Preliminary Effectiveness of Project ImPACT: A Parent-Mediated Intervention for Children with Autism Spectrum Disorder Delivered in a Community Program

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Abstract

This is a pilot study of the effectiveness of Project ImPACT, a parent-mediated intervention for ASD delivered in a community program. The primary aim was to compare child and parent outcomes between the intervention group and a community comparison for 30 young children with ASD at baseline and 12 weeks. The secondary aim was to identify parent factors associated with changes in child outcomes. Results indicated significant improvement in child communication skills and a strong trend for parent intervention adherence for the intervention group from baseline to 12 weeks. Higher baseline parenting stress was negatively related to child social gains from baseline to 12 weeks. Findings provide further support for delivering parent-mediated interventions in community settings to children with ASD.

Keywords

ASD; community-based services; implementation; parent-mediated interventions

While several research-based parent-mediated intervention methods for children with autism spectrum disorder (ASD) have been tested in controlled research settings (Brookman-Frazee, Vismara, Drahota, Stahmer, & Openden, 2009; National Research Council, 2001; Dawson & Burner, 2011; Rogers & Vismara, 2008), limited information is known about the effectiveness of such methods in "usual care," community-based service settings. Over the past decade, there have been increasing recommendations for translational research to address the need for implementation of efficacious interventions for children with ASD (Guralnick, 2005; Interagency Autism Coordinating Committee, 2011; National Standards Report, 2009). To address this need, the goal of the current study was to examine the initial effectiveness of a specific parent-mediated intervention targeting social-communication and delivered in a community-based setting to children with ASD and their caregivers.

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Reviews of the literature and best practice guidelines consistently identify active parent participation and education as an important component of intervention for children with ASD (National Research Council, 2001; Oono, McConachie, & Honey, 2012). Several intervention approaches that include a parent training component have documented efficacy in research settings (Brookman-Frazee et al., 2009; National Research Council, 2001; National Standards Report, 2009). Growing support exists for blended parent-implemented naturalistic developmental behavioral interventions (NDBIs) to address core issues of ASD and deficits in communication and cognition at early developmental stages (Ingersoll & Wainer, 2013; Rogers et al., 2012; Wallace & Rogers, 2010). These methods use behavioral strategies (e.g., direct prompting, contingency reinforcement) to teach specific social-communication skills along with emphasizing strategies derived from developmental science designed to facilitate reciprocity, social engagement, and shared affect during adult-child interactions. Child progress across several domains has been documented in two randomized trials (Rogers, & Dawson, 2009; Yoder & Stone, 2006) and controlled single-subject and quasi-experimental studies of systematic blending of behavioral/developmental methods (Ingersoll & Dvortcsak, 2010; Ingersoll, Dvortcsak, Whalen, & Sikora, 2005; Ingersoll & Wainer, 2013;). Given this empirical support, parent-mediated NDBIs are increasingly recommended as state-of-the-art treatment options for children at risk for developing ASD (Dawson et al., 2010; Ingersoll, 2009; Rogers et al., 2012; Stahmer, Schreibman, & Cunningham, 2011).

Despite well-documented efficacy data, less is known about the effectiveness of these parent-mediated approaches in community-based service settings, a critical service site for children with ASD. The limited research that has examined community-based early intervention and mental health services for children with ASD suggests that discrepancies exist between care provided in these routine services and that delivered in controlled research studies (Brookman-Frazee, Taylor, & Garland, 2010; Stahmer, Collings, & Palinkas, 2005). To mitigate discrepancies, there are increasing calls to implement research-based interventions in routine care settings serving children with ASD (Lord & Bishop, 2010).

Research suggests that community-based ASD providers can successfully be trained and subsequently deliver specific research-based interventions for children with ASD with strong treatment fidelity (Brookman-Frazee, Drahota, & Stadnick, 2012; Vismara et al., 2009; Vismara, Young, & Rogers, 2013; Wainer & Ingersoll, 2013). Further, a growing body of research has also reported that positive child and parent outcomes, similar to those in efficacy studies, can be obtained when parent interventions are delivered in community settings. Two quasi-experimental studies reported improvements in child adaptive behavior and communication skills following participation in a brief, naturalistic behavioral parent training program delivered in a similar community setting as in the current study (Baker-Ericzén, Stahmer, & Burns, 2007; Stahmer, & Gist, 2001). The earlier of these two studies (Stahmer & Gist, 2001) also reported that over half of parents who participated in the program met criteria for intervention skill mastery (i.e., appropriate use of intervention techniques during 75% of scored videotaped intervals). Studies outside of the U.S. examining community-based ASD services have reported similar positive findings across a range of child outcomes including cognitive, communication, and adaptive behavior skills,

autism severity, rate of development, and disruptive behavior problems (Freeman & Perry, 2010; Perry et al., 2008; Smith et al., 2010; Valenti et al., 2010).

Taken together, these studies suggest that research-based parent-mediated NDBIs for children with ASD delivered by community ASD providers are associated with positive child developmental outcomes. However, these studies have a number of limitations that the current study attempts to address. These limitations include the general lack of a control comparison group, assessment of parent intervention adherence, and examination of the impact of parent psychosocial factors on child outcomes. To address these limitations, the current pilot study examined the effectiveness of a specific parent-mediated NDBI, Project ImPACT (Improving Parents As Communication Teachers; Ingersoll & Dvortcsak, 2010), delivered in one community-based program that serves children with ASD and their families. The primary study aim was to compare child and parent outcomes in the intervention group to a community comparison group from baseline to 12 weeks. The secondary aim was to examine baseline parent stress, depression symptoms, and intervention adherence as predictors of child outcomes for all dyads at 12 weeks.

Methods

The current pilot study examined the effectiveness of the Project ImPACT intervention (Ingersoll & Dvortcsak, 2010) delivered between 2010–2012 in one community-based service center that routinely serves children with ASD and their families. This service center is affiliated with a local children's hospital and provides a variety of services including individual and group parent training programs, social skills groups, psychodiagnostic assessment, inclusion services, and cognitive behavioral therapy. The current study focused on the individual parent training program that is provided, which uses the Project ImPACT intervention as its standard treatment protocol. Children who participate in the parent training program have historically been between the ages of 18 months and 8 years.

Participants

Participants included 30 children and their parent. Each parent-child dyad was either in the intervention group or the community comparison group. A total of 16 parent-child dyads were in the intervention group and 14 parent-child dyads comprised the community comparison group. Inclusion criteria for all children included: 1) child between 18 months and 8 years, 2) child had a documented ASD diagnosis or was considered "at risk" for ASD, and 3) both parent and child were English-speaking. For dyads in the intervention group, each parent-child dyad had to be newly enrolled in the parent training program at the participating service center and had attended fewer than three sessions. For families in the comparison group, the child needed to be currently receiving community-based ASD services (outside of the service center) and parent-child dyads needed to have never received services at the service center where the study was conducted, the Project ImPACT intervention, or services that used similar intervention methods.

Regarding sociodemographics and diagnostic information, the mean age of the total sample was 54.83 months (SD = 25.44) and 80% were boys. Parents reported that children were 47% Multiracial, 30% White, 10% Hispanic/Latino, 7% Asian, 3% African American, and

3% Other. All children had a current ASD diagnosis according to the *DSM-IV* (APA, 2000) or were considered "at risk" for ASD (a provisional diagnosis for children under age 3) based on a community professional's diagnosis (87% were diagnosed by a psychologist) and verified by two of three ASD screening measures (described below) and a review of the most recent evaluation report documenting the ASD or "at risk" diagnosis. The child's biological mother was the respondent for 97% of the sample. Table 1 characterizes the sample. There were no statistically significant differences between study groups related to sociodemographics, service use, or ASD diagnostic type.

Procedures

Intervention Group—The recruitment process for intervention group dyads consisted of contacting parents who were recently enrolled in the program delivering Project ImPACT, and who provided permission to be contacted to receive study information. A total of 29 families were contacted. A phone screen was conducted with each family to confirm eligibility. Of these families, 13 were ineligible primarily because the child was outside of the study age range or the child did not have a documented ASD or "at risk" diagnosis. The remaining eligible 16 families agreed to participate in the study for approximately six months. All intervention group dyads completed the parent training program.

The Project ImPACT intervention (Ingersoll & Dvortcsak, 2010) consists of a prescribed set of naturalistic behavioral and developmental teaching strategies to facilitate child communication and social skills throughout daily activities and routines in young children (ages 18 months to 8 years). Project ImPACT uses NBDI methods that emphasize fostering the child's relationship with others involved in intervention to focus on developing reciprocity, social engagement, and shared affect during adult-child interactions while integrating behavioral strategies (e.g., direct prompting, contingency reinforcement) in the context of a highly engaged interaction to teach specific social-communication skills. Four core social-communication skills are addressed: 1) social engagement, 2) language, 3) imitation, and 4) play. The original protocol includes 24 sessions that can be delivered in an individual or group format. At the service center used for this study, the curriculum was condensed (in consultation with the intervention developer) into 12 sessions, due to constraints of the organization's funding source. In this service setting, Project ImPACT was delivered in an individual format over 12, one hour per week sessions. In each session, parents received didactic instruction in intervention strategies, modeling of the intervention strategies by the clinician with the child, and in-vivo feedback on their in-session practice of intervention strategies. Parents were provided with homework assignments to practice use of the intervention strategies throughout their child's daily activities. Table 2 describes the typical order that sessions were delivered. The intervention can be flexibly implemented to best meet the needs of the child and their family.

Project ImPACT was delivered by three clinicians in the community program. Clinicians were three full-time female clinicians who routinely delivered Project ImPACT at the service center used for this study. Clinicians had received formal training in Project ImPACT by the intervention developers and had met intervention adherence according to standard fidelity measures provided by the developers. Two clinicians held a master's

degree in Psychology and one clinician held a doctoral degree in Clinical Psychology. All clinicians specialized in working with children with ASD.

Community Comparison Group—Families in the community comparison group were recruited from a variety of local and national community organizations and providers that serve or provide resources to families of children with ASD including: providers at local school districts, the local California Regional Center, community agencies that serve children with developmental disabilities, private practitioners who routinely serve children with ASD but do not deliver Project ImPACT, and departments at the local children's hospital that serve children with ASD. Study information was also posted on several high traffic websites and in a weekly email newsletter for families of children with ASD. A total of 37 families were referred and contacted. A phone screen was conducted with each family to confirm eligibility. Of these families, 23 were ineligible. Reasons that children were ineligible included: the child was already enrolled in the Project ImPACT intervention or had previously received similar intervention methods, the child was outside of the study age range or the child did not have a documented ASD or "at risk" diagnosis.

Assessment Procedures—For both the intervention and community comparison groups, dyads were assessed at: 1) baseline (pre-intervention) and 2) 12 weeks from baseline (typical length of intervention). The primary caregiver completed a set of standardized questionnaires (described below) and was video recorded playing naturally with his or her child for 10 minutes at each assessment. Each assessment lasted approximately 1–2 hours and parents received $20 (up to $40 total) and their child received a small gift (up to two total) at each assessment period.

Eligibility and Sample Characteristics Measures

Family Sociodemographics and Service Use—Parent-report data were collected at the initial assessment regarding child and parent age, child gender, child race/ethnicity, parent level of education, family income, parent marital status, child comorbidity, and child history of current and past services. Parents reported concurrent services received at the 12-weeks assessment.

Social Communication Questionnaire (SCQ) (Rutter, Bailey, & Lord, 2003)— The SCQ is a 40-item parent-report measure that examines the presence of ASD symptoms in children. The SCQ has strong evidence for its use as a screening instrument and in identifying children at risk for ASD (Berument, Rutter, Lord, Pickles, & Bailey, 1999; Bishop & Norbury, 2002; Chandler et al., 2007; Charman et al., 2007). A Total Score is derived. A cutoff score of 15 is applied to the Total Score to divide the results into ASD versus Non-ASD. The SCQ was used to confirm ASD diagnoses and it was administered at baseline to all parents. This measure was used in combination with the Social Responsiveness Scale or Modified Checklist for Autism in Toddlers (described below) depending on the child's age to confirm concordance of the child's ASD diagnosis.

Social Responsiveness Scale (SRS) (Constantino & Gruber, 2005)—The SRS is a 65-item parent-report measure that examines the severity of autistic symptoms for children

ages 4–18. The SRS has robust reliability and validity (Charman, 2007; Constantino et al., 2003; Constantino, Przybeck, Friesen, D., & Todd, 2000). Five subscales and a Total Score are calculated. The Total Score is converted into a *T*-score that is classified into: 1) the Severe range, 2) the Mild to Moderate range, and 3) the Normal range. The SRS was used to help confirm ASD diagnoses and was administered at baseline to parents of children who were four years and older.

Modified Checklist for Autism in Toddlers (M-CHAT) (Robins, Fein, & Barton, 1999)—The M-CHAT is a 23-item parent-report ASD screening assessment for children 16 to 30 months. The M-CHAT has strong psychometric properties (Chlebowski et al., 2013; Kleinman et al., 2008; Robins, Fein, Barton, & Green, 2001; Robins, 2008). A Total Score is derived and classifies the results into "passing" or "failing." A "failing" classification, suggests a risk for ASD and a recommendation for follow-up. The M-CHAT was administered at baseline to confirm ASD diagnoses for children younger than four years.

Evaluation Report Documenting ASD Diagnosis—The child's most recent psychological, neuropsychological, school, or medical evaluation documenting a formal ASD diagnosis or "at risk" classification (for children under three years old) was reviewed at the baseline assessment.

Child Outcomes Measure

Vineland Adaptive Behavior Scales, Second Edition (Vineland-II) (Sparrow, Cicchetti, & Balla, 2005)—The Vineland-II is a standardized interview completed by parents that assesses child adaptive functioning in four domains: Communication, Daily Living Skills, Socialization, and Motor Skills. Only the Communication and Socialization domains were administered, per routine care at the service center used for this study. The Communication domain measures the child's verbal, receptive, and written language abilities while the Socialization domain assesses interpersonal, play and leisure, and coping skills. Each domain yields a standard score with a mean of 100 and a standard deviation of 15. The Vineland-II has strong internal consistency and concurrent validity (Sparrow, Balla, & Cicchetti, 2005). The PI administered the Vineland-II to all families in the comparison group and the clinician delivering the Project ImPACT to those in the intervention group administered the Vineland-II at baseline and 12 weeks, per routine care.

Parent Measures

Center for Epidemiological Studies-Depression Scale (CES-D) (Radloff, 1977)—The CES-D is a 20-item self-report scale that assesses the frequency of depression symptoms. The CES-D has strong reliability, with alpha coefficients ranging from .85 to .90, and validity for use in the general adult population (Radloff, 1977).

Parenting Stress Index-Short Form (PSI-SF) (Abidin, 1995)—The PSI/SF is a 36-item parent-report scale derived from the full-length PSI. Each item is rated on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The PSI-SF contains three sub-scales, each with 12 items: 1) Parental Distress, 2) Parent-Child Dysfunctional Interaction, and 3) Difficult Child. A Total Stress score is computed by summing the three

subscales. Subscale scores range from 12–60 and the Total score ranges from 36–180, with higher scores indicating a greater level of stress. The PSI-SF has strong psychometric properties (Abidin, 1995).

Parent Intervention Adherence—Video recorded observations of natural parent-child interactions lasting 10 minutes occurred at each assessment to examine changes in intervention adherence (i.e., degree to which the parent correctly uses the required intervention techniques during interactions with her child). Parents and children were asked to play or interact as they would typically at home. An established observation coding form that was created (Ingersoll & Dvortcsak, 2010) by the intervention developers was used to evaluate the parent-child interactions. The measure requires a trained coder to rate each intervention technique taught to parents on a 5-point scale from "1" (parent does not implement or never implemented appropriately) to "5" (parent implements competently throughout segment). Coders rated each of the six component summary scores: 1) Parent Uses *Follow Your Child's Lead*, 2) Parent models and expands child's language or play, 3) Parent creates opportunities for the child to initiate, 4) Parent helps child increase complexity of language, imitation or play, 5) Parent paces interaction to keep child engaged and learning, and 6) Parent targets child's social-communication goals. The mean of the six component summary scores was calculated for each video. Intervention adherence was defined as the mean of the summary scores at or greater than a rating of 4.

Five undergraduate or bachelor's-level research assistants, who were blind to study condition and had achieved reliability to independently code videos (i.e., correctly rated 80% of codes on two consecutive training videos), scored each 10-minute parent-child interaction. Approximately 30% (n = 22) of video observations were double coded. Inter-rater reliability was calculated in two ways. First, the intraclass correlation coefficient (ICC) was computed on the mean of the six component summary scores of each rater and was .66, which is within the acceptable range (Cicchetti, 1994). Second, percent agreement was computed. Percent agreement is method of determining interrater reliability for observational data that is often used in the developmental disability literature (e.g., Galensky et al., 2001; Koegel et al., 2012). Agreement was defined as both coders assigning a rating for each of the six summary scores that was within one point. Percent agreement was the quotient of the sum of the total number of agreements and the sum of the total number of agreements and disagreements, multiplied by 100. The average percent agreement was 96% (Range: 86–100%).

Data Analysis

To examine the first study aim, repeated measures mixed analyses of variance (ANOVA) were used to compare child and parent outcomes between the intervention and comparison groups. Individual models were performed for each child and parent outcome as measured by the Vineland-II Communication and Socialization standard scores, raw scores from the PSI-SF and CES-D and the parent intervention adherence mean. The second aim of the study was to examine parent factors as predictors of child outcomes for all families at 12 weeks. Multiple linear regression analyses were performed with Vineland-II Communication and Socialization baseline to 12 weeks difference scores as the outcome

variables. Data from families in both groups were pooled for these analyses. Study condition and baseline child standard scores on the Vineland-II were entered as covariates.

Results

Descriptive statistics are graphically depicted in Figures 1–5.

Baseline Groups Equivalence

Differences in sociodemographic and service use variables between the intervention and comparison groups were examined using one-way ANOVAs and chi-square analyses. There were no baseline differences between study groups for relevant child or parent sociodemographics, primary funding source, ASD diagnosis type, professional who provided the ASD diagnosis, or the number of services that the child was receiving (all p-values >0.05). To further assess the degree of association between categorical sociodemographic and service use variables, Cramer's V was calculated. No statistically significant associations were identified. Differences in baseline child and parent outcome variables were next examined using one-way ANOVAs. There were no baseline differences between the intervention and comparison group on the Vineland-II, PSI-SF, CESD-D, and the intervention adherence mean (all p-values >0.05).

Child and Parent Outcomes Comparison

Repeated measures mixed ANOVA were performed to compare child and parent outcomes between groups. There was a significant interaction between study group and time for child communication skills, $F(1, 27) = 5.70$, $p < .05$, $\eta^2 = 0.17$. There was a strong positive trend for parent intervention adherence, $F(1, 22) = 4.14$, $p = .05$, $\eta^2 = 0.16$. There was not a significant interaction between study group and time for child social skills, $F(1, 27) = 1.43$, $p = .24$, $\eta^2 = 0.05$, parent stress, $F(1, 24) = 1.62$, $p = .22$, $\eta^2 = 0.06$ or parent depression symptoms, $F(1, 27) = 0.83$, $p = .37$, $\eta^2 = 0.03$. Full model results are reported in Table 3.

Parent Characteristics Predicting Child Outcomes

To examine the secondary study aim examining the role of baseline parent factors on child skills changes, bivariate correlations between parent stress, depression, and intervention adherence at baseline and 12 weeks, and child difference scores in communication and social skills were first performed to guide selection of subsequent regression analyses. Parent stress at baseline demonstrated a statistically significant (at $p < 0.10$ level), negative correlation with changes in child social skills from baseline to 12 weeks ($r = -0.34$; $p = 0.09$). As a result, two multiple linear regression analyses were conducted with parenting stress (PSI-SF Total score) at baseline as the predictor variable, and changes in child communication and social skills between baseline and 12 weeks (change scores) as the dependent variables. Study group and the most proximal assessment child score (e.g., baseline child scores for the model predicting child changes from baseline to 12 weeks) were entered as covariates in the regression models. Of these models, baseline parenting stress emerged as a statistically significant predictor of changes in child social skills from baseline to 12 weeks, $\beta = -0.17$, SE = 0.07, $p < 0.05$, after controlling for study group and baseline child social skills. Specifically, there was a negative association between baseline

parenting stress and child social skills changes with higher baseline parenting stress related to smaller improvements in child social skills from baseline to 12 weeks.

Discussion

This study examined the initial effectiveness of the Project ImPACT intervention, a parent-mediated NDBI intervention for children with ASD served in a community-based program. Findings from the first study aim indicated that children in the intervention group demonstrated significantly greater gains in communication skills relative to comparison group children from baseline to 12 weeks. In addition, a strong positive trend was identified for parents in the intervention group demonstrating higher treatment adherence compared to comparison group parents from baseline to 12 weeks. Results from the second aim of the study indicated that higher baseline parenting stress was associated with less change in child social skills from baseline to 12 weeks (commensurate with the duration of the intervention), independent of study group.

Results of this first study aim are generally consistent with the small but growing literature that has examined outcomes from parent-mediated interventions delivered in community settings for families of children with ASD (e.g., Baker-Ericzén, Stahmer, & Burns, 2007; Stahmer, & Gist, 2001, Vismara et al., 2009). Specifically, these findings support the available literature that has documented signficant child improvements in social-communication skills and parent behavior change following participation in parent-mediated interventions. However, while the findings indicating greater improvement in specific child and parent skills for the intervention group are promising, it is important to note that not all child and parent outcomes examined improved. There are a number of possibilities that may explain these results. One possibility may be that the study groups differed on measured variables that were related to outcomes but were not detected due to the study's small sample size and the non-randomized design of the study. Related, the study groups may have differed on unmeasured variables that were related to study outcomes. Another possibility is that the concurrent services reported by parents impacted outcomes. Information on the intensity (i.e., frequency and duration) of and specific nature of concurrent service use throughout the study was not collected. Therefore, it is not known whether the intensity of services received differed between the study groups and what impact this may have had on study outcomes. Another consideration is that the original design of the Project ImPACT intervention includes 24 sessions delivered twice weekly rather than the 12 session, once-per-week model used in the current study. There is the possibility that the higher intensity format of the intervention may have yielded stronger intervention effects. It was beyond the scope of this study to examine the relation between treatment dosage and outcomes. However, a recent study that examined the efficacy of Project ImPACT (Ingersoll & Wainer, 2013) reported similar positive outcomes regarding parent intervention adherence and child language acquistion with both the 12 session and 24 session service delivery models.

Results from the second study aim are also somewhat consistent with the limited research that has examined caregiver functioning of children with ASD. Specifically, study findings confirm previous literature that has documented the high parenting stress levels that

caregivers of children with ASD experience (Baker-Ericzen et al., 2005; Hayes & Watson, 2013; Osborne, McHugh, Saunders, & Reed, 2008; Plienis, Robbins, & Dunlap, 1988; Robbins, Dunlap, & Plienis, 1991). Specifically, parents in this sample generally reported clinical levels of parenting stress across 12 weeks. In addition, study findings support the limited literature that has demonstrated the negative relationship between parenting stress and child skill acquisition (Robbins, Dunlap, & Plienis, 1991). Given that this study had increased methodological rigor, relative to the existing literature that has assessed parent-mediated interventions delivered in community settings, findings from this study are important in advancing empirical pursuits aimed at examining effectiveness for the ASD population.

This study adds to the available literature in several respects. Most importantly, the increased methodological rigor of the study provides more definitive support for the utility and postive impact on communication skills and parent behavior that the Project ImPACT intervention may provide for children with ASD and their caregivers. While the small sample size significantly impacted the statistical power of the effects examined, descriptive data on the other child and parent outcomes paralleled the postive trends in improvement that were identified for child communication skills and parent intervention adherence from baseline to 12 weeks.

Further, this study facilitates clarification of the previously mixed results regarding the impact of parenting stress, in particular, on child skills. Due to the finding that greater baseline parenting stress levels were related to less change in child social skills from baseline to 12 weeks, an important clinical consideration in services planning is the addition of parent stress assessment upon entry into parent-mediated services for children with ASD. The deleterious effects of high parenting stress on child skill acquision underscore the need for assessment of parenting stress in parent training. Related, study findings suggest the need for adapting parent-mediated interventions for caregivers with high levels of parenting stress. There is a growing interest in understanding how to best tailor ASD interventions based on child and family characteristics (Stahmer, Schreibman, & Cunningham, 2011). This research has suggested that caregivers who present with high stress levels may be poor candidates for parent training services. Children and their caregivers in this circumstance may fare better in intervention that requires less parent involvement. Additionally, examining interventions to address high levels of parent stress will be important as parent stress may directly affect child outcomes.

Future research is greatly needed, particularly with access to a larger sample size of families. It may also be important to assess additional aspects of parent functioning that may be not only an outcome of intervention, but may also facilitate the effects of intervention on their children. It should be noted that there was little movement in parent depression symptoms across study groups. The average depression scores across 12 weeks were well below the clinical range so the limited variability in scores may have impacted findings. This may suggest that assessing depression symptoms does not provide the best representation of psychosocial functioning functioning for caregivers of children with ASD or that the depression scale used was insufficiently sensitive. Further, it suggests the need to assess a broader range of parent functioning constructs. For example, parent confidence in managing

child behaviors, therapeutic alliance, and parental sense of social support may represent both naturally occurring outcomes of parent-focused intervention and mediators or moderators of child skill acquisition. The significance of these parent constructs in parent-mediated interventions have been reported in recent studies (Rogers et al., 2012; Stahmer & Gist, 2001). Finally, as mentioned earlier, future research should also examine the utility of "booster" sessions in maintaining or augmenting child and parent skills.

Strengths and Limitations

The primary strength of this study is its strong ecological validity. Specifically, this study examined the effectiveness of research-based practices in community settings for children with ASD. Another strength is the focus on parent factors to further understand the impact of a research-based parent training intervention on parent functioning and skills. Related, this study examined parent factors as predictors of child clinical outcomes. There is limited research examining predictors of child clinical outcomes beyond child age and IQ (Rogers, & Vismara, 2008). Study findings suggest the importance of systematically assessing parenting stress upon entry in ASD services that include a parent-involvement component. In addition, the inclusion of a community comparison condition was a methodological strength of this study.

While the comparison condition is a strength, it is also associated with inherent methodological limitations. Specifically, families were not randomly assigned to study group. Random assignment was not feasible for this study due to ethical constraints related to withholding treatment from families and because the purpose of the study was to compare Project ImPACT to usual care. While random assignment may facilitate examining intervention effectiveness and mitigate the influence of endogeneity biases (Duncan, Magnuson, & Ludwig, 2004), research suggests that random assignment may negatively impact the flexibility required when initially testing an intervention. This is particularly true for ASD intervention research within community settings that naturally involve funding, ethical, and sociopolitical factors that can be challenges to random assignment (Rogers, & Vismara, 2008). Given that this study aimed to provide initial results on the effectiveness of Project ImPACT, the methodological design of this study was appropriate, added methodological rigor to existing research, and provided the flexibility required to be tested within community service settings. Families did not differ on relevant sociodemographic, service use, or child ASD diagnostic characteristics thus providing a moderate degree of confidence that study findings were not due to differences in study groups.

Two methodological limitations related to outcome measurement should be noted. First, the outcome measures, with the exception of parent intervention adherence, were based on parent-report. Parents' perceptions of their child's behaviors and their own functioning may have been influenced by a number of factors such as parenting stress and their expectations of and experiences with services they have received. The former is particularly important to consider given that findings from the second aim of this study found a negative relation between parenting stress and changes in child skills. This finding introduces the possibility that parenting stress affected parent responses to the child outcome measures. Another important consideration is that given the high levels of parenting stress that were reported,

parent responses may have been impacted by their stress levels. Although the inclusion of an observational measure of parent intervention adherence addresses this limitation, to some extent, it is important for future research to include child and parent outcomes based on multiple informants. A second limitation related to outcome measurement was that the individual administering the Vineland-II, the primary child outcome measure, was not blind to study condition and differed by condition. This limitation potentiates the possibility of response bias or differences in response style. Finally, the relatively small sample size was a study limitation. While research examining ASD interventions typically use samples of similar size to the current study (Rogers, & Vismara, 2008), this study's sample size impacted statistical power and the ability to identify group differences.

Overall, this study is one of the few to examine the effectiveness of a specific research-based parent training intervention in community-based settings for families of children with ASD. Findings from this study provide initial information on the effectiveness of the Project ImPACT intervention delivered in community settings, suggest adaptations that may be needed to deliver the intervention in a community services context, and support the need for a larger, randomized or naturalistic experimental study examining the intervention.

Acknowledgments

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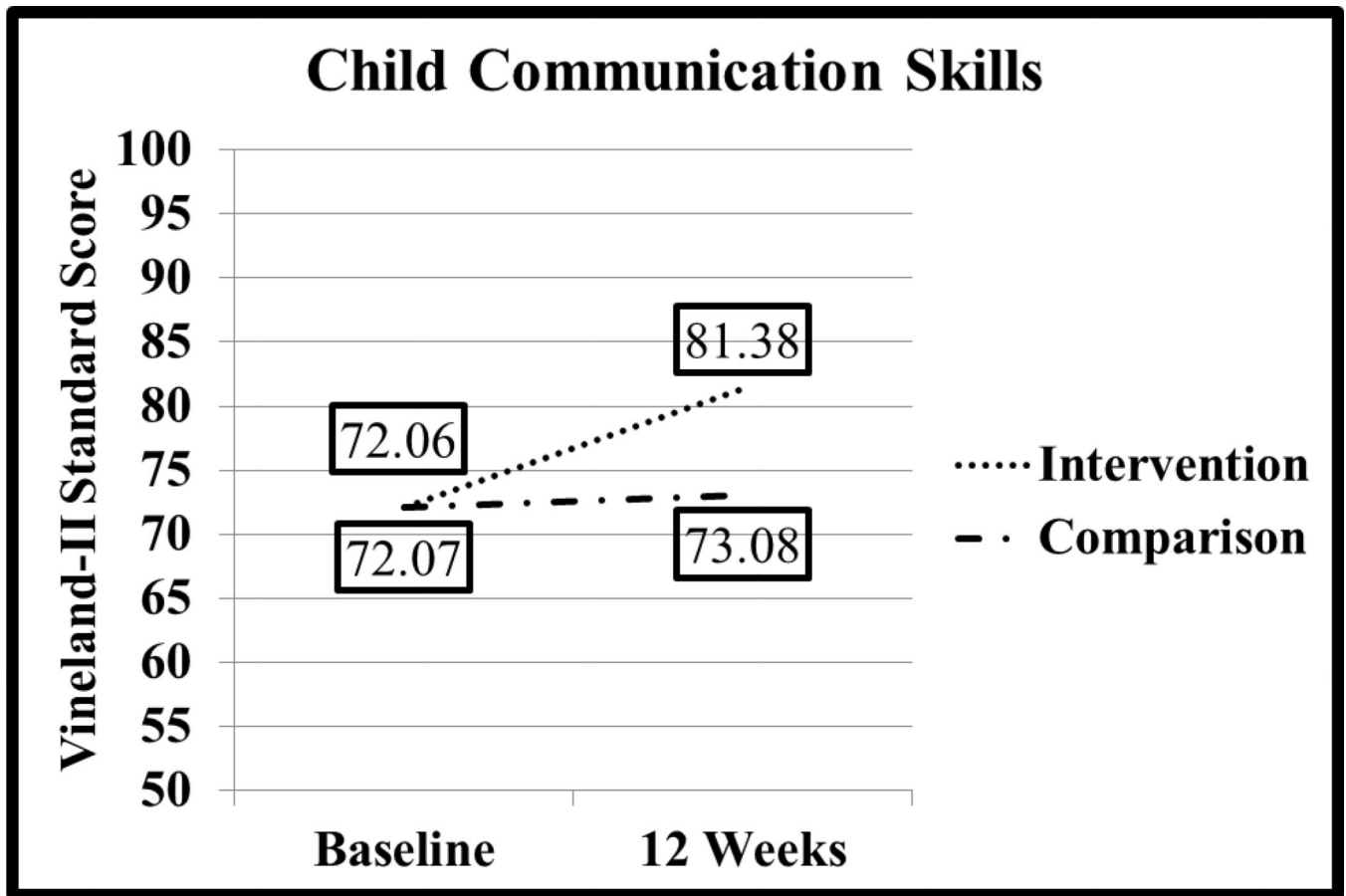
Figure 1. Child Communication Skills
Data displayed are standard scores from the Vineland-II (Sparrow, Cicchetti, & Balla, 2005).

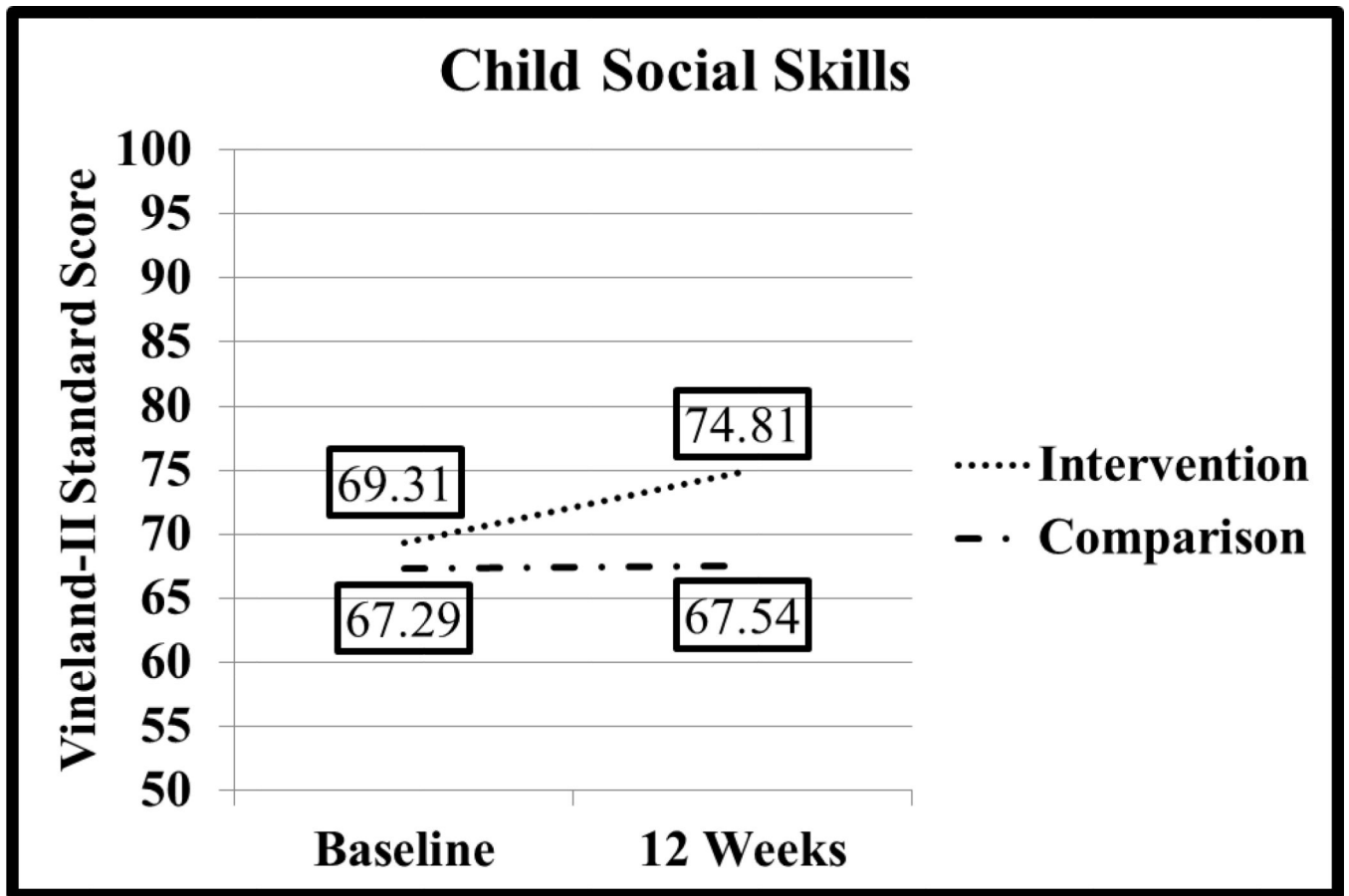**Figure 2. Child Social Skills**

Data displayed are standard scores from the Vineland-II (Sparrow, Cicchetti, & Balla, 2005).
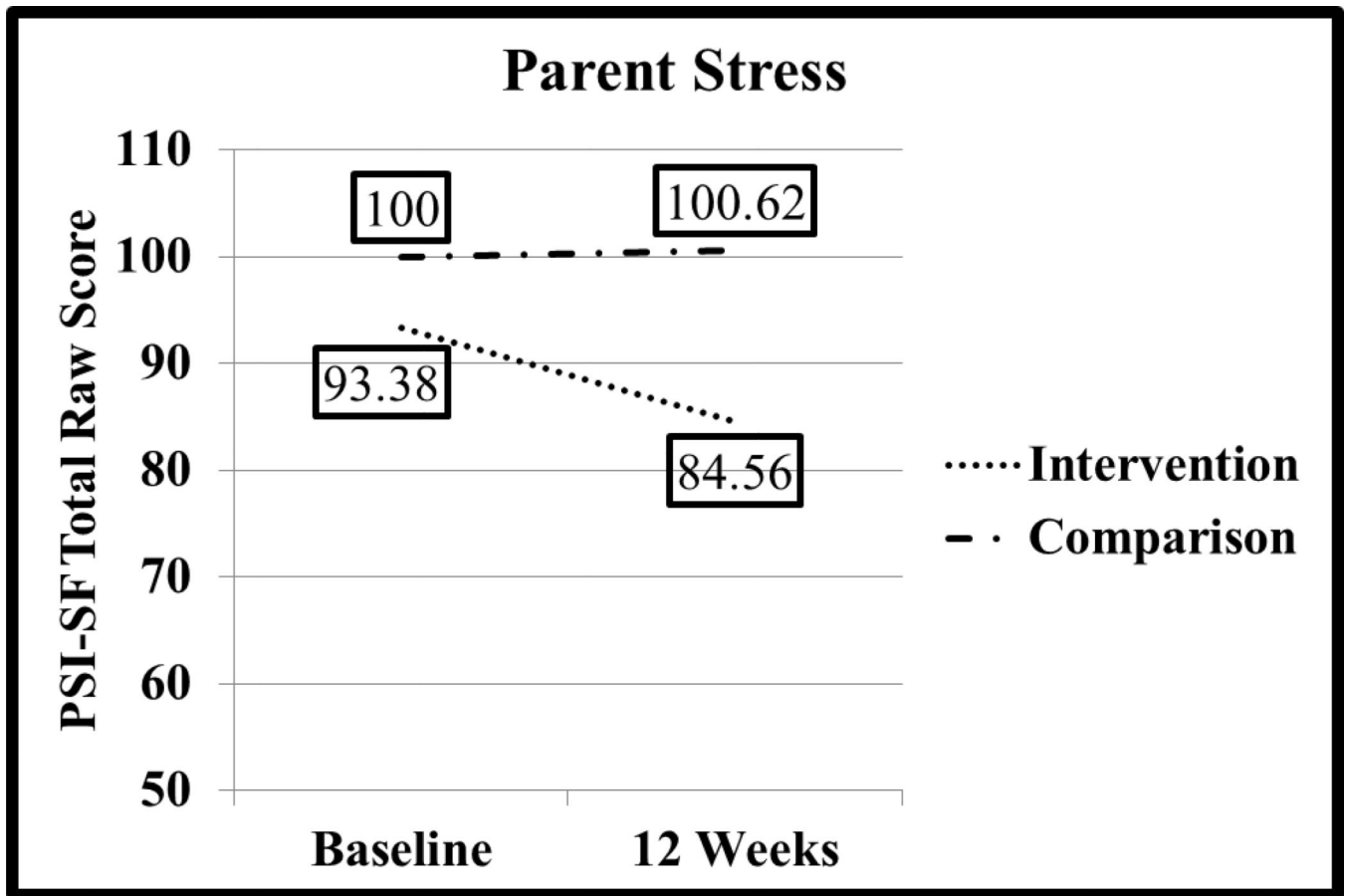
Parent Stress

Figure 3. Parent Stress

Data displayed are raw scores from the Parenting Stress Index/Short Form (Abidin, 1995). A score of 86 or greater on the Parenting Stress Index/Short Form is suggestive of clinically significant stress.

Figure 4. Parent Depression Symptoms
Data displayed are raw scores from the Center for Epidemiological Studies-Depression
Scale (Radloff, 1977). Scores between 16-26 on the Center for Epidemiological Studies-
Depression Scale are suggestive of mild depression symptomatology.

Figure 5. Parent Intervention Adherence
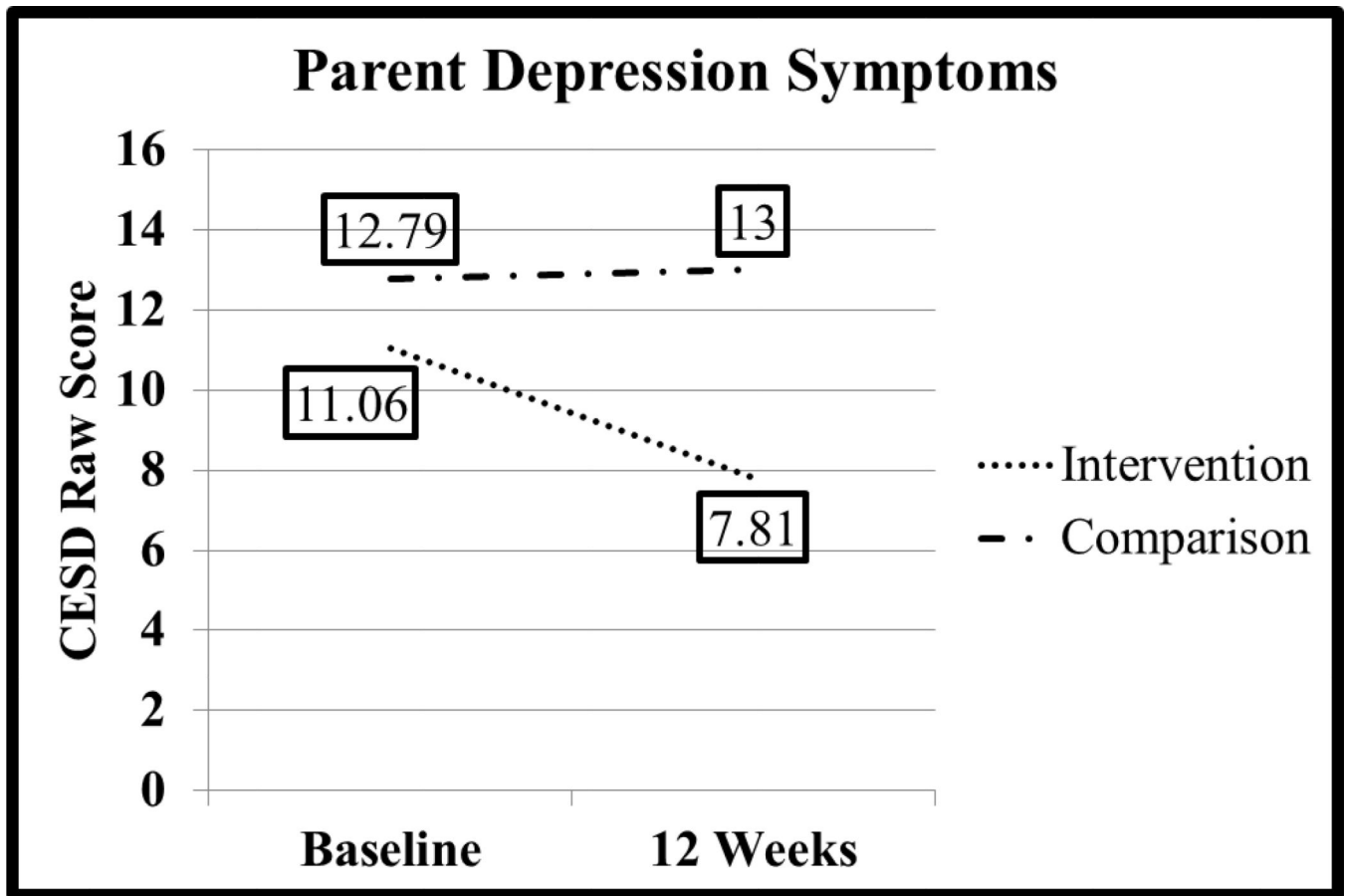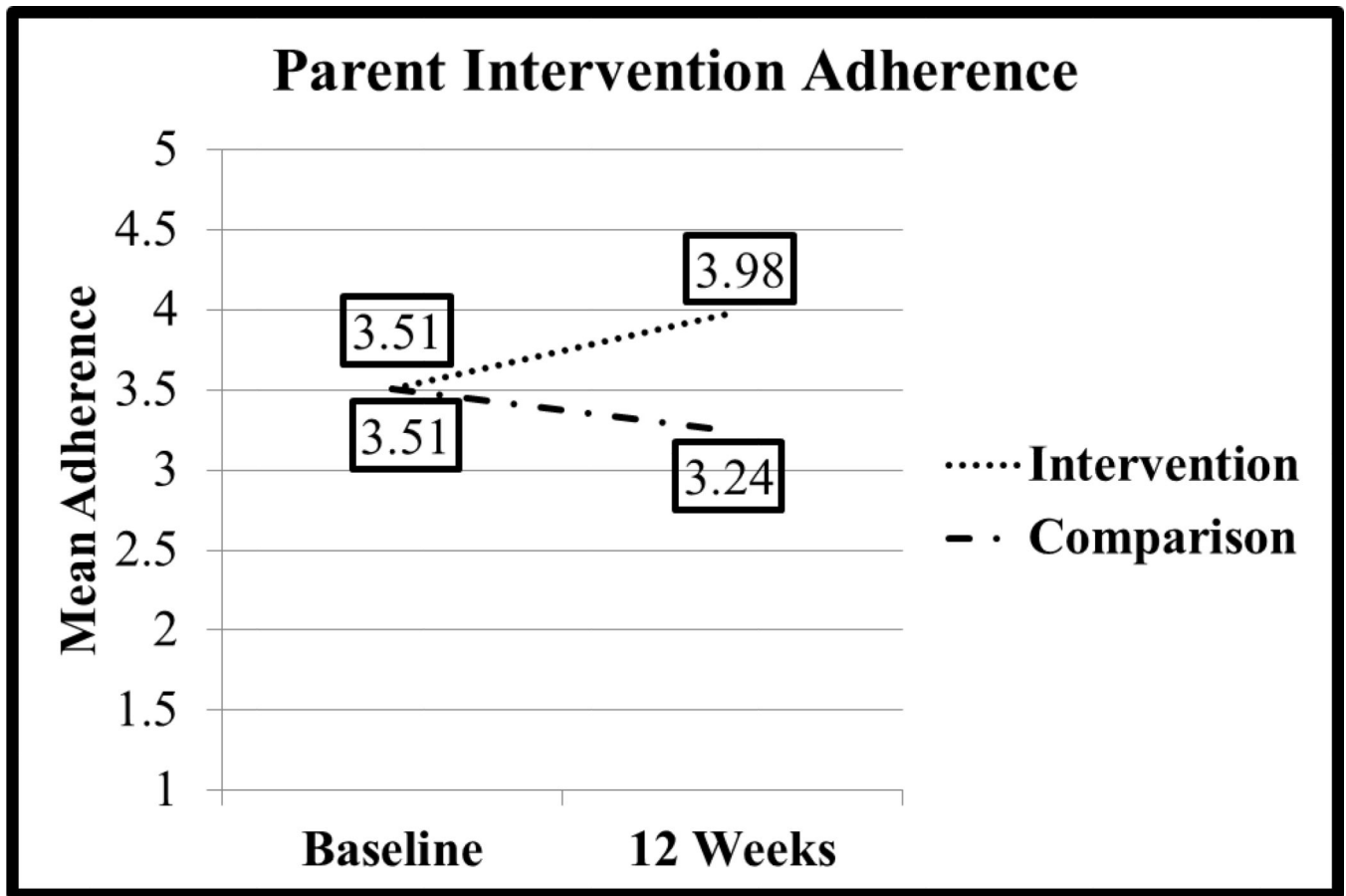Data displayed are the mean of the six summary intervention component scores on which
parents were rated.

Table 1

Baseline Characteristics of the Sample

	Intervention (n = 16)	Comparison (n = 14)
Child Age	M = 46.75 months (SD = 25.88; Range = 20–108)	M = 64.07 months (SD = 22.32; Range = 18–104)
Child Sex	81% boys	79% boys
Child Race/Ethnicity (%)		
Caucasian/White	31%	29%
Hispanic/Latino	6%	14%
Asian/Pacific Islander	13%	--
African American	6%	--
Multiracial	44%	50%
Other		7%
Family Income (%)		
0-$25,000	14%	7%
$25–50,000	36%	21%
$50–75,000	14%	7%
$75-$100,000	29%	57%
> $100,000	7%	7%
[*]**Maternal Age**	M = 34.80 years (SD = 6.81; Range = 23–45) (n = 15)	M = 36.50 (SD = 6.56; Range = 27–50) (n = 14)
Maternal Education (%)		
High School/GED	6%	21%
Associate's Degree	38%	21%
Bachelor's Degree	31%	36%
Master's Degree	19%	21%
Doctoral Degree	6%	--
Marital Status (%)		
Married	60%	79%
Separated/Divorced	7%	14%
Single	33%	7%
Primary Services Funder (%)		
Regional Center	56%	57%
Private Pay	6%	14%
Commercial Insurance	13%	21%
Private Pay & Regional Center	6%	7%
Private Pay & Insurance	13%	--
Medicaid	6%	--
ASD Diagnosis (%)s		
Autistic Disorder	53%	70%

	Intervention (n = 16)	Comparison (n = 14)
PDD-NOS	7%	10%
At-Risk for ASD	40%	20%
Diagnosing Provider		
Psychologist	100%	71%
Psychiatrist	--	14%
School Psychologist	--	14%
*__SRS Total Score__	n = 5	n = 12
Severe Range	100%	91%
Mild to Moderate Range	--	9%
Normal Range	--	
*__MCHAT__	57% Failed (n = 7)	100% Failed (n = 2)
*__SCQ Total Score__	(n = 14)	(n = 14)
ASD	71%	93%
Non-ASD	29%	7%
Number of Concurrent Services	M = 4.50 (SD = 1.55; Range = 2–7)	M = 4.07 (SD = 1.69; Range = 1–6)
Parent Training	--	71%
In-Home ABA	75%	64%
Occupational Therapy	81%	71%
Speech Therapy	94%	71%
Physical Therapy	31%	14%
Social Skills Group	25%	36%
Special Education	44%	64%
Other	14%	21%

Note.

*
denotes that data were not available for all participants.

Table 2

Typical Sequence of Sessions for Project ImPACT (Ingersoll & Dvortcsak, 2010)

Session 1	Therapists administer the intake assessments. Overview and goals of the program, intervention techniques (interactive and directive), and social-communication are discussed.
Session 2	Therapists begin with teaching the interactive techniques. They first discuss how to set up the home environment for practicing intervention techniques (e.g., scheduling predictable routines, setting up a defined space, limiting distractions, toy rotation) and following the child's lead.
Session 3	Therapists and parents develop specific goals for the child. Topics covered include how to use animation using direct language stimulation, (e.g., self-talk and parallel talk) to make play and daily activities more interactive.
Session 4	Therapists teach parents how to model and expand their child's language and use playful obstruction to create opportunities for communication and increase social engagement.
Session 5	Therapists teach parents how to use communicative temptations (e.g., have a desired toy in the child's sight but out of reach) and taking turns during play.
Session 6	Therapists begin teaching the directive techniques, which require the parent to use prompting and reinforcement to increase the complexity of their child's response.
Session 7	Therapists teach parents how to use eight specific language prompts coordinated with reinforcement to enhance their child's expressive language.
Session 8	Therapists teach parents how to use four specific prompts coordinated with reinforcement to enhance the child's ability to understand and follow directions.
Session 9	Therapists review previously taught interactive techniques and new directive techniques to teach the child social imitation.
Session 10	Therapists teach parents how to use six specific play prompts coordinated with reinforcement to increase the complexity of the child's play.
Session 11	Therapists review the use of interactive and directive techniques and update developmental and behavioral child goals.
Session 12	Therapists administer the post assessments and develop a plan for continued implementation of intervention techniques.

Note. This sequence was adapted, per routine care, for the site in which the intervention was delivered for this study.

Table 3

Repeated Measures Analysis of Variance

Effect	MS	df	F	p	η^2
Child Communication Skills					
Time	458.94	1	13.64	.001	0.34
Time × Study Group	191.76	1	5.70	.02	0.17
Error	33.66	27			
Child Social Skills					
Time	151.52	1	2.99	.10	0.10
Time × Study Group	72.62	1	1.43	.24	0.05
Error	50.67	27			
Parent Stress					
Time	495.24	1	2.46	.13	0.09
Time × Study Group	326.16	1	1.62	.22	0.06
Error	201.71	24			
Parent Depression Symptoms					
Time	45.39	1	1.22	.28	0.04
Time × Study Group	31.05	1	0.83	.37	0.03
Error	37.22	27			
Parent Intervention Adherence					
Time	0.13	1	0.33	.57	0.02
Time × Study Group	1.59	1	4.14	.05	0.16
Error	0.38	22			