assessing the within and between group differences following CDI training, a mixed between-within subjects analyses of covariance (ANCOVA), with pre-treatment scores as covariates, was conducted to determine

training effects from pre-training to post-training on each measure. ANCOVA was chosen to control for any incidental pre-treatment discrepancies between groups.

For hypotheses 2.1 to 2.4, assessing the maintenance of changes in child behavior, child receptive and expressive language, child prosocial behavior, and child adaptive functioning, paired samples *t* tests were conducted to assess for significant changes in parent report of child externalizing behavior problems, adaptive functioning, and child prosocial behaviors, and observed significant changes in child language. However, due to the small sample size of groups that completed the Time 3 assessments in the current study, related low power for analyses, and potential for inaccuracy in results, transformations were not conducted on these variables to correct for significant skewness for analyses. Instead, the Wilcoxon Signed Ranks Test, a non-parametric repeated-measures analysis, was used to evaluate significance on data that was not normally distributed.

For hypotheses 3.1 to 3.4, assessing the changes from pre-treatment to 6-week follow-up in child behavior, child receptive and expressive language, child prosocial behavior, and child adaptive functioning, paired samples *t* tests were conducted to assess for significant changes in parent report of child externalizing behavior problems, adaptive functioning, and child prosocial behaviors, and observed significant changes in child language. However, due to the small sample size of groups that completed the Time 3 assessments in the current study, related low power for analyses, and potential for inaccuracy in results, transformations were not conducted on these variables to correct for significant skewness for analyses. Instead, the Wilcoxon Signed Ranks Test, a non-parametric repeated-measures analysis, was used to evaluate significance on

data that was not normally distributed.

Table 2-1. Demographic characteristics of immediate treatment and waitlist groups

Characteristic	Immediate Treatment		Waitlist Control		<i>t</i> (28)	χ^2	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i> ^a	<i>SD</i>			
Child age (months)	57.00	13.87	65.87	17.27	1.55	--	0.13
CARS-II severity	49.67	7.16	48.40	6.80	-0.49	--	0.62
Child sex (% male)	80.00	---	80.00	--	--	0.00	1.00
Child ethnicity (%) Caucasian)	86.70	--	86.70	--	--	0.00	1.00
Receiving other treatments during participation (%)							
Occupational therapy	33.30	--	60.00	--	--	2.80	0.09
Speech therapy	73.30	--	53.30	--	--	0.42	0.52
Psychiatric medication	28.60	--	28.60	--	--	0.00	1.00
Diagnosis (%)							
Autistic Disorder	46.70	--	33.30	--	--	0.56	0.46
Asperger's Syndrome	6.70	--	6.70	--	--	0.00	1.00
PDD-NOS	46.70	--	60.00	--	--	0.54	0.46
Maternal age (years)	34.93	8.86	38.93	7.11	1.36	--	0.18
Maternal education (%) completed ≥ 2 years college)	80.00	--	86.70	--	--	0.24	0.62

Note: PDD-NOS = Pervasive Developmental Delay, Not Otherwise Specified

^an= 15.

^bn = 15.

Table 2-2. Demographic characteristics of time 2 completers and drop-outs before time 2

Characteristic	Completers ^a		Drop-Outs ^b		<i>t</i> (37)	χ^2	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i> ^a	<i>SD</i>			
Child age (months)	61.43	16.04	73.33	11.45	-2.07	--	<0.05
Child sex (% male)	80.00	--	66.70	--	--	0.69	0.41
CARS-II severity	49.03	6.89	49.33	8.32	-0.12	--	0.91
Child ethnicity (%) Caucasian)	86.70	--	55.60	--	--	4.11	<0.05
Receiving other treatments during participation (%)							
Occupational therapy	46.70	--	55.60	--	--	0.22	0.64
Speech therapy	63.30	--	66.70	--	--	0.03	0.86
Psychiatric medication	20.00	--	22.20	--	--	0.02	0.89
Diagnosis (%)							
Autistic Disorder	40.00	--	33.33	--	--	0.13	0.72
Asperger's Syndrome	3.33	--	0.00	--	--	0.31	0.58
PDD-NOS	53.33	--	66.67	--	--	0.50	0.48
Maternal Age (years)	36.93	8.15	37.56	9.14	-0.20	--	0.81
Maternal Education (%) completed ≥ 2 years college)	83.30	--	77.70	--	--	0.15	0.70

Note: Completers= completed time 2 assessment, Drop-Outs= did not complete time 2 assessment

PDD-NOS = Pervasive Developmental Delay, Not Otherwise Specified

^a*n*= 30.

^b*n* = 9.

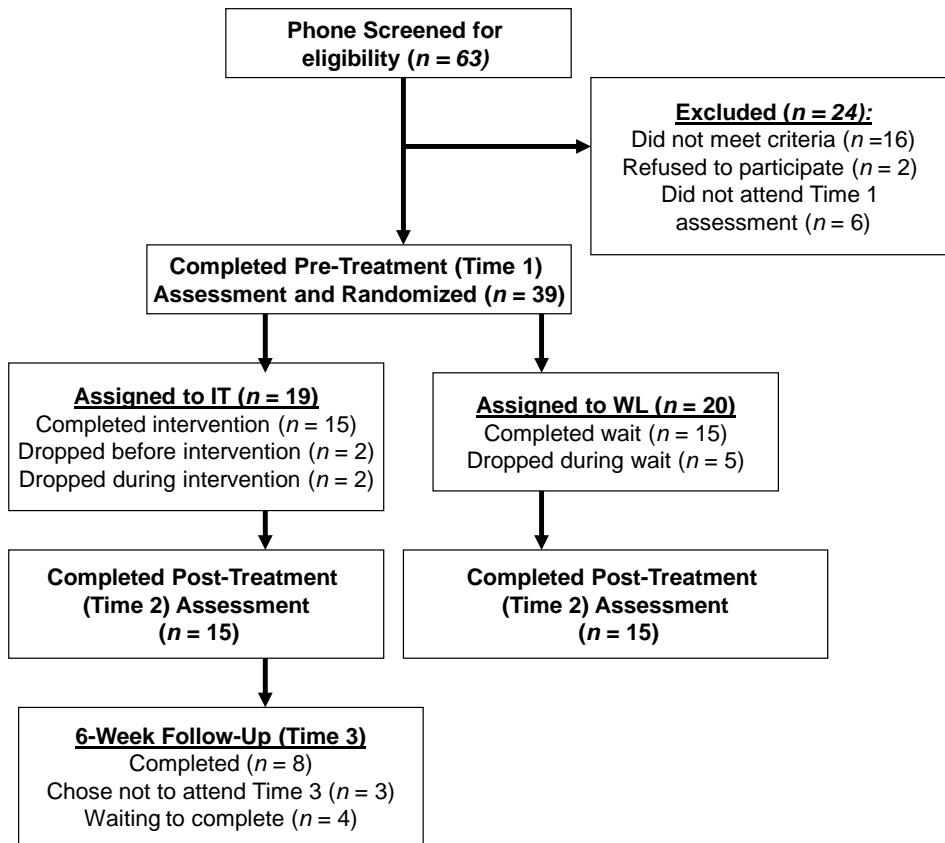


Figure 2-1. Sampling and flow of participants throughout Child Directed Interaction Training. IT = Immediate Training Group; WL= Waitlist Control. Participant flow chart from phone screening through the final assessment for Child Directed Interaction Training.

CHAPTER 3 RESULTS

Demographic Information

Independent samples *t* tests and chi-square analyses were conducted to determine whether significant differences existed between the Immediate Treatment and Waitlist Control groups at pre-treatment. The results were not significant, indicating no significant differences in child age, mother age, severity of ASD symptoms, breakdown of ASD diagnoses, mother education, child ethnic diversity, or gender between groups at pre-treatment (see Table 2-1). In addition, participants who completed the Time 2 evaluations were compared to participants who dropped out of the study before their Time 2 assessment. Additional independent samples *t* tests and chi-square analyses were conducted to determine whether significant differences existed between Time 2 completers and study dropouts at pretreatment. The results were not significant for child gender, use of other treatments or services, breakdown of ASD diagnoses, severity of ASD symptoms, or maternal education, indicating no significant differences in these domains between groups at pre-treatment. However, there were significant differences in child age, indicating that children who completed their Time 2 assessment were significantly younger than children who dropped out before their Time 2 assessment, $t(37)=-2.07$, $p < .05$. Children in families who dropped out were also significantly more ethnically diverse than children in families that completed their Time 2 assessments $\chi^2= 4.11$, $p < .05$ (see Table 2-2).

Comparison of the Immediate Treatment and Waitlist Control Groups at Immediate Post-Treatment Assessment

Results were analyzed to determine whether CDIT improves verbal, adaptive, prosocial and behavioral functioning in children with ASD at immediate post-treatment

assessment (Time 2 Assessment) when compared to a Waitlist Control group. Mixed between-within subjects analyses of covariance (ANCOVA), with pre-treatment scores as covariates, were conducted. At Time 2 assessment, differences between the IT and WL groups were examined for the following outcome variables: (a) child disruptive behavior as measured by the ECBI and the Maladaptive Behaviors Index on the Vineland-II, (b) child receptive language as measured by the PPVT-III, (d) child expressive language as measured by total child verbalizations during DPICS and Wordcount measures, (e) child social behaviors as measured by the SCS ad the Vineland-II Socialization Domain, and (d) child adaptive functioning as measured by the Vineland-II Composite Score. Mean scores for IT and WL groups on outcome measures are shown on Table 3-1. More specific findings for domains of functioning are outlined below.

Disruptive Behavior

On the ECBI Intensity Scale, the parents of children in the IT group reported significantly fewer disruptive behaviors at Time 2 than caregivers in the WL group, $F(1,27)= 16.50, p < .001$ and parents reported significantly lower problem scores associated with their child's behavior, $F(1,27)= 8.95, p < 0.05$. These results are consistent with decreased ECBI frequency and severity scores obtained in a previous study evaluating CDIT in an ASD population (Abner et al., 2008). Group differences were not significant on the Maladaptive Behaviors Index of the Vineland-II, indicating that parents did not perceive children as improving significantly on this measure, $F(1,27)= 1.86, p = 0.19$.

Receptive and Expressive Language

On the PPVT-III, an objective measure of child receptive language, group

differences were not significant at Time 2, $F(1,27)= 0.01$, $p = 0.91$. On objective measures of expressive language, children in the IT condition did not demonstrate increased vocalizations as measured words spoken (Wordcount) $F(1,27)= 0.58$ $p = 0.81$, or by the DPICS; conversely they demonstrated significantly reduced social vocalizations compared to children who had yet to receive treatment as measured by DPICS, $F(1,27)= 5.83$ $p < .05$.

Social Skills

Group differences on the Social Responsiveness Scale were not significant for Social Motivation $F(1,27)= 0.93$, $p = 0.34$, Autistic Mannerisms $F(1,27)=1.14$, $p = 0.30$, Social Communication $F(1,27)=0.13$, $p = 0.72$, Social Cognition $F(1,27)=1.33$, $p = 0.26$, on the SRS overall Composite Score $F(1,27)=2.43$, $p = 0.13$, or on the Socialization subscale of the Vineland-II, $F(1, 27)=2.80$, $p = 0.11$. However, on the Social Awareness scale, children in the IT group demonstrated significant gains when compared to children in the WL group at the Time 2 post-treatment assessment, $F(1,27)= 6.82$, $p < .05$. This outcome suggests that children did improve in their social understanding following CDI training, particularly in the domain of awareness of social cues.

Adaptive Functioning

Group differences for the overall Composite score of the Vineland-II were not significant, $F(1,27)= 0.08$, $p = 0.79$.

Maintenance of Treatment Gains from Post-Treatment (Time 2) to 6-Week Follow-Up

Paired samples t tests were conducted to assess for significant changes in parent report of child externalizing behavior problems, adaptive functioning, and child prosocial behaviors, and observed significant changes in child language from Time 2 to

Time 3 assessments. When data was not normally distributed, a Wilcoxon signed-rank test, a non-parametric test, was calculated. All results were non-significant; indicating that the children's functioning did not significantly improve or worsen between the post-treatment assessment and 6-week follow-up (see Table 3-2).

Changes from Pre-treatment to 6-week Follow-Up

In order to assess the changes from pre-treatment to 6-week follow-up in child behavior, child receptive and expressive language, child prosocial behavior, and child adaptive functioning, paired samples *t* tests were conducted. When data was not normally distributed, a Wilcoxon signed-rank test, a non-parametric test, was calculated. Analyses indicated significant improvements from pre-treatment to 6-week follow-up in disruptive behavior as measured by the ECBI Intensity Scale, $t(7)=3.47$, $p < .05$, the ECBI Problem Scale, $t(7)= 4.30$, $p < .05$, and the Vineland-II Maladaptive Behavior Index Scale, $t(7)= 2.49$, $p < .05$. General adaptive functioning, as measured by the Vineland-II Composite score also improved during study participation, $t(7)= -3.11$, $p < .05$ (see Table 3-3).

It is important to note that the subset of participants in the Immediate Treatment group who returned for their 6-week follow-up assessment demonstrated lower severity on some domains of functioning at the pre-treatment assessment than children that had not yet completed their 6-week follow-up. The results of an independent samples *t* test indicated that at pre-treatment, children who later completed their 6-week follow-up assessment demonstrated significantly less symptom severity on the SRS Social Motivation Scale ($M=81.14$, $SE=4.70$) than children who had not yet completed their 6-week follow-up assessment ($M=88.38$, $SE=3.46$), $t(7)= -1.59$, $p < .05$. In addition, children who completed their 6-week follow-up assessment demonstrated significantly

lower symptom severity on the SRS Composite Scale ($M=75.86$, $SE=5.37$) than children who had not yet completed their 6-week follow-up assessment ($M=86.00$, $SE=2.27$), $t(7) = -1.82$, $p < .05$.

Table 3-1. Mean scores for measures at time 1 and time 2 assessments

Measure	Group	n	Time 1		Time 2		<i>F</i> (1,27)	<i>p</i>	<i>d</i> ^a
			<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Eyberg Child Behavior Inventory									
Intensity	IT	15	134.67	31.09	101.20	37.19	16.50	<.001	1.12
	WL	15	135.93	24.24	134.27	19.35			
Problem	IT	11	17.85	5.16	7.00	6.32	8.95	<.05	0.92
	WL	14	15.00	7.89	13.36	7.52			
Vineland Adaptive Behavior Scales, 2nd Ed.									
Maladaptive Behavior Index	IT	12	20.47	1.81	19.67	2.27	1.86	0.19	0.36
	WL	10	20.50	1.78	20.36	1.55			
Composite	IT	12	74.27	11.40	75.75	11.87	0.08	0.79	0.18
	WL	10	75.40	9.31	77.64	8.48			
Socialization	IT	12	70.40	9.45	73.75	13.55	2.80	0.11	0.24
	WL	10	71.00	10.15	70.79	10.45			
Social Responsiveness Scale									
Awareness	IT	15	75.07	12.03	67.47	14.22	6.82	<.05	1.03
	WL	15	78.26	8.46	78.53	5.42			
Cognition	IT	15	81.07	10.10	80.60	9.34	1.33	0.26	0.18
	WL	15	77.33	9.84	82.13	7.24			
Communication	IT	15	81.33	15.13	78.73	12.53	0.13	0.72	0.10
	WL	15	81.13	8.54	79.80	8.57			
Motivation	IT	15	81.27	11.60	75.27	12.33	0.93	0.34	0.17
	WL	15	71.93	14.52	73.00	13.92			
Autistic Mannerisms	IT	15	83.60	9.82	79.60	11.54	1.14	0.30	0.12
	WL	15	80.33	10.80	81.00	11.19			
Composite	IT	15	85.00	9.28	80.27	11.97	2.43	0.13	0.17
	WL	15	82.13	9.00	82.00	8.56			
Peabody Picture Vocabulary Test, 3rd Ed.									
	IT	15	82.60	26.72	84.00	22.25	0.01	0.91	0.42
	WL	15	98.10	24.11	93.87	24.62			
Dyadic Parent–Child Interaction Coding System									
Total child verbalizations	IT	14	64.20	32.27	37.79	19.23	5.83	<.05	0.80
Wordcount	WL	15	59.87	17.03	53.07	18.84			
	IT	14	132.27	88.93	166.33	73.58	0.58	0.81	0.10
	WL	15	185.33	91.56	157.14	100.03			

Note: IT= immediate treatment, WL= waitlist control.

^aCohen's *d* = effect size between IT and WL groups at time 2.

Table 3-2. Mean scores for measures at time 2 and time 3 assessments

Measure	Time 2			Time 3			<i>t</i> (7)	<i>z</i> ^a	<i>p</i>	<i>d</i> ^b
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>				
Eyberg Child Behavior Inventory										
Intensity	8	88.0	28.4	8	100.63	27.62	-2.34	--	0.52	0.45
Problem	4	4.25	4.79	4	7.25	3.40	-2.04	--	0.13	0.72
Vineland Adaptive Behavior Scales, 2 nd Ed.										
Maladaptive Behavior Index	6	18.83	1.17	6	19.50	1.22	-1.35	--	0.24	0.56
Composite	6	81.83	11.96	6	86.50	13.87	-1.65	--	0.16	0.36
Socialization	6	80.17	13.41	6	85.50	18.40	-1.07	--	0.33	0.33
Social Responsiveness Scale										
Awareness	8	61.75	15.76	8	68.62	8.09	-2.08	--	0.08	0.55
Cognition	8	79.63	10.64	8	79.00	9.90	0.28	--	0.79	0.06
Communication	8	76.50	16.17	8	74.75	13.19	--	0.95	0.34	0.12
Motivation	8	72.75	15.12	8	73.63	10.88	-0.26	--	0.80	0.07
Autistic Mannerisms	8	78.00	13.62	8	79.88	9.82	--	-0.68	0.50	0.15
Composite	8	77.00	14.79	8	79.88	10.92	--	-1.26	0.21	0.22
Peabody Picture Vocabulary Test, 3 rd Ed.										
	8	92.00	18.52	8	90.13	18.92	-0.26	--	0.80	0.10
Dyadic Parent–Child Interaction Coding System										
Total child verbalizations	8	33.37	14.02	8	39.38	24.71	--	-0.53	0.59	0.30
Wordcount	8	113.00	65.60	8	112.67	83.90	--	-0.63	0.53	0.00

Note: Analyses from immediate treatment condition.

^aCohen's *d* = effect size between Time 2 and Time 3.

^bWilcoxon Signed Ranks Test= non-parametric test for non-normal data

Table 3-3. Mean scores for measures at time 1 and time 3 assessments

Measure	Time 1			Time 3			<i>t</i> (7)	<i>z</i> ^a	<i>p</i>	<i>d</i> ^b
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>				
Eyberg Child Behavior Inventory										
Intensity	8	129.75	25.89	8	100.63	27.62	3.47	--	<0.05	1.09
Problem	6	18.33	2.80	6	8.67	6.38	4.30	--	<0.05	1.96
Vineland Adaptive Behavior Scales, 2nd Ed.										
Maladaptive Behavior	7	20.71	1.38	7	19.57	1.13	2.49	--	<0.05	0.90
Composite	7	78.71	10.40	7	85.43	12.97	-3.11	--	<0.05	0.57
Socialization	7	75.00	10.30	7	85.57	16.80	-1.52	--	0.18	0.76
Social Responsiveness Scale										
Awareness	8	72.50	14.26	8	68.62	8.09	1.20	--	0.27	0.33
Cognition	8	78.63	12.40	8	79.00	9.90	-0.18	--	0.87	0.03
Communication	8	81.50	11.23	8	74.75	13.19	--	-1.90	0.06	0.55
Motivation	8	77.63	14.08	8	73.63	10.88	--	-1.10	0.27	0.32
Autistic Mannerisms	8	82.63	11.26	8	79.88	9.82	--	-1.15	0.25	0.25
Composite	8	82.13	11.84	8	79.88	10.92	--	-0.85	0.40	0.20
Peabody Picture Vocabulary Test, 3rd Ed.										
	8	82.75	29.91	8	90.13	18.92	--	-1.08	0.32	0.94
Dyadic Parent–Child Interaction Coding System										
Total child verbalizations	8	62.63	34.70	8	39.38	24.71	--	-1.26	0.21	0.77
Wordcount	8	128.33	58.23	8	112.67	83.90	--	-0.84	0.40	0.22

Note: Analyses from immediate treatment condition.

^aCohen's *d* = effect size between Time 2 and Time 3.

^bWilcoxon Signed Ranks Test= non-parametric test for non-normal data.

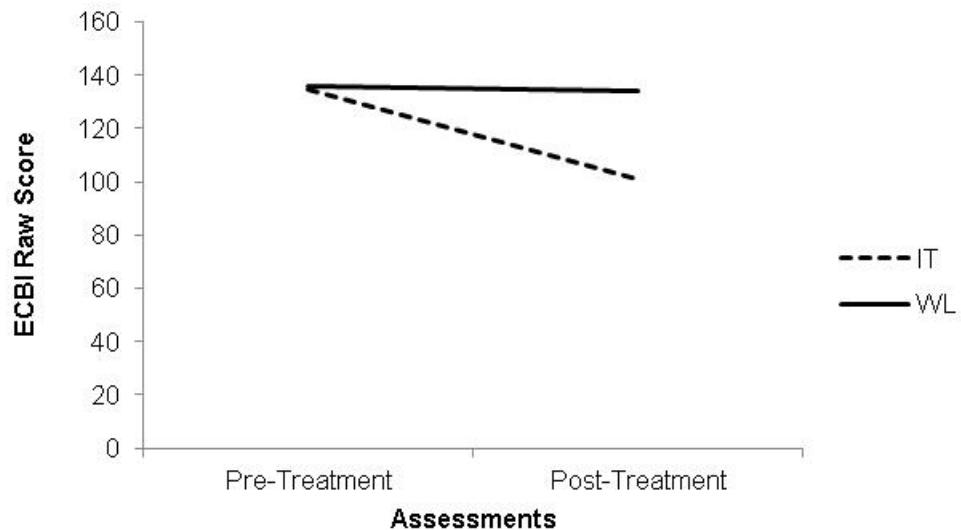


Figure 3-1. Caregiver ratings of the ECBI Intensity raw scores from pre- to post-treatment for the IT and WL groups. ECBI = Eyberg Child Behavior Inventory; IT = Immediate Treatment Group, WL = Waitlist Control Group. The scores presented in this graph are the means from the 15 Immediate Treatment and 15 Waitlist Control Participants at pre- and post-treatment.

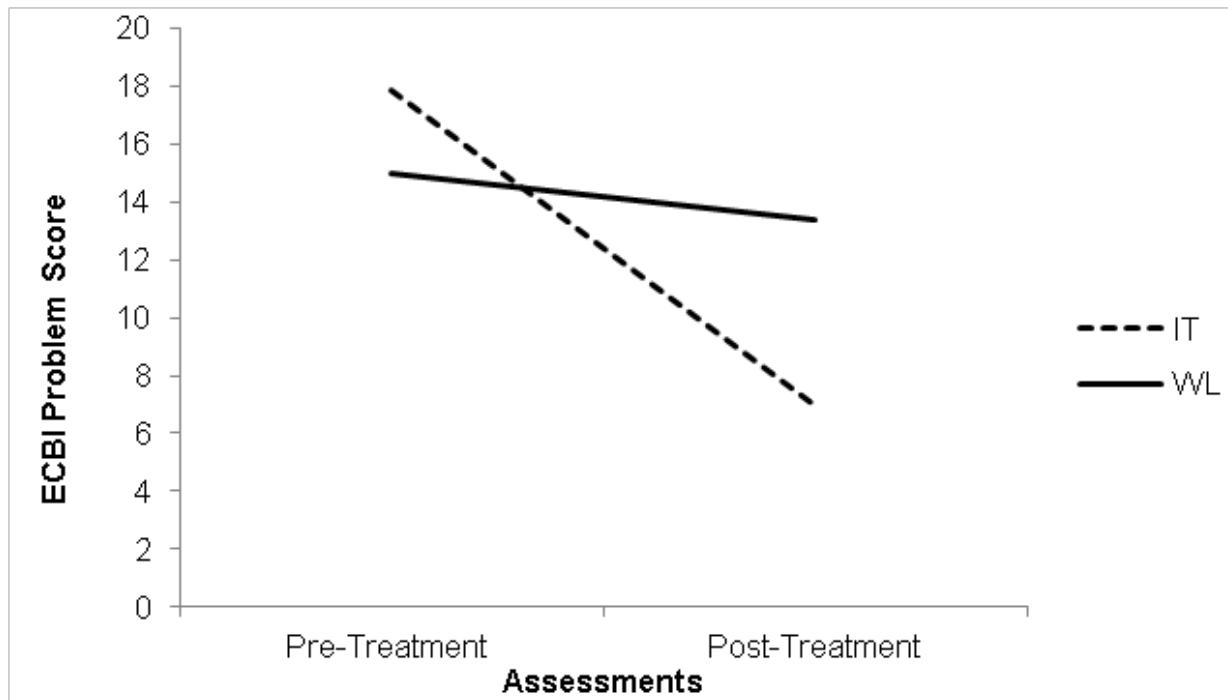


Figure 3-2. Caregiver ratings of the ECBI Problem scores from pre- to post-Treatment the IT and WL groups. ECBI = Eyberg Child Behavior Inventory; IT = Immediate Treatment Group, WL = Waitlist Control Group. The scores presented in this graph are the means from the 15 Immediate Treatment and 15 Waitlist Control Participants at pre- and post-treatment.

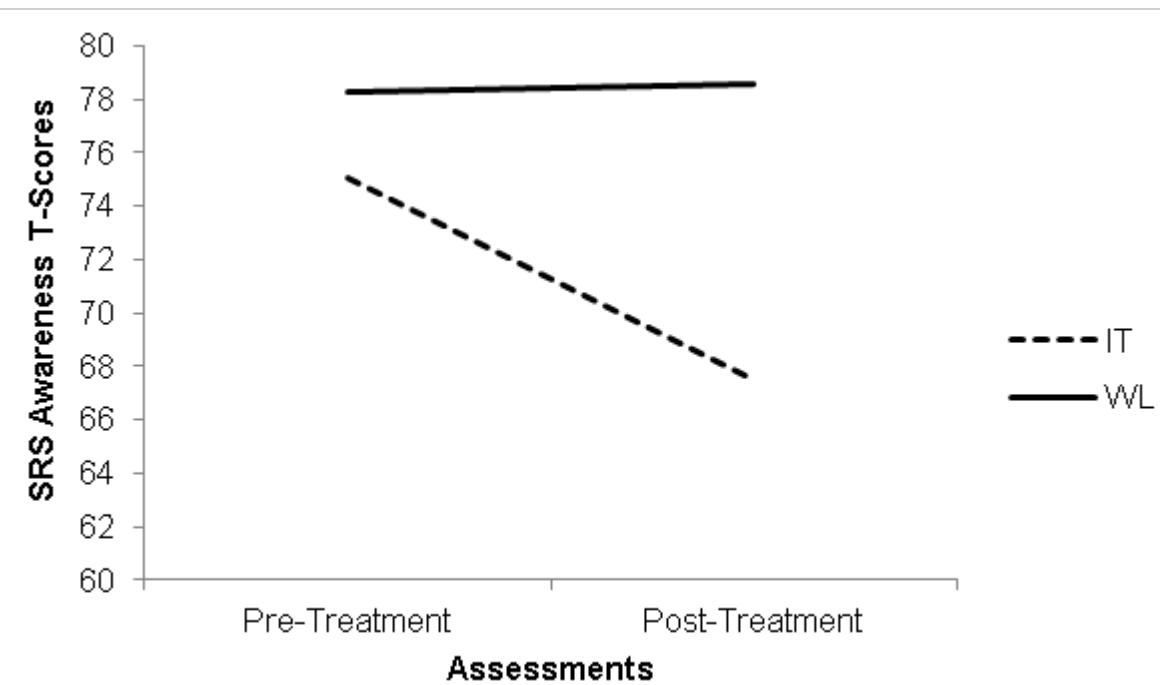


Figure 3-3. Caregiver ratings of the Social Responsiveness Scale Awareness scores from pre- to post-treatment the IT and WL groups. SRS= Social Responsiveness Scale; IT = Immediate Treatment Group, WL = Waitlist Control Group. The scores presented in this graph are the means from the 15 Immediate Treatment and 15 Waitlist Control Participants at pre- and post-treatment.

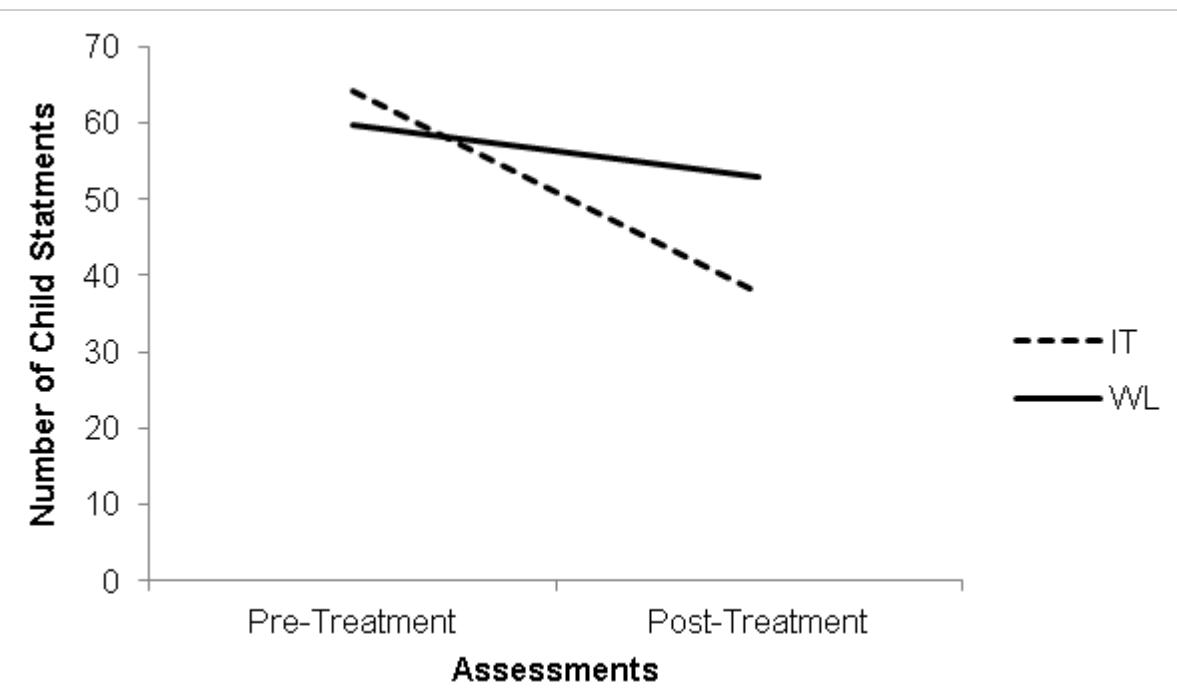


Figure 3-4. Observed number of total child verbalizations during a 5-minute child-led play situation of the DPICS from pre- to post-treatment in the IT and WL groups. DPICS = Dyadic Parent–Child Interaction Coding System; IT = Immediate Treatment Group, WL = Waitlist Control Group. The scores presented in this graph are the means from the 15 Immediate Treatment and 15 Waitlist Control Participants at pre- and post-treatment.

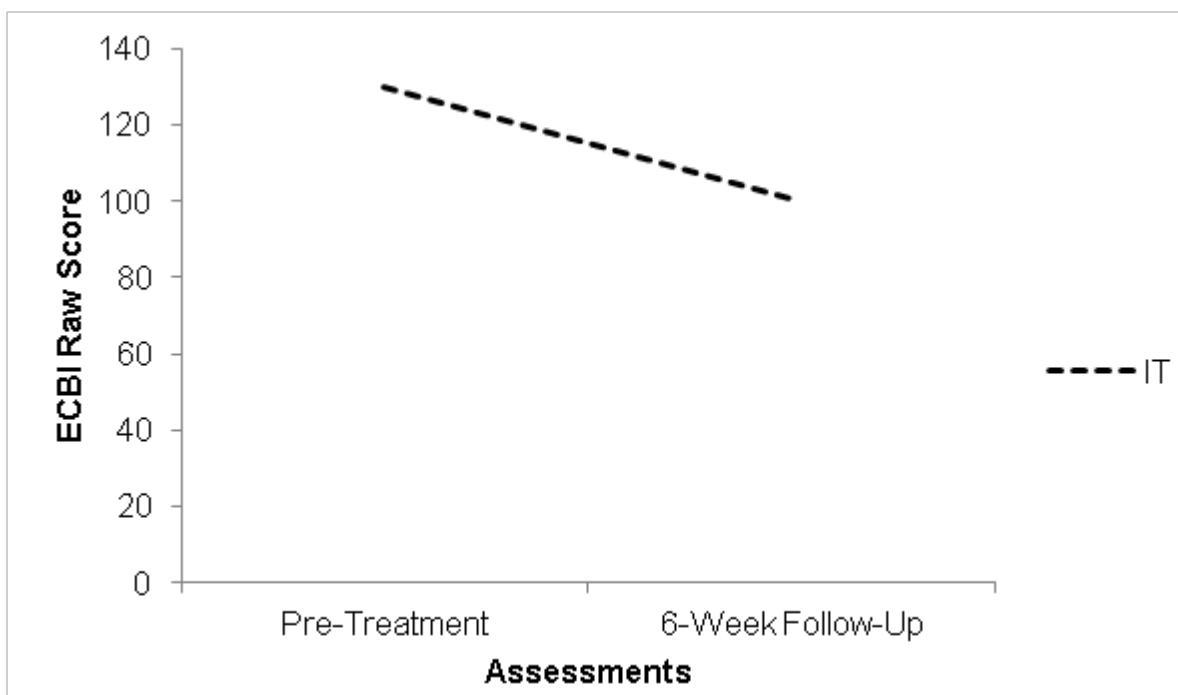


Figure 3-5. Caregiver ratings of the ECBI Intensity raw scores from pre-treatment to 6-week follow-up assessments for the IT group. ECBI = Eyberg Child Behavior Inventory; IT = Immediate Treatment Group. The scores presented in this graph are the means from the 8 Immediate Treatment participants at pre-treatment and 6-week follow-up.

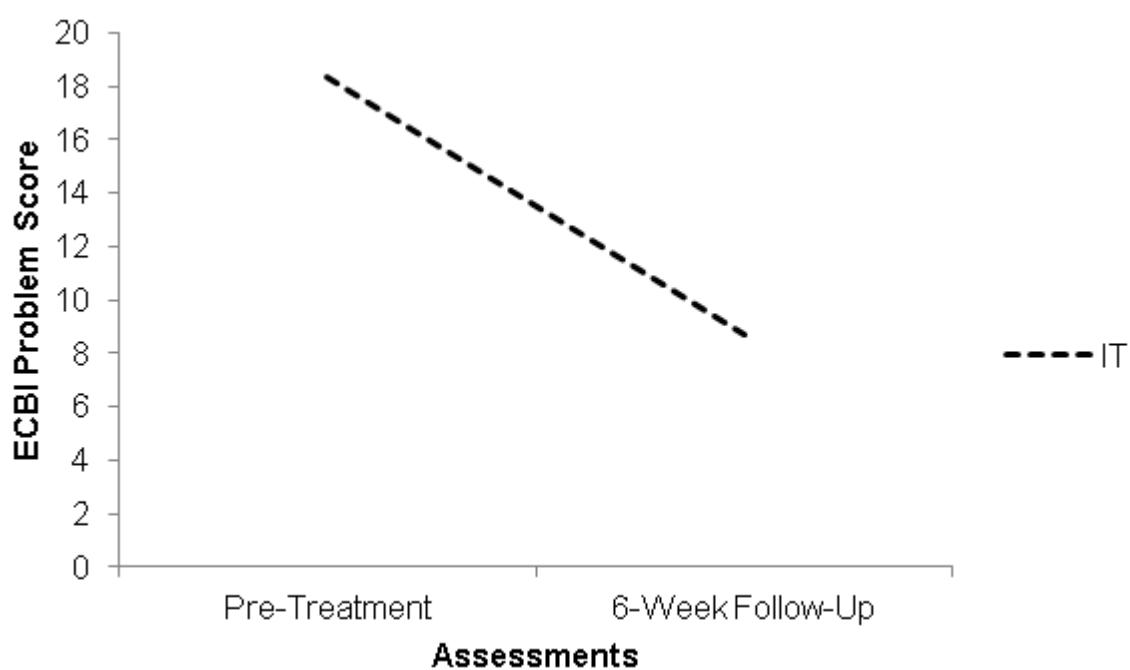


Figure 3-6. Caregiver ratings of the ECBI Problem scores from pre-Treatment to 6-week follow-up assessments for the IT group. ECBI = Eyberg Child Behavior Inventory; IT = Immediate Treatment Group. The scores presented in this graph are the means from the 6 Immediate Treatment Participants at pre-treatment and 6-week follow-up.

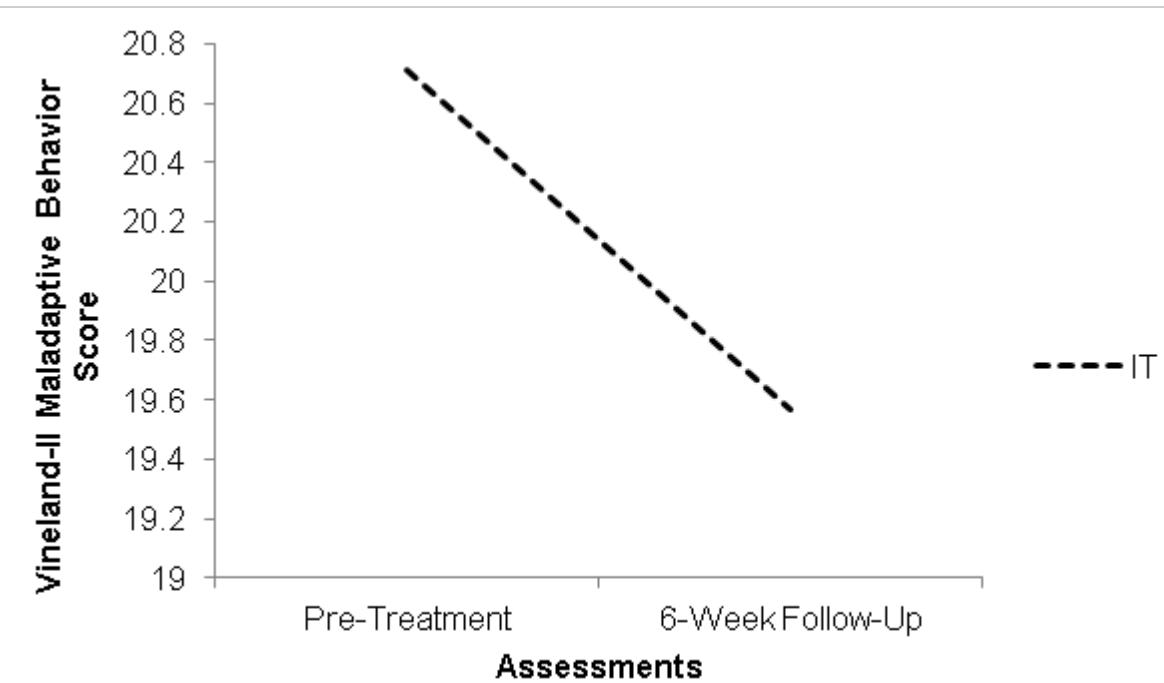


Figure 3-7. Caregiver ratings of the Vineland-II Maladaptive Behavior Index scores from pre-treatment to 6-week follow-up assessments for the IT group. Vineland-II = Vineland Adaptive Behavior Scales; IT = Immediate Treatment Group. The scores presented in this graph are the means from the 7 Immediate Treatment participants at pre-treatment and 6-week follow-up.

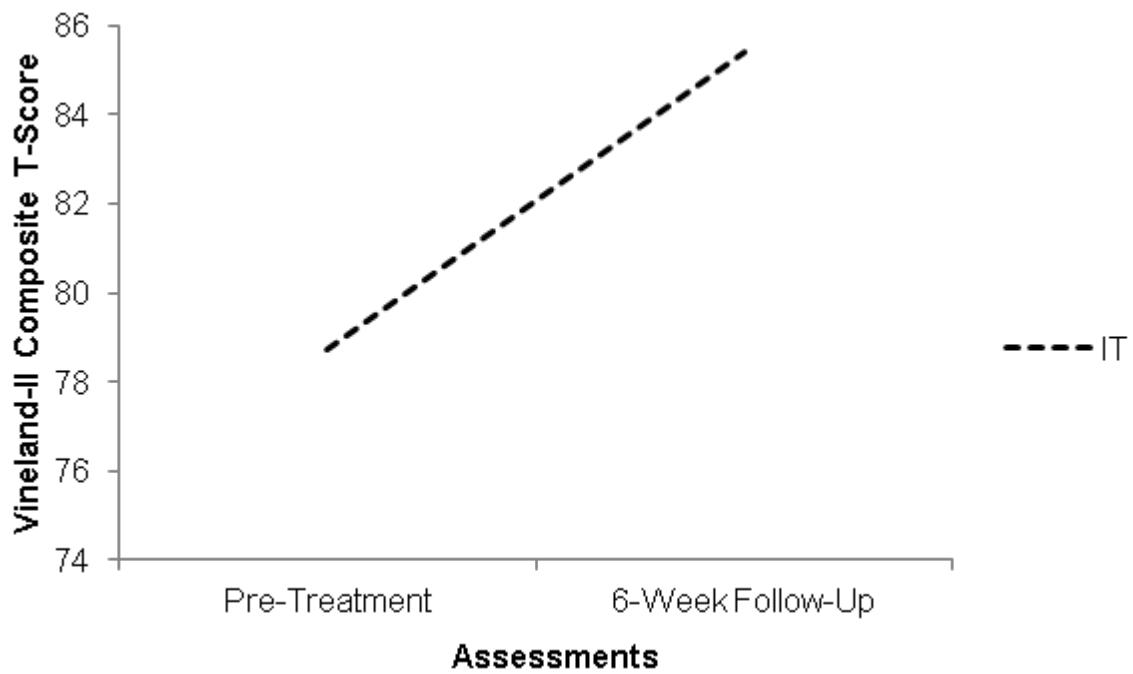


Figure 3-8. Caregiver ratings of the Vineland-II Composite scores from pre-treatment to 6-week follow-up assessment for the IT group. Vineland-II = Vineland Adaptive Behavior Scales; IT = Immediate Treatment Group. The scores presented in this graph are the means from the 7 Immediate Treatment participants at pre-treatment and 6-week follow-up.

CHAPTER 4 DISCUSSION

General Findings

Overall, the results of the study indicate that caregiver implementation of CDIT skills improves disruptive behavior and social awareness compared to children in the waitlist control condition. Results also indicate that gains are maintained from post-treatment to 6-week follow-up. The significant improvements in disruptive behavior and social awareness reported after only 8 1-hour sessions establish the power of this intervention in changing behavior in a short time-period; however other treatments may be needed to address areas of functioning that were not improved by CDIT.

CDIT may be useful as an initial or adjunct treatment to prepare children for engagement in other therapies, such as occupational and speech therapy, different behavioral interventions, and even medical procedures. When a child engages in disruptive behaviors, such as noncompliant or oppositional behaviors, treatment providers may have difficulty teaching the child and making progress on target goals. If a child is misbehaving at home, parents may have difficulty completing any homework assignments required to supplement treatment. In addition, many children with ASD avoid social interactions, including those with teachers and therapists; this difficulty building rapport may also interfere with skill acquisition and treatment adherence. However, after a child has been treated with CDIT, a child may be more compliant and cooperative with other treatment modalities. In addition, improved social awareness may be the first step to helping a child to form closer and more appropriate relationships with other people, including treatment providers. Improved child cooperation may in turn lead to better progress in other treatment modalities and overall better services

received by children and families. The treatment outcome results following CDIT are outlined in greater detail below.

Comparison of the Immediate Treatment and Waitlist Control Groups at Immediate Post-Treatment Assessment

Disruptive Behavior

Children demonstrated significant parent-reported decreases in the frequency and intensity of problem behaviors on the ECBI Intensity Scale, a measure of the frequency of child disruptive behavior. Disruptive behaviors are prevalent and problematic for families of children with ASD (Greene *et al.*, 2004; Mandell *et al.*, 2005a). Although children in the study were not selected for disruptive behavior problems and children were not required to demonstrate problematic behaviors to be eligible for study participation, sixty-three percent of children in our sample had clinically elevated behavior problems (ECBI Intensity score ≥ 131) at pretreatment. Reducing disruptive behavior in children with ASD is important because disruptive behaviors (as opposed to behaviors associated with poor adaptive functioning) are strongly associated with parent stress (Lescavalier, Leone, & Wiltz, 2006).

Considering the dramatic improvement in disruptive behavior reported on the ECBI, it raises the question as to why similar improvements were not reported on the Vineland-II Maladaptive Behavior Index. On average, children's scores on this measure were in the Elevated Range at the pre-treatment assessment and were not significantly reduced post-treatment. This measure differs from the ECBI, which asks for the parent to report the frequency and intensity of clear, observable disruptive behaviors. Items on the Maladaptive Behavior Index are worded more subjectively and include internalizing problems (i.e., sadness and anxiety) and critical items (i.e., inappropriate sexual

behavior) as well as externalizing symptoms into the total score. It is possible that the scale is less sensitive to specific behavior changes or that children did not significantly change other components of maladaptive behavior, such as internalizing behaviors, following treatment.

Receptive and Expressive Language

The treated children did not display any significant increases in receptive or expressive language following CDIT. In fact, children spoke significantly fewer parent-directed statements following treatment compared to waitlist controls as measured by total child verbalizations during the DPICS observation. Although these results appear problematic, the lack of observed language acquisition may be related to the fact that children in this sample had generally good or advanced language abilities to begin with. In the domain of receptive language, it is possible that children did not have room for significant improvement due to a ceiling effect. For example, 63% of children had a receptive language standard score on the PPVT-III in the average range or higher, and 23% of children had a receptive language score on the PPVT-III in the above average to superior range at their pre-treatment assessment. To understand whether CDIT may positively affect receptive vocabulary, it may be necessary to sample a group of children with impaired or less advanced language abilities at pre-treatment.

In the domain of expressive language, it appears that children generally had a good grasp of language and word-use at the pre-treatment assessment based on their receptive language scores and an average of 60 to 64 social statements made in the five-minute child-led play situation. Neither DPICS categories nor Wordcount evaluates the quality of child verbalizations as they pertain to children with ASD; only the quantity of child talk is measured by these instruments. Although the DPICS categories measure

prosocial verbalizations, critical statements, commands, and questions directed at the parent, they do not measure the specific kinds of maladaptive speech most characteristic of ASD such as echolalia, repetitive or stereotyped phrasing, or excessive question-asking. Clinically, it appeared that this maladaptive use of language was reduced in children over treatment, but neither Wordcount nor the DPICS system are designed specifically for or are sensitive to verbal patterns related specifically to ASD; improvements in the quality of child social talk would be missed on these measures. It is possible that the decrease in child statements as measured by the DPICS demonstrates a reduction in maladaptive language (for example, repetitious statements about stereotyped interests) and may represent a more meaningful interaction overall. Investigators need to add the verbalization categories that are most typical of the kinds of language deficits seen in children with ASD.

Social Skills

Parents reported improvements on the Social Awareness domain of the Social Responsiveness scale compared to waitlist controls, but not on other domains of social behavior as measured by the SRS or on the social domain of a measure of adaptive functioning. Evaluating child social changes is important because the ability to read and understand other people facilitates building close interpersonal relationships in the future and may create opportunities for learning in the context of social situations. One of the core features of ASD is a lack of age-appropriate social skills and understanding (APA, 2000). After completing CDIT, parent-report measures indicated that children improved significantly in their ability to pick up on social cues and the sensory aspects of reciprocal social behavior. At pre-treatment, all children were in the clinical range of social awareness and although children remained in the clinical range of difficulties,

their degree of change after just 8 weeks is promising. It is possible that additional treatment sessions or practice over time is necessary to result in changes to other social behaviors.

Adaptive Functioning

Children showed no significant improvements in adaptive functioning compared to waitlist controls. It is possible that 8 weeks of treatment was not sufficient to result in significant adaptive changes, especially when one considers that treatments that focus on specific skill acquisition, such as ABA, are extremely time-intensive with a duration ranging from a few months to 2 years (Rogers & Vismara, 2008). CDIT did not target many core areas assessed by the Vineland-II, such as fine and gross motor functioning, skills of daily living in the community and at home, and academic goals.

Maintenance of Treatment Gains from Post-Treatment (Time 2) to 6-Week Follow-Up

The results indicated that children's functioning did not significantly improve or worsen between the post-treatment assessment and 6-week follow-up. Treatment gains in disruptive behavior and social awareness did not significantly dissipate over time. However, it is important to note that the small sample sizes used for these analyses may have resulted in a loss of necessary power to see changes that did occur.

Changes from Pre-treatment to 6-week Follow-Up

Analyses indicated significant improvements from pre-treatment to 6-week follow-up in disruptive behavior, strengthening the evidence that children's improvements were more than socially desirable questionnaire responses by parents made to please their trainers. Children also improved in adaptive functioning, which potentially highlights the adaptive changes that we would expect to take place over time naturally as children

develop. Changes in receptive and expressive language were not significant, which is consistent with the lack of gains from pre- to post-treatment. Changes in social behavior were not significant in the group of 8 children who returned for their 6-week follow-up assessment; however, it is important to note that at pretreatment, these 8 children demonstrated significantly better social skills than the 7 children who had not completed their 6-week follow-up assessment. It is possible that this subset of the Immediate Treatment group did not make as many social changes as the rest of the treatment group or that the limitation of a small sample size may have resulted in a loss of necessary power to see changes that did occur.

Limitations, Strengths and Future Directions

Some limitations of this research should be noted. The study was conducted with a relatively small sample size of only 30 participating families (15 in each condition). Only data from 8 families was available to be analyzed for the second and third aims of this study, limiting the power and generalizability of the findings for these analyses; five of the remaining 7 participants did not attend their 6-week follow-up assessments in time for the author's dissertation defense and 2 participants chose not to attend their 6-week follow-up assessments. In addition, the subset of 8 families evaluated was significantly less severe in social domains at pre-assessment than the other 7 families that had yet to complete their 6-week follow-up assessments.

Along with sample size concerns, all families were living in central Florida within one hour driving distance from the University of Florida, creating an unavoidable geographic limitation. Children participating in the study were mostly Caucasian and male, with female children and ethnic minorities largely unrepresented. In addition, 44% of the families that dropped out of treatment before their Time 2 Post-Treatment

Assessment were not Caucasian, such that drop-outs were significantly more ethnically diverse than families that remained in the study. Despite limited ethnic diversity in treatment completers, the sample of completers is representative of the lack of diversity found in children receiving treatment for ASD in the community (Mandell et al., 2009; Thomas, Ellis, McLaurin, Daniels, & Morrissey, 2007). However, future studies need to be conducted with a more ethnically diverse sample to examine the outcomes of CDIT with non-white children and families.

Another study limitation is related to diagnosis of child ASD in our sample. Children were diagnosed by an outside healthcare professional with their diagnosis confirmed by the administration of the CARS2 at pre-treatment assessment; the use of a gold-standard diagnostic measure was not required for treatment eligibility due to the lack of assessors trained in these measures. Diagnostic practices in the community varied, but we know that 27% of study participants were diagnosed with the *Autism Diagnostic Observation Scale* (ADOS; Lord et al., 2000), the gold-standard observational measure for assessing ASD, in the University of Florida Psychology Clinic. Although the use of a gold-standard diagnostic measure would have been ideal, the assessment practices used in the study were representative or superior to those commonly seen in the community, where many diagnosing professionals do not use any formal diagnostic measures (Wiggins, Baio, & Rice, 2006). Future studies should evaluate CDIT in a sample that has been uniformly diagnosed with gold-standard instruments to increase the probability that all children participants are accurately diagnosed.

Length of treatment also created a study limitation. In traditional PCIT, families

remain in the Child Directed Interaction phase of treatment until they reach mastery criteria, ensuring that they are expert in implementing CDI skills with their child. However, clinical experience has demonstrated that some families may reach mastery criteria for CDIT in the first or second session of treatment and we did not want to penalize parents who learn the skills more quickly by denying them important sessions of coaching and learning to tailor this skill set to their specific ASD child. Due to this study design, families ended treatment after 8 sessions whether or not they were considered to be competent in using CDI strategies. In our sample, only 47% of parents met CDI mastery, meaning that over half the sample would not be considered sufficiently trained in their use of treatment strategies and whose lack of skill have affected their ability to implement CDIT effectively during their 5 minute practice sessions at home. Families might have benefited from additional sessions of CDI, either to improve skills in families that had not reached mastery or to provide an additional opportunity to tailor treatment for parents who were expert in their skills. It is possible that additional changes would have been seen if treatment had lasted longer. Future research should evaluate whether length of participation in CDIT and parental mastery of the skills are related to improvements in child functioning over and above what was seen in this study.

Important strengths of this research can also be noted. In an article evaluating psychosocial treatments for ASD, researchers asserted that “Traditional 1 h a week treatments for language or social skills or behavior used in the US mental health system are rarely sufficient to produce generalizable improvements in core areas of ASD” (696, Lord *et al.*, 2005). However, children who completed 8 weekly sessions of

Child Directed Interaction Training demonstrated significant improvements in the areas of disruptive behaviors and social awareness compared to Waitlist Controls at post-treatment. In addition, children maintained these gains at 6-week follow-up. These improvements are clinically relevant especially when evaluating time-limited, manualized, psychosocial interventions with children on the spectrum. CDIT is practical and increasingly available: any trained PCIT therapist can follow the manualized sessions and most parents are likely able to dedicate an hour to treatment and 5 minutes per day to practice of the skills they learned in treatment. In addition, our clinical observations suggest that parents enjoy treatment and find it helpful. Only two families that began treatment dropped out during CDIT—one because of a divorce and caregiver changes and the other because the parents felt that their child had already made sufficient improvements.

Identifying short-term psychosocial treatments that can reduce disruptive behaviors is essential to improving child functioning and helping children to be compliant with other commonly used treatments for ASD, including speech and occupational therapy. In addition, using a psychosocial treatment to reduce disruptive behaviors could avoid the use of antipsychotic medications, which although often effective, can result in adverse effects, including weight gain, fatigue, drowsiness, increased appetite, dizziness, drooling, constipation, and tremor (Shea, Turgay, Carroll, Schulz, Orlik, Smith, & Dunbar, 2004) and the results of long-term use are unknown (McCracken *et al.*, 2002).

This study touches on some concerns in the PCIT literature about implementation of PCIT with children on the spectrum. There has been some

controversy regarding whether the Parent-Directed Interaction phase of PCIT, which specifically addresses noncompliant behaviors, should be implemented in children with ASD (Masse, McNeil, Wagner, Chorney, 2007). The evidence suggests that the use of aversive stimuli or even verbal correctives or directives may be unnecessary in many families. It appears that the use of differential social attention and CDI skills alone can result in significant decreases in problem behaviors. Together, these results suggest that PDI may not be necessary for some children with co-morbid ASD and disruptive behavior. Parents may also be more adherent to CDI alone than to a treatment that includes a punishment component because CDI may be less stressful to implement (Moore & Symons, 2009).

Some researchers had also hypothesized that only children with high-functioning ASD would respond to a treatment that depends significantly on the use of differential social attention (Masse, McNeil, Wagner, Chorney, 2007). However, participants in this study ranged widely in ASD severity and included both children who would be identified as “high-functioning” and those who would be labeled “low-functioning” by treatment providers. The results indicate that even for children with relatively severe ASD symptoms, significant improvements were observed after CDIT.

Future randomized controlled trials evaluating CDIT in ASD need to be conducted to address the limitations in this research by increasing sample size and geographic limitations. Also, additions to the coding system targeting specific ASD symptoms need to be developed to improve behavior observations of child social and language behaviors that are tailored to the specific needs of children with ASD. Many of the improvements in caregiver-child attachment and conversation that were observed

clinically were not detected with our current outcome measures. However, the significant changes seen in these preliminary findings indicate a need to continue to examine this practical and replicable treatment for children on the autism spectrum.

APPENDIX A

TREATMENT DIAGRAMS

Diagram 1: Inclusion and Exclusion Criteria

	Inclusion Criteria	Exclusion Criteria
Child	<ul style="list-style-type: none"> • Diagnosis of ASD (based on the CARS2 + previous diagnosis by a Mental Health Professional) • Cognitive functioning \geq 3 years 0 months on non-verbal tasks • Speaks 3 intelligible words • Age 3 years 0 months to 7 years 11 months • Stable on their medications or other interventions one month prior to treatment and throughout the duration of their study participation 	<ul style="list-style-type: none"> • History of severe sensory impairment (e.g., deafness)
Primary Caregiver	<ul style="list-style-type: none"> • Cognitive functioning \geq 75 OR 2 years of college education • Attendance at all sessions and assessments 	<ul style="list-style-type: none"> • Suspected abuse • Crisis requiring out-of-home placement during the study.

Diagram 2. Instruments

Instrument	Informant	Weekly During Tx	Time 1	Time 2	Time 3
Demographic and Background Questionnaire	PrimP SecondC		✓		
Semi-Structured Interview	PrimP SecondC		✓		
Social Responsiveness Scale	PrimP		✓	✓	✓
CARS2	O/PrimP		✓		
DAS-II	O		✓		
Vineland-II	O/PrimP		✓	✓	✓
PPVT-III	O		✓	✓	✓
Word Count	O	✓	✓	✓	✓
DPICS	O	✓	✓	✓	✓
Eyberg Child Behavior Inventory Intensity Scale	PrimP SecondC	✓	✓	✓	✓

Note. PrimC = Primary caregiver; SecondC=Secondary caregiver if participating; O = Observer.

Diagram 3. Assessment and Treatment Timeline for IT and WL Conditions

	Week 1	Weeks 2-11	Week 12	Weeks 13-17	Week 18	Week 19-22	Week 23
IT	Time 1 Assessment	Weekly CDIT Tx	Time 2 Assessment	<i>No Tx</i>	Time 3 Assessment	<i>No Tx</i>	
WL	Time 1 Assessment	<i>No Tx</i>	Time 2 Assessment	Weekly CDIT Tx			Time 3 Assessment

Note. IT = Immediate Treatment condition; WL = Waitlist condition; Tx = Treatment.

Diagram 4. Outcome Measures Breakdown

Outcome	Outcome Measure(s)
Behavior problems	<ul style="list-style-type: none">• Eyberg Child Behavior Inventory• Vineland II: Maladaptive Behaviors Domain
Language	<ul style="list-style-type: none">• PPVT-III• Dyadic Parent–Child Interaction Coding (child verbalizations)• Word Count
Prosocial Behavior	<ul style="list-style-type: none">• Vineland II: Socialization Domain• Social Responsiveness Scale
Adaptive Functioning	<ul style="list-style-type: none">• Vineland II Composite Score

APPENDIX B
CDIT PHONE SCREENER

CDIT Phone Screener:

Confirm the following information:

Screening date:	Child Name:
Parent Name:	Child DOB/Age:
Address:	Between the ages of 3 and 7? <u> </u> No <u> </u> Yes
City/Zip:	Male/Female?:
Email:	Referral Source:
1 or 2 parent family?	Child resides in your home?: <u> </u> No <u> </u> Yes
Phone 1:	OK to leave message? <u> </u> No <u> </u> Yes
Phone2:	OK to leave message? <u> </u> No <u> </u> Yes
Major concerns regarding [child's name]:	

Provide the following information about the study (check the small box when done):

For children ages 3-7 w/ a previous diagnosis of ASD	You may be assigned to immediate or wait-list groups
CDI training is at no cost	Attend a 3 hour pre assessment
Primary caregiver is required to participate, but other caregivers can also participate	May be a 10 week wait before training starts
Child must reside in the primary caregivers home	Training is weekly for 8 weeks
Child can not have history of severe sensory impairment (i.e. deafness)	You will be paid for assessment 2 and 3
Child must be stable on other medication or interventions throughout the duration of their study participation	PHI will be secure if participate or destroyed if not eligible

Ask parent to rate the child on the following behaviors:

where Yes (Y) = Behavior is a problem for me, No (N) = Not a problem for me

Dawdles in getting dressed	Dawdles or lingers at mealtime
Has poor table manners	Refuses to eat food presented
Refuses to do chores when asked	Slow in getting ready for bed on time
Refuses to go to bed on time	Does not obey house rules on own
Refuses to obey until threatened with punishment	Acts defiant when told to do something
Argues with parents about rules	Gets angry when doesn't get own way
Has temper tantrums	Sasses adults
Whines	Cries easily
Yells or screams	Hits parents
Destroys toys and other objects	Is careless with toys or other objects
Steals	Lies
Teases or provokes other children	Verbally fights with friend own age
Verbally fights with sisters or brothers	Physically fights with friend own age
Physically fights with sisters or brothers	Constantly seeks attention

Interrupts	Is easily distracted	
Has short attention span	Fails to finish tasks or projects	
Has difficulty entertaining self alone	Has difficulty concentrating on one thing	
Is overactive or restless	Wets the bed	

Once Screener is complete:

If scheduled for Pretreatment Assessment visit: File completed screener in confidential participant folder.

If not meeting inclusion/exclusion criteria: Shred screener and note screen failure in referral tracking.

APPENDIX C
DEMOGRAPHIC AND BACKGROUND QUESTIONNAIRE

Date: ____/____/_____

Child's LAST Name: _____ Child's FIRST
Name: _____

Child's Date of Birth: ____/____/_____

Child's Age: _____ year

Child's Sex (circle one): Male Female

Child's Ethnicity: (check one)

- Caucasian
- Hispanic
- African-American
- Native American
- Asian-American
- Bi-racial (please specify) _____
- Other (please specify) _____

Who referred your child for treatment: (please check one)

- Outpatient or clinic at Shands
- Another Agency, clinic, or hospital referred
- School or teacher
- Another physician or doctor
- Another psychologist
- I decided to seek treatment for him/her
- Other (please specify) _____

Is your child currently in school?

- No
- Daycare
- Preschool
- Kindergarten
- Elementary School
- Home school

Is your child in a special classroom? (circle one) Yes No

Who diagnosed your child with an Autism Spectrum Disorder: (please check one)

- Pediatrician
- Psychologist
- Psychiatrist
- School psychologist

Other (please specify) _____

How old was your child when he/she was officially diagnosed: _____ years old

What kinds of assessments have been done to evaluate your child's functioning:
(please check all that apply)

- Intelligence Testing
- Full psychological battery
- Language testing
- Occupational therapy evaluation
- Parent questionnaires
- Special tests ordered by a physician

Which Autism Spectrum Disorder diagnosis describes your child: (please check one)

- Autistic Disorder
- Asperger's Syndrome
- Pervasive Developmental Delay, Not Otherwise Specified (PDD-NOS)
- Unsure (please describe) _____

Has your child been diagnosed with any other health or psychological difficulties: Yes
No

If Yes, please describe:

Is your child currently receiving services related to ASD symptoms (circle one): Yes
No

Where are you receiving services for your child's ASD symptoms (please check all that apply):

- School
- Psychologist's office
- Pediatrician's office
- Psychiatrist's office
- Speech/language therapist's office
- Occupational therapist's office

What treatments for ASD is your child currently receiving (please check all that apply):

- Behavioral treatment
- Special services at school
- Social skills group

- Speech/language therapy
 Occupational therapy
 Special diet
 Medication
 Play therapy
 Other (please specify) _____

What treatments for ASD has your child received in the past (please check all that apply):

- Behavioral treatment
 Special services at school
 Social skills group
 Speech/language therapy
 Occupational therapy
 Special diet
 Medication
 Play therapy
 Other (please specify) _____

Please list your child's current medications, the reason he or she takes them, and how long he or she has been on them:

Medication #1

Name: _____

Dosage _____ How long (months) _____

Reason: _____

Medication #2

Name: _____

Dosage _____ How long (months) _____

Reason: _____

Medication #3

Name: _____

Dosage_____ How long (months) _____

Reason: _____

Medication #4

Name: _____

Dosage_____ How long (months) _____

Reason: _____

APPENDIX D
SEMI-STRUCTURED INTERVIEW

Parent Interview

I. Primary Concerns: What do they want from the evaluation?

II. Developmental information:

A. Pregnancy:

Illness, medication, accidents, problems, complications; Length of Pregnancy, birth-weight

B. Labor & Delivery:

Length of labor; problems or complications
(medication, anoxia, jaundice, forceps)

C. Temperament as an infant: (e.g., crying, sleep, or feeding problems)

D. ASD Diagnosis

1. When did you first notice your child displaying behaviors that concerned you? Please describe in detail.

2. How was your child diagnosed? (At what age/ by whom/ details)

3. What treatments have you tried/are currently using
(frequency/effectiveness)

E. Developmental Milestones:

1. Walking: (age began)

2. Talking : (age of first words; age of first 2-word sentences)

3. Toilet Training: (age bladder trained; bowel trained; problems)

F. Family Information:

1. Who is in the family now:

Name	Age	Relationship to Child	ASD diagnosis
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2. Parent(s) involvement with child during early years:

3. Relationship with parents & siblings:

G. Medical History of Child

1. Accidents:

2. Illnesses/ Hospitalizations/ Surgery:

3. Head Injury (ever been in a car accident or knocked unconscious)

4. Seizures, tics, or unusual staring spells:

5. Sensitivities (food/ textures/sounds/lights)

6. Medications (current and past) – effective/problems/dose:

(If relevant, is child on medication today)

H. School:

1. Day Care (type of day care or child care arrangement)
Behavior, Learning, Peer relationships:
-
-
-

2. Preschool (ages; type of school or child care arrangements)
Behavior, Learning, Peer relationships:
-
-
-

3. Kindergarten (Type of School; Behavior, Learning, Friends):
-
-
-

4. First Grade (Behavior, Learning, Friends):

5. Second Grade (Behavior, Learning, Friends):

6. Other Relevant Grades (e.g., grades in which behavior, learning, or social relationships changed):

7. Special Education Classes:

8. Repeated or Skipped Grades:

-
- I. Current ASD Behaviors/ Behavior Problems (Problem, Current frequency, When it began, What usually sets it off, what usually stops it):

III. Discipline:

- A. Who disciplines:

- B. What is used? (What else? What else?)

For each, how often; how effective:

C. Spanking: (If parents haven't mentioned spanking, ask specifically how often (per day/wk/or month, and make note of their attitudes about it):

D. Other Concerns/ Problems Not Yet Addressed:

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BIOGRAPHICAL SKETCH

Leah Newlove Clionsky was born in Springfield, Massachusetts on September 18, 1984. The daughter of two psychologists, she was raised in Springfield and graduated from the Loomis Chaffee School in 2003. She earned her B.A. in psychology and French and graduated with honors from Vassar College in 2007.

In August of 2007, she enrolled in a dual Master of Science and Doctor of Philosophy program at the University of Florida's Department of Clinical and Health Psychology. Leah completed her Master of Science in 2009 under the mentorship of Sheila Eyberg, Ph.D., ABPP. She participated in a research assistantship in the Child Study Laboratory for 4 years, until she began her pre-doctoral internship at Baylor College of Medicine in Houston, Texas in 2011. Leah completed the final months of this internship on-site at Ben Taub General Hospital. She received her Ph.D. from the University of Florida in the summer of 2012 and is currently working as a postdoctoral fellow at Baylor College of Medicine.