

FACTORS INFLUENCING PARENT FIDELITY TO PARENT-MEDIATED
INTERVENTION FOR INFANTS/TODDLERS AT RISK FOR
AUTISM SPECTRUM DISORDER

Linn Wakeford

A dissertation submitted to the faculty at the University of North Carolina at Chapel Hill
in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the
School of Education (Applied Developmental Sciences and Special Education).

Chapel Hill
2017

Approved by:

Harriet Able

Elizabeth Crais

Samuel L. Odom

Brian A. Boyd

Kathleen Gallagher

© 2017
Linn Wakeford
ALL RIGHTS RESERVED

ABSTRACT

Linn Wakeford: Factors Influencing Parent Fidelity to Parent-Mediated Intervention for Infants/Toddlers At Risk for Autism Spectrum Disorder
(Under the direction of Elizabeth Crais and Harriet Able)

Increasingly, parents are being given significant roles in delivering interventions to their young children with or at-risk for Autism Spectrum Disorder (ASD). However, little is known about the extent to which parents can and do implement intervention with high fidelity, or the factors that may affect their ability to do so. Secondary data from thirty-six families enrolled in the Early Development Project -2 were used to investigate factors that may affect parent fidelity to parent-implemented early intervention for children with or at-risk for ASD. Methods included correlational analyses and multiple regression to identify key predictors of parent fidelity. Results indicated that parent fidelity may be affected by a combination of factors related to socio-economic status, parenting style, the extent to which intervention is consistent with parenting style, and the adherence fidelity of the interventionist. These outcomes emphasize a need for researchers and interventionists to consider these and potential other factors that may affect parent participation in parent-implemented early interventions for children with or at-risk for ASD.

To my family.
By blood and by marriage, past and present, you are my greatest blessings.
Thank you for everything.

ACKNOWLEDGEMENTS

I have many people to acknowledge for supporting me in this work. Grace Baranek instigated my opportunity to take a significant role in the Early Development Project as the Intervention Coordinator, and inspired my desire to do this kind of research in her doctoral seminar on ASD. Linda Watson, Betsy Crais, Lauren Turner-Brown, Grace Baranek, and Steve Reznick welcomed me onto the EDP team and kept me there for EDP-2. The families with whom I worked in EDP and EDP-2 opened their doors to me each week, shared themselves and their children with me, and gave me insight and opportunity to learn about families of children at risk for ASD; the other families enrolled in the project did the same for the rest of the intervention team. Christene Tashjian, EDP-2 Project Coordinator, and my fellow interventionists, Lisa Boyd, Jessica Amsbary, Maura Sabatos-Devito, Lucy Stefani, and Lauren Little, all contributed significantly to my thinking about how parents were receiving and implementing the intervention and about our role as interventionists. Our Intervention Team meetings always provided much food for thought.

Virginia Dickie and Ruth Humphry, Directors of the Division of Occupational Science & Occupational Therapy at UNC at different times in my career as a PhD student, along with my other faculty colleagues, were patient and supportive, pushing me ahead but also giving me the time I needed to do all the things that needed to be done.

My Program Committee in the School of Education, Harriet Able, Betsy Crais, Sam Odom, George Noblit, and Kate Gallagher, got me to the point of actually being able to do this research, and my Dissertation Committee, Betsy Crais, Harriet Able, Sam Odom, Kate Gallagher, and Brian Boyd, helped me complete the task. I am especially grateful to Betsy Crais,

who served as my dissertation advisor, reading and re-reading drafts, offering excellent advice, and making my completion of the document not only my priority but hers as well as the time drew near to finish.

And finally, much gratitude goes to my family and friends, who also have been encouraging to me and optimistic for me, who asked about my work at appropriate intervals and also knew when it was best not to ask. This would have been a very lonely task if not for each and every one of you. Thank you.

TABLE OF CONTENTS

LIST OF FIGURES.....	ix
LIST OF TABLES.....	x
CHAPTER ONE: INTRODUCTION.....	1
CHAPTER TWO: LITERATURE REVIEW.....	8
Fidelity of Implementation in Intervention.....	8
Parent-Mediated/Parent-Implemented Early Interventions for Children with ASD.....	35
Conceptual Model.....	45
CHAPTER 3: METHODS.....	62
The Early Development Project-2.....	62
Purpose of the Study.....	72
Data.....	73
Data Analysis.....	78
CHAPTER 4: RESULTS.....	85
CHAPTER 5: DISCUSSION.....	89
CHAPTER 6: CONCLUSIONS.....	100
APPENDIX A: EDP-2 DEMOGRAPHICS FORM.....	105
APPENDIX B: PARENTAL STRESS SCALE ITEMS.....	110
APPENDIX C: MATERNAL BEHAVIOR RATING SCALE (MBRS).....	111
APPENDIX D: EDP-2 PARENT IMPLEMENTATION RATING FORM (PIRF).....	118

APPENDIX E: PIRF SCORING GUIDE.....119

APPENDIX F: EDP-2 INTERVENTIONIST FIDELITY CHECKLIST (IFC).....121

APPENDIX G: ICF SCORING GUIDE.....122

REFERENCES.....162

LIST OF FIGURES

Figure 1 - Relationships among components of Implementation Science and Implementation Fidelity, based on Darrow, 2011.....	130
Figure 2 - Parenting style, conceptualized as intensity along responsiveness and demandingness continua, based on Maccoby & Martin, 1983, as cited in Fletcher, Walls, Cook, Madison, & Bridges (2008).....	131
Figure 3 - Transactional Model of Parent Implementation Fidelity.....	132
Figure 4 - Diminishing demands of community context (need for preschool transportation) on family life as a result of mother's actions (joining carpool) and development of new habits and ways of managing time.....	133
Figure 5 - Study process for Early Development Project.....	134
Figure 6 - Content of Adapted Responsive Teaching (Adapted from Mahoney, G.J. & MacDonald, J. (2007).....	135
Figure 7 - ART session plan for Thomas.....	136
Figure 8 - Scree plot for Principle Components Analysis of the Interventionist Fidelity Checklist.....	137
Figure 9 - Histograms representing distribution of ordinal variables with overlaid normal distribution line for comparison. All variables meet acceptable criteria for normal univariate distribution.....	138
Figure 10 - PIRF fidelity by participant over time, with the majority of data points indicating 80% fidelity or higher, but also with multiple data points below 80% fidelity. This variability is notable over the entire course of intervention sessions.....	139

LIST OF TABLES

Table 1 - Parent- implemented intervention studies targeting children with or at-risk for ASD, ages 0-5, published in peer-reviewed journals, in English, between January, 2004 and June, 2014 (n=35).....	140
Table 2 - Comparison of conceptual frameworks for fidelity of implementation of intervention.....	143
Table 3 - Summary of recommendations for measurement of fidelity.....	144
Table 4 - Demographic characteristics of participant families.....	145
Table 5 - Results of Principle Components Analysis for the Parent Implementation Rating Form.....	146
Table 6 - Results of ANOVA for PIRF scores (parent fidelity) by family.....	147
Table 7 - Descriptive statistics for PIRF fidelity scores by participant (N = number of PIRF forms collected).....	148
Table 8 - Principle Components Analysis component matrix for the Interventionist Fidelity Checklist, with high positive loadings for components 1 and 2 in bold.....	149
Table 9 - Number of Interventionist Fidelity Checklists available for each interventionist.....	150
Table 10 - Results of ANOVA Statistics for the Interventionist Fidelity Checklist.....	151
Table 11 - Bivariate and partial correlations among demographic variables.....	152
Table 12 - Descriptive statistics for ordinal variables.....	154
Table 13 - Frequency distribution of household income data, with variable category labels replaced with actual dollar amounts.....	155
Table 14 - Results of bivariate correlations between study variables (N=36).....	156
Table 15 - Summary of model for prediction of parent implementation fidelity scores by household income, parenting style, and IFC-adherence (interventionist adherence fidelity).....	157

Table 16 - Analysis of Variance for regression models for prediction of parent implementation fidelity scores by household income, parenting style, and IFC-adherence (interventionist adherence fidelity).....	158
Table 17 - Beta (β) and correlation coefficients for regression models for prediction of parent implementation fidelity scores by household income, parenting style, and IFC-adherence (interventionist adherence fidelity).....	159
Table 18 - Conceptual alignment of items on the IFC and PIRF.....	160

CHAPTER 1: INTRODUCTION

For over twenty years, researchers interested in Autism Spectrum Disorders (ASD) have been working to develop methods and tools to identify children at-risk for a diagnosis of ASD as early as possible. Despite the challenges confronted in this process of tool development, ASD professionals currently have multiple screening and assessment tools available for use with infants and toddlers (Matson, Rieske, & Tureck, 2011), and the combination of these tools and expert clinical impressions now allows for identification of risk as early as 12 months (Pierce, Carter, Weinfeld, Desmond, Hazin, Bjork, & Gallagher, 2011; Reznick, Baranek, Reavis, Watson, & Crais, 2007; Turner-Brown, Baranek, Reznick, Watson, & Crais, 2012) and stable diagnosis as early 24 months (Lord, Risi, DiLavore, Shulman, Thurm, & Pickles, 2006). Public health campaigns launched by the Centers for Disease Control and other organizations encouraging parents, health care professionals, and others to “Learn the Signs. Act Early” have increased attention to early detection of ASD risk. In addition, the United States (U.S.) government and other funding sources have supported significant numbers of early identification and early intervention studies, and the American Academy of Pediatrics has mandated ASD screening at all well-baby check-ups for children at ages 18 and 24-30 months (Johnson & Myers, 2007). As a result of these efforts at early identification, there has been an increase in the number of children under the age of three who have been designated as at risk for or diagnosed with ASD. This then presents an imperative for early intervention to address core and associated characteristics of ASD.

As noted by Wallace and Rogers (2010), the primary purpose of early screening and detection is to facilitate the initiation of early intervention, which may eliminate or diminish characteristics of ASD in the young child. Therefore, as they state, “early detection science requires that early treatment science develop in parallel...” (p.1300). Although there is still a paucity of empirically supported interventions for infants and toddlers with or at risk for ASD, a growing body of research in this area is beginning to coalesce around key components of effective early intervention for children with ASD. Among those key components are the following intervention procedures: involvement of parents in providing intervention (e.g. via coaching), beginning intervention as soon as risk is detected, individualization of the intervention to the child, addressing a broad range of child outcomes, and providing a high intensity of services (Wallace & Rogers, 2010). A substantial body of research has examined and supported the theory that parent-child interactions have strong effects on child outcomes in a number of areas, including communication, cognition, social skills, and social-emotional well-being (Landry, Smith, & Swank, 2006) and the benefits of parent involvement in intervention for young children with ASD has also been documented (e.g., Koegel, Bimbela & Schreibman 1996; Sandall, Hemmeter, Smith & McLean, 2005). Therefore, the development of interventions that make use of parent-child interactions is a logical addition to the variety of comprehensive treatment models and focused intervention strategies for children with ASD that have been/are being developed and tested (Boyd, Odom, Humphreys, & Sam, 2010). In fact, in the past 10 years, more than 30 studies involving parent-implemented interventions for young children with ASD have been published, and studies of this type continue to be funded by organizations such as Autism Speaks and the U.S. Department of Education.

Despite the emphasis on parent involvement in the delivery of ASD intervention, there has been little consistency in the research literature regarding parent fidelity to intervention, and almost no direct attention to the factors that may influence parent fidelity. In a review of 24 studies of parent-mediated/parent-implemented interventions for children with disabilities (including but not exclusively ASD) published over a 30-year period (1972-2012), Barton and Fettig (2013) reported that parent fidelity to intervention was measured in approximately 79% of those studies. This researcher's review of the literature indicated that parent fidelity was measured in 60% of studies in which parents were implementing early interventions for children with ASD, published between 2004 and 2014. (see Table 1). However, even among these studies there is such variability in measurement of fidelity, discussions of social validity, and descriptions of parents as study participants (Wakeford & Odom, 2011), as to yield little that is useful in terms of better understanding the larger issues of parent implementation of intervention.

The purpose of this study was to examine factors that may influence parent fidelity to parent-mediated early intervention for infants/toddlers at risk for ASD. The relevance of the study is founded on three empirically supported assumptions which include 1) screening tools and public awareness campaigns that support the early identification of risk factors for ASD have led to a growing population of very young children for whom early intervention is needed; 2) parents of young children at-risk for (or diagnosed with) ASD may be given significant roles in helping to provide intervention for their children; and 3) parent fidelity to intervention is presumed to be an important factor in the effectiveness of the intervention, but there is significant variability in how fidelity is assessed or assured. Given veracity in these assumptions, there is a growing body of research regarding parent-implemented behavioral early interventions for ASD that is limited in its usefulness due to a lack of understanding parent fidelity and the

factors that influence it. This lack of understanding then results in limited ability of both researchers and practitioners to determine which approaches to intervention “work” for which families of young children with or at risk for ASD.

Following approval by the University of North Carolina Institutional Review Board, this study was conducted using secondary data from the Early Development Project-2 (EDP-2), a randomized controlled trial testing a parent-mediated intervention for infants/toddlers at risk for ASD against a services-as-usual control condition. Participant families for EDP-2 were recruited from a community sample in the central part of North Carolina, using birth records. English-speaking parents of children turning one year old were mailed a packet that included an introductory letter about the study, a parent report screening tool for ASD risk called the First Year Inventory (FYI; Reznick, Baranek, Reavis, Watson, & Crais, 2007), and a form indicating whether or not the parent was willing to participate in the study beyond completing the FYI and returning it. Completed and returned FYIs were computer scored using an algorithm to determine ASD risk in two primary domains, social-communication and sensory-regulatory, and an overall risk category. Parents of children who scored at or above the 98th percentile on the FYI and who had agreed to subsequent participation were contacted and invited to participate in the assessment portion of the study. The assessment included child measures of social, communication, sensory-regulatory, and overall development, as well further assessment of autism symptoms. The assessment also included two parent measures, one of parent stress, and one of parenting style (responsivity). Demographic data were also collected at the time of the assessment. Following interpretation to parents of assessment results, parents were invited to continue participation in EDP-2 by consenting to the intervention portion of the study, with the understanding that they would be randomized to one of two intervention conditions. The study

condition was a parent-mediated intervention called Adapted Responsive Teaching (ART), and the control condition was support for referral of the child to the North Carolina Infant/Toddler Program, the state's early intervention services. The ART intervention was a manualized intervention based on a pre-existing intervention called Responsive Teaching (Mahoney & MacDonald, 2007). In each home-based ART intervention session, parents were coached by a trained interventionist to use simple responsive parenting strategies to elicit new or more advanced social-communication and sensory regulation behaviors from the child. Behaviors targeted for each child and in each session were individualized based on a combination of assessment results, parent concerns, and interventionist/parent observations. At the end of each session, the interventionist and the parent developed an "action plan" for ways in which the strategies could be used during every day routines, activities, and parent-child interactions. Over the course of the 30 in-home intervention sessions, both interventionist fidelity to the intervention and parent fidelity/participation were measured. Following a six-eight month period each family was invited to participate in a second assessment to evaluate child and parent outcomes. A total of 83 families participated in EDP-2, with 43 in the ART condition and 40 in the control (community services) condition.

The theoretical foundation for the study was a transactional perspective, specifically based on the work of John Dewey (1922). A transactional perspective was used in order to situate all elements of the intervention-family interaction as simultaneously influential on one another. That is, parent fidelity to intervention could potentially be influenced by proximal factors such as the qualities of the child, parent, and interventionist, to more distal factors such as socioeconomic and cultural factors, as well as multiple factors in between. At the same time, the

parent's participation in and fidelity to the intervention could effect changes in the child, the parent themselves, the interventionist, and others in the family or community.

The current study included a sample of 36 families who participated in the ART intervention. Families were excluded if someone other than a parent was the primary adult participant in ART, or if data on key variables was missing. The sample included some diversity, but the majority of parents were Caucasian, married or living with a partner, had at least a college degree, and were of middle to upper-middle class socioeconomic status. The measure of parent fidelity to ART was used as the dependent variable for this study, with independent variables selected based on literature review regarding parent participation in interventions for their children and on the specific data available from the sample of families who received the ART intervention. Independent variables included demographic factors, child autism symptoms, parenting style, parent stress, and the fidelity of the interventionist to the delivery of the ART intervention. Prior to examining the relationships between and among all variables (correlational analysis), and examining the potential for a prediction of parent fidelity by one or more of the independent variables, demographic data were reduced to a single variable (household income). In addition, the variability and dimensionality of the parent fidelity and interventionist fidelity measures were examined. The interventionist fidelity measure was split into 2 variables, adherence and quality, based on Principle Components Analysis, and using a total of 15 of the 23 items on the original measure.

Results of correlational analysis reflected significant relationships between parent fidelity and household income, parenting style, and interventionist fidelity-adherence, as well as between household income and parenting style, and between interventionist fidelity-quality and household income and parenting style. No significant relationship was discovered between

parent fidelity and parental stress, child autism symptoms, or interventionist fidelity-quality. Multiple regression analysis resulted in a 3-factor solution in which household income, parenting style, and interventionist fidelity-adherence most parsimoniously predicted parent fidelity.

The results of this study are congruent with much of the early intervention/early childhood research literature that indicates that household income and/or parenting style influences parent participation in child-oriented interventions. The finding that interventionist adherence is a predictive factor in parent fidelity is not as well-represented in research literature, but is reasonable given the assumed need for interventionists to model strategies and coach parents effectively in order for parents to use the intervention on their own. Given this 3-factor model as well as the significant relationship between parenting style and household income, the benefit of using a transactional model in examining parent fidelity was reinforced. That is, multiple factors may simultaneously influence parent fidelity to parent-mediated early interventions in a way that is essentially “more than just the sum of their parts.” The fact that parental stress and autism symptomatology were not influential to parent fidelity in this sample may have been because the children were very young and parents had few concerns coming into the study. Previous literature indicates that parent stress and severity of behavioral challenges in the child often are linked with higher levels of parent participation. The primary limitations of the study were the small, relatively homogenous sample, and the fact that the fidelity measures presented challenges due to only moderate inter-rater reliability (parent fidelity measure) or to measurement of more than one component (interventionist fidelity measure).

CHAPTER 2: LITERATURE REVIEW

In order to both inform and provide a context for this study, research and other relevant literature is reviewed in two primary areas: 1) fidelity of implementation, including empirically documented factors that may influence fidelity in early childhood and educational research, and 2) parent-mediated and parent-implemented interventions for young children with or at-risk for ASD, including the measurement of implementation fidelity. The conceptual model guiding this study follows these explications of relevant literature.

Fidelity of Implementation in Intervention

Over the past 20 years there has been an increasing emphasis on the identification and use of empirically supported intervention programs and practices in human service fields (education, allied health, mental health, etc.). This imperative for evidence-based practices has led to a significant increase in intervention research, and the categorization of interventions as evidence-based, “promising,” and, in some cases, lacking in empirical support. Translating and disseminating results in a manner that supports adoption of evidence-based practices by practitioners presents significant challenges to researchers (Durlak & DuPre, 2008; Ogden & Fixsen, 2014). That is, there remains a gap between science and practice. A portion of that gap can be attributed to limitations in establishing the effectiveness of an intervention because fidelity in implementing it was not examined (Barton & Fettig, 2013; Durlak & DuPre, 2008; Wolery, 2011). In addition, even when measured, *lack* of fidelity by practitioners to the authentic content and process of an intervention contributes to the gap between science and practice. Therefore, fidelity of implementation is a key element in establishing which intervention

practices and programs are empirically supported, determining how they differ from interventions that are not empirically supported, and assuring that the translation and dissemination of those interventions into practice is done with authenticity (Ogden & Fixsen, 2014; Wolery, 2011). The field of “implementation science” has developed in part to address the need for assuring fidelity to intervention practices in both research and service delivery settings, and to ensure that evidence-based practices are actually utilized.

Implementation science is an interdisciplinary field in which researchers engage in the “scientific study of methods to promote the systematic uptake of clinical research findings and other evidence-based practices into routine practice . . .” (ICEBeRG, 2006). This scientific field of inquiry is relatively young, having emerged primarily in the mid-1970’s, but it has grown rapidly as researchers in human service professions have recognized and concerned themselves with the poor record of moving evidence-based practices into community-based service settings (Green, 2008; Ogden & Fixsen, 2014). Implementation science examines the supports and barriers to the types of change required for the use and sustainability of evidence-based practices at the systems, organizational, and practice levels. *Fidelity of implementation* is among the issues addressed by implementation science overall, but its importance lies at the practice level, and is essentially the extent to which the individual delivering services implements an intervention in the way in which it was intended by the developer (Darrow, 2011). Figure 1, adapted from Darrow, shows the relationship of Implementation Science to Implementation Fidelity, indicating the breadth of the science in addressing the supports and barriers to fidelity at systems and organizational levels, and the centrality of fidelity at the actual practice level.

Dane and Schneider (2008) identify five components of implementation fidelity, namely quality of delivery, adherence, exposure, participant responsiveness, and program differentiation.

The first three of these components are included in Figure 1. *Quality of delivery* refers to the manner in which the intervention is delivered, such as the enthusiasm and attitude of the person implementing the intervention. *Adherence* is the extent to which the key elements of the intervention have been delivered, and *exposure* is the frequency with which those key elements are delivered. These three components of fidelity are largely under the control of the person delivering the intervention, assuming that the larger organizational and system supports are adequate.

The two remaining components identified by Dane and Schneider are *participant responsiveness* and *program differentiation*. Participant responsiveness is the extent to which the individual “targeted” by the intervention engages, participates in intervention activities, and displays positive affect (e.g., enthusiasm) during the intervention session. Program differentiation is the extent to which the delivery of the intervention demonstrates that the intervention is notably and markedly different from other interventions, which is especially important in studies comparing intervention approaches. These components (participant responsiveness and program differentiation) are important overall in assessing the efficacy and/or effectiveness of an intervention, but, like child outcomes, also are essentially results of the implementation process, rather than being aspects of the intervention itself as delivered by the interventionist (Darrow, 2011). For example, the interventionist may implement an intervention with high quality and appropriate adherence and frequency, but the recipient of the intervention may not, for any number of reasons, respond well or in the manner expected. In addition, the manner in which the interventionist delivered the intervention may reflect high fidelity, but still not clearly differentiate that intervention from other practices, some of which may lie in the

development of the intervention itself or because implementation of an alternative condition was not well delineated and/or measured (Durlak, 2010).

Fidelity in intervention studies targeting child outcomes. In his commentary published in *Topics in Early Childhood Special Education*, Wolery (2011) makes a concise, well-argued statement about the importance of measuring fidelity in early childhood intervention studies, using research by Strain and Bovey (2011) as a positive exemplar. Wolery indicates that there are four reasons that fidelity measurement is important, saying

Measuring fidelity (a) potentially allows investigators to document the findings were not due to the lack of fidelity in a study; (b) presents information about how transportable interventions are to the real world; (c) provides information for replication studies; and (d) sheds light on the nature of children's experiences in the study. (p.155).

In reflecting on the assessment of fidelity to the Learning Experiences - An Alternative Program for Preschoolers and Parents (LEAP; Strain & Bovey, 2011), Wolery praises the LEAP developers for their creation of a fidelity measure that is thorough and validated, such that it is reliable, sensitive, and discriminating in terms of the extent to which LEAP is or is not implemented as intended in all studied classrooms (both LEAP and control). This level of fidelity measurement currently is uncommon in early childhood and education studies overall, and, as noted by Kaiser (2013), treatment fidelity standards are still relatively low in early childhood intervention and education research. As recently as 2014, a review article by McConachie, Fletcher-Watson, and others outlines a significant need for measurement of treatment adherence in ASD early intervention studies, noting specifically the need to measure parent adherence in order to increase the rigor of the research. Attention to fidelity in

intervention studies is indeed increasing, and the results include the development of conceptual models and frameworks, development and testing of fidelity measurement tools, and recommendations regarding fidelity measurement in intervention studies. Regardless, there remain significant issues with fidelity measurement, including variable definitions of fidelity, lack of a common language in terms of what should be measured, variability in what is measured and whether or not fidelity is explicitly linked to child outcomes, and a paucity of validated measures being used (Gearing, El-Bassel, Ghesquiere, Baldwin, Gillies, & Ngeow, 2011). An overview of the current problems and advances in fidelity measurement in early childhood intervention and education research is provided below.

Problems with fidelity in intervention studies targeting child outcomes. In early childhood studies in which fidelity is measured, several key problems can be noted. Among these problems are the various ways in which fidelity is defined, the components identified as aspects of fidelity, and the ways in which fidelity is measured.

Defining fidelity. Fidelity to the intervention by the person delivering it has been measured explicitly in a relatively small number of early childhood and educational intervention studies targeting child outcomes (Barton & Fettig, 2013; Ledford & Wolery, 2013). Within these studies, the definition of “fidelity” to the intervention is either not made explicit or varies from one study to the next. For instance, in a study of Early Intensive Behavioral Intervention (EIBI; Strauss, Vicari, Valeri, D’Elia, Arima, & Fava, 2012), researchers discuss the measurement of “parent fidelity” but do not explicitly define what comprises fidelity to EIBI. In contrast, Knoche, Sheridan, Edwards, and Osborn (2010) define fidelity briefly as “implementing strategies as intended”, and provide a full explication of fidelity of implementation and why the measurement of it is important in early childhood intervention studies. Breitenstein, Fogg,

Garvey, Hill, Resnick, & Gross (2010) provide a brief overview of the components and terms often associated with fidelity of implementation, and then define fidelity specifically for their study as the “degree to which group leaders deliver the intervention competently and according to protocol” (p.159). Despite these differences in definition, the most commonly measured component continues to be that identified in a review by O’Donnell (2008), i.e., adherence (or integrity). Adherence is defined as the extent to which an intervention has been delivered as planned or as described in the intervention manual.

Defining and delineating components of fidelity. In addition to variations in defining fidelity in early childhood and education studies, there also is variability in the delineation of the components of fidelity. For instance, in a study by Odom, et al, 2010, *structural* and *process* components of fidelity were measured in the implementation of a school success curriculum by preschool teachers. In this study, the word “structural” referred to the exposure component of fidelity as defined by Dane and Schneider (1998), and the word “process” referred to adherence and quality of delivery. However, in a study of a parenting program designed to address child behaviors, Breitenstein, et al. (2010) measured *adherence* and *competence* (defined below) as the primary components of implementation fidelity by the interventionists (parenting group leaders), and measured *exposure* based on parent attendance at group parenting sessions. In this study, adherence referred to “the extent to which the interventionists’ behaviors conform to the intervention protocol” and competence referred to the “skillfulness in the delivery of the intervention related to facilitation and process skills” (p. 159). It seems that adherence, in this case, included some aspects of process, assuming that the intervention protocol included both content and the manner in which content should be delivered. However, based on the description provided by Breitenstein, et al (2010), some aspects of the intervention process may be

considered part of competence, or competence may be composed of what Dane and Schneider (2008) called “quality of delivery.” In a second article published by Breitenstein and her colleagues (Breitenstein, Gross, Garvey, Hill, Fogg, Resnick, 2010), more clarity was provided regarding what comprises adherence and competence, making it clear that to these researchers, competence was, indeed, largely about quality of delivery. Yet, “quality of delivery” is among the constructs related to fidelity that lacks consensus in definition (Carroll, Patterson, Wood, Booth, Rick, & Balain, 2007). For example, Pence, Justice, and Wiggins (2008) measured quality of delivery with a teacher self-report tool addressing primarily “comfort level” with the curriculum, while Hamre and colleagues identified quality of delivery as synonymous with good teaching (Hamre, Justice, Pianta, Kilday, Sweeney, Downer, & Leach, 2010). A prime example of inconsistencies in labeling and defining components of fidelity can be found in Wehby, Maggin, Partin, and Robertson (2012). These researchers collected data on teacher implementation of the Good Behavior Game in preschool classrooms, and referred to the results of their checklist as “adherence,” “procedural fidelity,” and “integrity” all in the space of a single paragraph. The meaning for all of these terms was essentially the same, i.e., the extent to which the teacher implemented each step of the game process as outlined in the Good Behavior Game manual.

To date, there is little agreement or consistency among researchers regarding the components of fidelity and the ways in which they intersect with one another and/or influence outcomes. Table 2 provides an example of the terminology used for various aspects of fidelity in several conceptual models that are discussed later in this paper. Researchers who address intervention fidelity using their own frameworks add to the variability represented in this table.

Measurement of fidelity. Without question, variations in the terminology used in defining both “fidelity” and its components in intervention research create challenges for measuring fidelity in a manner that is easily replicable and translatable (Durlak & Dupre, 2008). Some researchers measure multiple aspects of interventionist fidelity, while others measure only adherence, ultimately precluding comparisons or meta-analytic approaches for examining effectiveness and outcomes. For instance, in an examination of a preschool literacy program, Hamre, et al (2010) measured three aspects of interventionist (teacher) fidelity: dosage, adherence, and quality of delivery. However, in another study of a preschool literacy intervention, Noe, Spenser, Kruse, and Goldstein (2013) measured only dosage and adherence. Additionally, many fidelity measurement tools, even for manualized interventions, have not been empirically validated and may not measure one or more key components of the intervention accurately (Ogden & Fixsen, 2014). For instance, Hamre, et al (2010) used a validated measure of generalized teaching strategies (*Classroom Assessment Scoring System-Pre-K* [CLASS], Pianta, La Paro, & Hamre, 2008, as cited in Hamre, et al, 2010, p. 344) but specific measures of teacher fidelity to the literacy intervention were unvalidated instruments, including two new scales for the CLASS and an intervention-specific checklist. Hamre and colleagues did include reliability data for coding of both of these measures. In the literacy intervention study by Noe, et al (2014), only an 8-item researcher-developed checklist was used to measure interventionist fidelity, and no reliability data or mention of a second video coder were included in the study description. Examining these two studies of preschool literacy programs (Hamre, et al, 2010 and Noe, et al, 2014) provides some insight into the issues presented when fidelity measures used do not allow for cross-study comparisons.

Measurement of fidelity also is challenged by the complexities inherent in studies that involve multiple interventionists or sites, or multiple levels of implementation (e.g., fidelity of a trainer or coach *and* the fidelity of the coached teacher or interventionist who actually delivers the intervention). The practical implications of measuring fidelity at all levels for complex programs will include costs of both time and money, and ultimately may include having too many variables to include in data analysis for the number of actual participants in the study (Ogden & Fixsen, 2014).

In addition to examination of fidelity of implementation by the interventionist, other aspects of implementation have been measured in some early childhood and education studies. For instance, Breitenstein, Fogg, et al (2010) measured participant responsiveness via a 7-item parent Engagement Form completed by the group leader following each parenting session, and a weekly parent satisfaction questionnaire (measuring social validity). Knoche, et al (2010) also measured participant responsiveness, using a coding guide for video-recordings of each home visit that quantified parental interest in and engagement with their child, and interest in and engagement with the professional (interventionist). Knoche and colleagues also collected implementation data that allowed the researchers to ascertain which specific methods and strategies within the intervention being tested (*Getting Ready* intervention) differentiated it from what early childhood professionals working in Head Start and Early Head Start do naturally during home visits with families (program differentiation measures).

There are additional aspects of fidelity that often are not measured, but may be important to the overall efficacy or effectiveness of an intervention. These aspects may include the introduction of adaptations to the intervention by the interventionist or the use of behaviors that are incongruent with the intent of the intervention (e.g., use of negative consequences in an

intervention based on positive behavioral supports). Adaptations by the interventionist may occur based on the need to individualize the intervention or to consider the local culture when implementing a multi-site intervention (Ogden & Fixen, 2014), and may or may not interfere with the integrity of the intervention itself. However, if they are not anticipated and measured, adaptations and incongruent behaviors on the part of the interventionist may affect fidelity and/or outcomes in ways that researchers will not be able to ascertain or explain (Gearing, et al, 2011).

Advances in the measurement of fidelity in intervention studies. Although problems clearly exist in defining and measuring fidelity in early childhood studies, there also has been considerable recent attention given to improving the ways in which researchers address these issues. Several researchers have developed conceptual frameworks designed to organize and prioritize fidelity to intervention in early childhood research, and others have outlined recommendations to ensure fidelity in these studies. A brief review of these conceptual frameworks and recommendations, including how issues of fidelity measurement may be addressed, is provided below.

Conceptual frameworks. Recently several implementation science frameworks have been introduced to early childhood and educational research. In fact, Volume 35 of the *Journal of Early Intervention*, published in June, 2013 was devoted to the measurement of implementation fidelity in early childhood intervention research, and four of the six articles included make an argument for the use of a particular framework or way of thinking about how fidelity should be measured (Kaiser, 2013).

Within the journal, Dunst, Trivette, and Raab (2013) stipulate that fidelity should be measured in two primary areas of practice which are distinct from one another but interdependent, i.e., *implementation* and *intervention*. According to Dunst, et al., *implementation*

includes the methods used to promote the adoption and use of an evidence-based intervention by practitioners (e.g., interventionist training), and *intervention* is the actual application of the intervention practices, by the practitioner. Therefore, implementation fidelity is the extent to which the practitioner has learned and adopted the content and process of the intervention, and intervention fidelity is the extent to which the intervention has been used as intended with the recipient to obtain targeted outcomes. Measurement of both types of fidelity and linking them with outcomes allows researchers to ascertain the extent to which key aspects of both the implementation and intervention transact and affect those outcomes. Powell and Diamond (2013) conceptualize fidelity in a manner similar to that of Dunst, et al (2013), but with a more specific focus on the implementation aspects of training, to ensure that interventions are delivered as intended. They used an explicit coaching model to address the training of Head Start teachers in evidence-based literacy practices, and included attention to content and process in the adoption and delivery of those practices. Content included the five key characteristics of responsive teaching that were to be learned and implemented by teachers (following the child's lead, reading the child's cues as an indicator of interests, adult responses contingent to child behaviors, reciprocal adult-child interaction, and promoting child elaborations of engaged behaviors). The process focused on adherence to Participatory Adult Learning Strategies, which included coaching behaviors such as active learner involvement, feedback, guidance, and support, coach-guided learner reflection and frequent opportunities to use the responsive teaching strategies. The two remaining articles in this volume of *JEI* that address measurement of fidelity focus on tool development. Sutherland, McLeod, Conroy, and Cox (2013) conceptualized fidelity as being composed of both quantitative and qualitative components, and discussed the need for measurement tools that include frequency (quantitative) and "discriminated use" (qualitative)

data regarding the delivery of intervention. Snyder, Hemmeter, Fox, Bishop, and Miller (2013) talked even more specifically about measurement tools, describing their process in the development of the Teaching Pyramid Observation Tool (pilot version), which addressed the extent to which teachers learn and adopt (essentially “buy into”) the use of behavioral and social-emotional supports in the classroom, the extent to which they actually used those supports in the classroom as intended, and the impact of both of these aspects of fidelity on child outcomes. Aspects of other previously developed implementation science frameworks may also apply to early childhood intervention and education research. Of note, Carroll, et al. (2007) overtly identify factors that moderate adherence, including intervention complexity, facilitation strategies, quality of delivery, and participant responsiveness.

Gearing, et al. (2011) provide a review of 24 peer-reviewed articles in which authors either addressed theory and background aspects of fidelity of implementation, or measured fidelity overtly. Resulting from this review is a comprehensive model, or guide, for the inclusion of fidelity measurement in intervention studies in a variety of fields. This model includes four primary components of fidelity gleaned from the literature: 1) intervention design 2) interventionist training; 3) intervention delivery; and 4) intervention receipt. Each of these components is then further detailed in five areas: 1) development and use of protocols and manuals; 2) execution; 3) maintenance; 4) external and internal threats; and 5) measurement. Gearing and colleagues argue that this guide, if widely adopted by researchers, would address many of the issues with fidelity measurement that currently exist, such as lack of congruent terms and definitions and lack of measurement methods that can be used across studies.

While there is some conceptual alignment of ideas within these frameworks, the language used and focal aspects vary significantly. Table 2 outlines a comparison of terms and concepts

across the conceptual frameworks developed and explicated by Dane and Schneider, those addressed in the June 2013 volume of *JEI*, and those presented by Carroll, et al. and by Gearing, et al.

Recommendations for measuring fidelity in intervention research. In addition to the development of conceptual frameworks which may provide a firmer foundation for assuring fidelity in intervention studies, researchers have also made overt recommendations regarding how fidelity is measured in these studies. A number of these recommendations are summarized in Table 3.

Kaiser and Hemmeter (2013) synthesize recommendations for fidelity measurement based on the six articles included in the aforementioned volume of *JEI*. These recommendations include addressing fidelity by both the person delivering the intervention, and by the individual (coach, trainer, interventionist) teaching that person to deliver the intervention when a coaching model is used. It is further recommended that for both researcher-delivered and coached interventions, measurement tools be developed that are sensitive to the active ingredients of the intervention content and process, which in turn requires that those active ingredients can be identified and linked directly to child outcomes (i.e., that the active ingredients are supported by empirical data). Ledford and Wolery (2013) specifically recommend that direct counts be used in measuring adherence and dosage, and Snyder, et al (2013) recommend measurement of contextual factors surrounding intervention. Ogden and Fixen (2014) echo this recommendation that contextual factors be overtly considered and measured as potential confounders of the relationship between intervention and outcomes, and they also recommend that the sustainability of an intervention program be considered as well. This includes examining the effect of changes in staff, leadership, organization, and other factors as the intervention program is implemented

over time, and increasing implementation supports when small or pilot programs of intervention move to a larger scale.

The scale of interventions is addressed both directly and indirectly in the recommendations of several researchers. Both Moncher and Prinz (1991) and Ledford and Wolery (2013) make the recommendation that fidelity be measured for each participant, which may be challenging in large scale, complex, or multi-site studies. Schulte, Easton and Parker (2009) create a similar challenge with their recommendation that measurement of fidelity include the intervention *as received* by each child, arguing that differences in even subtle aspects of intervention content and/or process among children may influence outcomes. Glasgow, Magid, Beck, Ritzwoller, and Estabrooks (2005) encourage researchers to consider practical clinical trials with multiple baseline, within-subject designs, which may decrease the number of participants needed and increase the potential for accurate measurement of multiple aspects of fidelity. Although Glasgow, et al. were addressing the need for better research-to-practice studies in health care arenas, their design recommendations would allow early childhood researchers to undertake pilot studies with tightly monitored implementation fidelity and the linking of intervention to outcomes prior to scaling up to a larger study.

Given the previous discussion about unplanned or non-manualized adaptations to intervention that may occur, it is important to find ways to document and/or systematize these adaptations. Durlak and DuPre (2008) discuss the issue of adaptation and its effect on measures of fidelity and on outcomes, and make the recommendation that researchers find the “balance” between adherence and adaptation for any particular intervention. They argue that perfect fidelity across all providers of an intervention is unlikely, that client-centered adaptations have been empirically supported with positive outcomes, and that providers may actually be able to use

adaptations to improve on an intervention using their understanding of those receiving the intervention. Therefore, Durlak and DuPre suggest that rather than trying to achieve strict adherence to all aspects of an intervention, researchers should monitor and account for adaptations and how they affect outcomes. In a related effort to prevent unnecessary drift in an intervention, both Dunst, et al. (2013) and Barton and Fetting (2013) suggest that the fidelity of the persons delivering an intervention be examined in direct relationship to the fidelity of the coach or trainer teaching them how the intervention should be delivered.

In general, recommendations for improving fidelity and the measurement of fidelity include 1) more systematic and detailed approaches to development of intervention content and the processes by which it is learned and delivered, 2) greater attention to identifying key components of an intervention and the relationships between those key components and outcomes, 3) use of measurement tools that provide accurate data about both the quantity and quality of the intervention as delivered, and 4) increased consideration and measurement of contextual factors surrounding delivery of intervention.

Factors that influence fidelity. Because there is an assumed relationship between fidelity to implementation and child outcomes (Hamre, et al., 2010), early childhood and education researchers also have begun to examine more closely the specific aspects of intervention delivery contexts that could influence fidelity and therefore affect child outcomes. As noted previously, Carroll, et al. (2007) identified four factors that may moderate, or influence, fidelity to an intervention. The first of these factors is *intervention complexity*. Carroll and colleagues argue that interventions that are “simple,” that is, detailed, specific, and have clearly delineated content and process are more likely to be implemented as intended. Complex interventions often leave more room for variability, adaptations, or lack of clarity, making them more vulnerable to

breeches in fidelity. Therapists trained to implement EIBI reflected on this “simplicity” issue, saying that having basic skill targets that require minimal materials supported their ability to implement the intervention with fidelity (Symes, Remington, Brown, & Hastings, 2006).

The second moderating factor identified by Carroll, et al. is *facilitation strategies*, which include the manuals, protocols, training, feedback and other methods used to assure that those delivering the intervention learn and use the intervention with high fidelity. The use of facilitation strategies begins before the intervention is even implemented and is part of an ongoing support process for interventionists. These strategies, if successful, should lead to well-trained interventionists who implement the intervention with fidelity. In contrast, poorly developed or utilized facilitation strategies can lead to poor service delivery. EIBI therapists interviewed by Symes, et al. (2006) substantiate the importance of facilitation strategies, indicating that training that included behavior management, instructional techniques, Applied Behavioral Analysis (ABA) theory, and the opportunity to observe experienced therapists was instrumental to their procedural fidelity.

Carroll, et al.’s third and fourth moderating factors use terms synonymous with terms used by Dane and Scheider (1998), i.e., *quality of delivery* and *participant responsiveness*. However, Dane and Schneider use these terms to represent key components of fidelity itself, while Carroll, et al. argue that the manner in which an intervention is delivered (quality) and the extent to which participants accept the intervention (participant responsiveness) actually act as moderators of how much and how well the intervention is diffused in the participant group. For example, the therapists interviewed by Symes, et al. (2006) indicated that child behaviors influenced their fidelity to EIBI, reporting that children who presented frequent behavioral problems decreased the therapist’s ability and desire to implement the intervention with fidelity.

Therefore, child behavior problems would be characterized as moderators of intervention fidelity. Carroll, et al. (2007) noted that participant responsiveness also includes how the participant feels about the benefits or importance of the intervention personally, and that “buy in” is needed not only from the participants, but also from those delivering the intervention (i.e., the interventionist). Therefore, a secondary moderator also may be the beliefs of the interventionist about the benefits and usefulness of the intervention, either in general or for a particular participant (Carroll, et al., 2007; Symes, Remington, Brown, & Hastings, 2006). For example, Wehby, Maggin, Partin, and Robertson (2012) found that teacher beliefs about a classroom-based behavior intervention, i.e., how effective, appropriate, and worthwhile they found the Good Behavior Game, had a unique positive relationship to the number of steps of the intervention implemented by the teacher.

Characteristics of the interventionist. In addition to interventionist beliefs about the intervention, researchers have begun to identify other characteristics of the person delivering the intervention (including teachers, therapists, and parents) that may influence fidelity. For instance, Klimes-Dougan, August, Lee, Realmuto, Bloomquist, Horowitz, and Eisenberg (2009), investigated the influence of practitioner and school (organizational) qualities on the implementation of a prevention program targeting elementary school students at risk for developing serious behavior problems and/or drug use. Specifically, they examined four categories of practitioner characteristics (experience, personality, beliefs, and coping) on adherence, exposure, and quality in the delivery of the Early Risers program in 27 rural elementary schools. Findings included positive correlations of fidelity with practitioner qualities of extroversion, openness, belief in success, conscientiousness, re-appraisal methods of coping, and feeling supported by the Early Risers technical support personnel. A similar, but negative

outcome is reported in Wehby, et al. (2012), who noted that teachers who were experiencing high levels of “burn-out” tended to deliver low levels of another mental health intervention (the Good Behavior Game), regardless of how supported they felt by their coach. Another group of researchers (Lieber, Butera, Hanson, Palmer, Horn, Czaja, ... Odom, 2009) examined characteristics of preschool teachers as part of a larger, multi-site study targeting the use of professional development activities to increase teacher fidelity to curriculum changes. They found that teachers who were “high implementers” tended to be open, motivated, organized, responsible, good classroom managers, and responsive to coaching. Despite the range of education and experience levels represented in this study, Lieber, et al. reported no correlations between curriculum implementation and either level of education or years of experience. This finding is consistent with Baker, et al. (2010), who concluded that education, experience, and ethnicity had no significant impact on implementation of a preschool prevention program. However, Lieber’s results contrast with the findings of Knoche, et al. (2010) who reported a significant positive relationship between education and experience, and the quality of delivery, i.e., effective use of strategies, in a school readiness early intervention. Similarly, Taylor, Asgary-Eden, Lee, and LaRoche (2015) found that adherence to the content and process of a parenting program was significantly influenced by the years of experience of the provider. The interventionist perspective on personal qualities that support or hinder fidelity was among the constructs examined qualitatively by Symes, et al. (2006) in their study related to implementation of EIBI. Of the 19 therapists interviewed, 47% identified “patience,” or being able to remain calm, as a key personal characteristic that facilitated high procedural fidelity, and “emotional reaction to child behaviors” was identified by 21% of therapists as hindering fidelity.

Characteristics of participants. Participant responsiveness has already been mentioned as a potential moderator of fidelity, including the example of the influence of child behavior problems on interventionist fidelity to EIBI. Overall, however, the characteristics of the participant have not been well investigated in terms of how they may influence fidelity (Hock, Kinsman, and Ortaglia, 2015). Instead, the majority of studies that examine participant characteristics do so in order to ascertain the influence of those characteristics on outcomes (Itzhak & Zachor, 2011; Strauss, Vicari, Valeri, D’Elia, Arima, & Fava, 2012). In studies in which parents are key participants in actually implementing the intervention, it is important to examine parent and family characteristics and the potential effects of those characteristics on parent participation and fidelity. Parent/family characteristics may include socioeconomic factors, parenting style, and culture, which often are intertwined. Culture is also a part of the entire intervention context, particularly as it is related to the overall acceptability of the intervention.

Socioeconomic situation, parenting style, and culture. Although only some of the available research is related to parent-implemented interventions for children with or at risk for ASD, the need for parents to “buy into” and implement program strategies also exists within programs designed to address child behavior/mental health concerns and targets of early intervention services. In her discussion of programs to address behavioral or mental health concerns in young children, Zilberstein (2016) noted that families with financial hardships may have unstable housing situations, long or irregular work hours, and/or responsibilities for the care of multiple children that interfere with their abilities to implement intervention strategies on a regular basis. Similarly, families that face significant financial challenges may live with multiple extended family members or in other types of housing in which a number of other people also

are living. These living situations may present challenges to parent implementation of intervention due to lack of privacy or opportunities for 1:1 interactions with children. These challenges are reflected in part in a qualitative examination of components that should be included in parenting interventions for families in transitional housing (Holtrop, Chaviano, Scott, and Smith, 2015). Parents who were living with other low income or homeless families identified concerns about negative impacts on both parenting and child behaviors from others living in the same space. In a meta-analysis of literature related to parent training to address child behavior problems, Reyno and McGrath (2006) indicated that income level and parent education/employment both had effects on responses to treatment. Similarly, in a review of literature regarding parent participation in mental health programs for children, Haine-Schlagel and Walsh (2015) noted that socioeconomic status (including income and parent education) were among the factors associated with parent participation in both treatment sessions and the follow-up use of strategies between sessions. However, it is important to note that there is variability in research findings and socioeconomic factors are not consistently key predictors of parent participation or fidelity to intervention. For example, Danko, Brown, Van Shoick, and Budd (2016) reported that household income, parent age, and parent education were all unrelated to parent completion of “homework” between sessions of Parent-Child Interaction Therapy (PCIT). The best predictor of homework completion in their study was parent gender, with mothers more likely to complete homework than fathers. Morawska, Ramadewi, and Sanders (2014) had similar findings regarding socioeconomic influences in their Australian study of parenting interventions to address child behavior problems, in that greater severity, parental depression, and previous help-seeking behaviors were predictors of parent participation, with no predictive socioeconomic factors.

Research literature regarding intervention for children with ASD includes minimal attention to parent characteristics and the influence of these characteristics on parent fidelity, and those that do address this relationship vary in the extent to which clear conclusions can be drawn. In a study that directly linked participant characteristics to fidelity of implementation, Randolph, Stichter, Schmidt, and O'Connor (2011) addressed research claims (e.g., from the National Research Council) that parent education may be a critical element in the implementation of intervention, using a multiple baseline single case design with three caregivers of children with ASD. They reported that three caregivers who did not have college degrees were able to learn and use a Pivotal Response Training (PRT) intervention with their children, but the researchers were unable to offer any comparison with parents who did have college degrees, due to the research design. In a study that used a parent report survey to examine factors influencing parent adherence to interventions for ASD, Hock, Kinsman, and Ortaglia (2015) indicated that the "perceived burden on the family" was a significant predictor of low parent adherence to medication, developmental, and alternative treatments, although not to behavioral treatments. Having an advanced degree was the most significant predictor of low parent adherence to behavioral treatments. Burden to the family was measured using a Likert-style scale for the item, "Treatments have been burdensome on my family's resources (e.g., money, time, energies)" (p. 3). Unfortunately in this study, although the sample likely included low-income families, based on the range of educational levels (54% did not have a college degree at the bachelor's level or higher), neither household income nor employment status was noted, nor was the relationship between burden and indicators of SES explored. Thus, we do not know whether the burden was greater for families in low income households. Alternately, Carr, Shih, Lawton, Lord, King, and Kasari (2016) reported more definitively that SES was a predictor of both parent attendance and

adherence to an early intervention for young children with ASD. Their study targeted low-resourced families in five sites, and included families receiving intervention either in their home or in a central location nearby (e.g., community center in their neighborhood). Regardless of where families were receiving intervention (home or other), as SES increased, so did attendance. SES was also a positive predictor of adherence, but at a lower significance level than its predictive value for attendance.

Parenting *style* and parenting *practices* are terms that have been used to describe the ways in which parents enact their roles. Parenting style refers to the overall emotional climate provided to the child by the parent, and parenting practices are the specific behaviors parents use to “socialize” the child (Fletcher, Walls, Cook, Madison & Bridges, 2008). Parenting style has been conceptualized as the relative intensity (low/high) of parenting approaches along two continua, designated as “responsiveness” and “demandingness” (Maccoby & Martin, 1983, as cited in Fletcher, et al., 2008). The intersection of low to high responsiveness with low to high demandingness results in four categories of parenting style (see Figure 2). Parenting style tends to influence parenting practices, and the term parenting style often has been used to mean both general parent attitudes and more specific behaviors, as is the case for the current study.

Although parenting style, including levels of responsiveness, is a separate construct from socioeconomic factors and culture, it is affected by both. Acknowledging the potential for significant variability, Zilberstein (2016) summarized multiple studies of the ways in which socioeconomic factors influence parenting style, stating that in low income families, parents are more likely to use parenting strategies that encourage obedience, interdependence, family cohesiveness, persistence, and respect. These strategies include firm limits with sure consequences for disobedience, rules and demands over child choice, and meeting the child’s

needs without the child making requests. Children in these families tend to engage in peer-led activities and interactions, while adults engage in separate activities, so that children must learn to manage social relationships and challenges on their own, without undue support from adults. In families living in high resource situations, parents tend to use strategies that promote autonomy, individuality, collaborative decision-making, and self-promotion (Zilberstein, 2016).

Cultural influences on parenting style may be even more complex than socioeconomic conditions, in that many parents find themselves straddling two or more cultures in which they must guide their children. This is particularly true for minority and immigrant families, who use some parenting strategies to enculturate their children to cultural or ethnic identities, and some strategies to support child success in majority cultures (Zilberstein, 2016; Butler and Titus, 2015). In addition, cultural, racial, and socioeconomic contexts may overlap, adding additional layers to the ways in which norms, values, beliefs, and ways of doing and being influence the parent-child relationship. In a review of literature related to culture and parenting style, Wakeford (2008) conceptualized culture as having three components: ideological, material, and behavioral. The ideological component includes values and beliefs (including taboos) which are shared on a foundational level. The material component includes the artifacts and objects that are produced, used and valued by the group as a whole (Bonder, Martin & Miracle, 2004; LeVine & New, 2008). Finally, the behavioral component includes rituals, routines, customs and practices which express or demonstrate the shared values and beliefs of the group and either produce or make use of the artifacts and objects that are valued. The ideological component of a culture (values and beliefs) is the strongest, as it supplies the meaning for the other two components, and provides the motivation for the behavioral component (LeVine & New, 2008). Wakeford concluded that culture, along with SES, educational experiences, and other factors, influences

parenting ideologies, i.e., beliefs and values. In turn, these beliefs and values influence parent behaviors, including responsiveness and directiveness, as well as the toys, materials, space, time, and social opportunities that they provide for play and learning activities.

Wakeford (2008) also explicated other factors in research literature that may influence parenting style, particularly responsiveness. These include parent qualities (most of which are related to mothers due to the relative paucity of research about these factors in fathers) such as satisfaction with life, self-esteem, understanding of the parent role, educational level, attachment to own parents, and personality. Child factors may also influence parenting style, and those may include child behavior, temperament, and overall functioning, including the presence of a disability or illness. For example, in a study examining predictors of parent responsiveness, results indicated that a combination of child social-communication and sensory-regulatory patterns were predictive of responsive parent behaviors to their 1-year-olds at-risk for ASD (Kinard, Sideris, Watson, Baranek, Crais, Wakeford, and Turner-Brown, 2017). That is, parents in that study tended to talk less and use more play actions with children who communicated less and who demonstrated under-reactivity to environmental stimuli. External contexts that have been shown to have an effect on parenting style, in addition to SES and culture, may include the number of children in the family, the presence (or absence) of social support systems, and the occurrence of disruptive life events (Wakeford, 2008)

Characteristics of context. Organizational and social contexts have been examined as influences on implementation fidelity in several studies. School (including preschool) settings have been shown make unique contributions to teacher fidelity of implementation, particularly in terms of the effect of school culture, working alliances, and administrative support (Klimes-Dougan, et al.,2009; Baker, et al.,2010; Wehby, et al.,2012; Lieber, et al., 2006).

While many early childhood education and intervention studies have been conducted in schools and clinical settings, home-visiting contexts also have been studied in early childhood intervention literature. Parent-therapist relationships have been identified as important to the teaching/learning process in the literature about home-visiting, but the specific influence of the home environment on either interventionist or parent fidelity to an intervention has not been documented. While they did not address fidelity to intervention, Harrison, Romer, Simon, and Schulze (2007) discovered that mothers of children with disabilities saw their relationship with their child's therapist as a key element of their ability to learn intervention strategies and techniques. This finding was echoed in a study of the relationships between low-income African American mothers and their Parent-Educator home visitors (Woolfolk & Unger, 2009), and Ardyson and Wakeford (2017) reported that mothers of young children receiving occupational therapy services looked to therapists as a source of both intervention strategies and the support to implement those strategies. In addition, both Woolfolk and Unger (2009) and Harrison, et al. (2007) noted that the relationship between the intervention provider and the child was an important contributor to the nature of the parent-interventionist relationship.

Culture, including parental beliefs and values, norms, and social relationships may affect parent fidelity not only as it is related to parenting style, but also as it contributes to the acceptability of the intervention to the parent. In most intervention studies that address this aspect of the intervention experience, acceptability is referred to as social validity, and includes the extent to which parents find an intervention both feasible and useful. Social validity often is measured using parent questionnaires after the intervention is complete. Other ways of measuring social validity may include parent interviews or written responses to open ended questions. Questions targeting social validity may target how easily parents were able to learn

and use the intervention, how useful they found the intervention (i.e., did the intervention have the desired effect on the child?), whether or not they would continue to use the intervention, and whether or not the child enjoyed and engaged in the intervention activities. In a review of fidelity measurement in parent-mediated intervention for young children with disabilities, including ASD, Barton and Fettig (2013) indicated that 63% of researchers measured social validity or acceptability using some variety of methods. However, the potential relationships between and among social validity, parenting style, and parent fidelity were not explored. Dunlap, Ester, Langhans, and Fox (2006) did not make an empirical link among social validity, parenting style and parent fidelity in their report of single case studies, but did use a social validity measure to assess the “goodness of fit” between the intervention and the family context. In this study, high social validity was reported for the intervention that was used to improve toddlers’ functional communication and decrease behavior problems and was implemented specifically during challenging daily routines. Only one study was found that identified a potential relationship between parent fidelity and social validity (Chung, Snodgrass, Meaden, Akamoglu, and Halle, 2016), and this researcher’s interpretation of that study reflected the possibility that parenting style factors were involved as well. Chung, et al. examined their initial findings in two single-case studies, which indicated that although both mothers reported high social validity of the intervention targeting toddler communication, parent fidelity was variable and somewhat low. In addition child outcome measures showed little to no change in the children’s communication skills. The lack of consistency between social validity measures and the parent fidelity and child outcomes measures seemed problematic. Further investigation resulted in the researchers finding that initial fidelity measures for one mother were low because she tended to use intervention strategies incidentally almost as often as she did intentionally, but only her intentional uses of the

strategy actually were performed with high fidelity to the process that was coached. No information was provided specifically about the mother's parenting style, but the possibility exists that high social validity resulted from the congruence of the mother's natural style with the basic premise of the intervention on which she was coached, to the point that it took a second look to determine when the mother was intentionally using coached strategies. However, despite this congruence between style and strategies, she was not consistently using the strategies with fidelity in the incidental contexts.

Other parenting values and beliefs also may influence the acceptability, or social validity, of an intervention. For example, these values and beliefs may be about how children develop and learn, including the need for discipline (Kummerer and Lopez-Reyna, 2006, Self-Brown, Frederick, Binder, Whitaker, Lutzker, Edwards, and Blankenship 2011; Zilberstein, 2016), the successful functioning of the family hinging on interdependence rather than independence (Chao and Kanatsu, 2008; Calzada, Huang, Anicama, Fernandez, and Brotman, 2012), or that the primary role of the parent is to assure the survival of the child (Richman, Miller, and LeVine, 1992). Parental beliefs about the intervention itself also may influence its acceptability, including beliefs about the potential benefits or efficacy of the intervention (Spoth, Redmond, Khan and Shin, 1997; Salari and Filus, 2017; Nock, Ferriter, and Holmberg, 2007), the cause of the "problem" (Kummerer and Lopez-Reyna, 2006; Peters, Calam, and Harrington, 2005), and/or the potential for or expectations of change (Kummerer and Lopez-Reyna, 2006; Nock, Ferriter, and Holmberg, 2007). Others may include values about beliefs about the "costs" of intervention also may affect whether or not parents find it acceptable, with perceptions about costs in time, energy, and monetary resources among the most common barriers to social validity and subsequent participation (Spoth, et al., 1997).

Fidelity of implementation in intervention: Summary. Fidelity of implementation has become a key concern of those conducting early childhood education and intervention research. Explicit attention to and measurement of fidelity is necessary in order to link intervention with outcomes, establish evidence-based practices, support dissemination of research to practice, and to provide clear guidelines for replication of interventions in community settings and/or scaled-up studies. However, both researchers and practitioners face multiple challenges in conceptualizing and measuring fidelity to intervention, including lack of clarity in defining both fidelity and its components, lack of common methods for creating and using measurement tools, and lack of adequate understanding of the various contextual and personal factors that may influence fidelity. As researchers have become more attentive to these issues in early childhood education and intervention research, advances have been made in the form of conceptual models that may guide the simultaneous development of interventions and measures of fidelity to those interventions, and recommendations for more rigorous attention to and measurement of implementation fidelity. Although these recent advances provide a stronger discourse for fidelity in intervention research and more supports for intervention researchers, there continues to be a significant need for empirical examination of multiple issues of fidelity in early childhood education and intervention.

Parent-Mediated/Parent-Implemented Early Interventions for Children with ASD

Early identification of risk and early diagnosis of ASD in children has created a demand for interventions that are effective and accessible, and research has supported the theory that parent-child interactions have a significant effect on child outcomes in a number of areas. In addition, the necessity of parent involvement in intervention for young children with ASD also has been documented (e.g., Koegel, 1996; Sandall, Hemmeter, Smith, & McLean, 2005).

Therefore, there has been a notable increase in what researchers refer to as parent-mediated (PM) or parent-implemented (PI) interventions for young children with ASD, and these approaches are characterized by the fact that they give parents a significant role in delivering the intervention.

Despite the differences in terminology used by researchers, the characteristics that distinguish “parent-mediated” from “parent-implemented” interventions have not been clearly articulated as yet in the literature, but when considered together comprise a way of intervening that includes parents as interventionists. In essence, parents become an intentional conduit through which children are given opportunities to learn particular new skills and behaviors in a manner individualized to the child. Professionals provide training and support for parents often through a coaching model, and parents implement various strategies to support the development of the child. Because this description applies to both parent-mediated and parent-implemented intervention approaches, for the sake of clarity these approaches will be referred to simply as “parent-implemented” (PI) for the remainder of this paper.

According to the National Professional Development Center on Autism Spectrum Disorder (NPDC-ASD), PI intervention “entails parents directly using individualized intervention practices with their child to increase positive learning opportunities and acquisition of important skills” (Hendrick, 2009). The NPDC-ASD provides a comprehensive guide to PI intervention, including methods for determining family needs, planning, parent training, progress monitoring, and documentation. Intervention strategies may be highly structured and designed for delivery in specific contexts (e.g., Ben Chaabane, Alber-Morgan, & DeBar, 2009) or may be embedded within natural environments and daily routines (e.g., Kashinath, Woods, & Goldstein, 2006; Mahoney & Perales, 2003, 2005). In general, PI interventions include implementation of strategies as often as possible in order to increase the child’s opportunities for learning.

PI interventions for young children diagnosed with ASD. Parent-implemented interventions for children under five years of age already diagnosed with ASD have been examined empirically and have yielded positive outcomes in multiple areas of child development. For instance, Elder, Valcante, Yarandi and Elder (2005) documented significant changes in child social- communication abilities, as did Kashinath, Woods, and Goldstein (2006), and Wetherby and Woods (2006). Other areas of child skill development successfully targeted with PI interventions include imitation skills (Ingersoll & Gergans, 2007), joint attention (Kasari, Gulsrud, Wong, Kwon, & Locke, 2010; Rocha, Schreibman, & Stahmer, 2007; Schertz & Odom, 2007), play (Gillett & LeBlanc, 2007; Kasari et al., 2010), feeding (Gentry & Luiselli, 2008; Tarbox, Schiff, & Najdowski, 2010), toilet training (Kroeger & Sorensen, 2010), and parent-child interactions (Aldred, Green, & Adams, 2004). Several of these PI interventions have been tested in multiple iterations, targeting either different child outcomes or different diagnostic groups. For instance, Mahoney and Perales (2003) describe child social-emotional well-being as a primary target for the Responsive Teaching intervention delivered by parents of young children with ASD or pervasive developmental delay, and later tested this same PI intervention targeting cognitive and communicative development in addition to social-emotional functioning (Mahoney & Perales, 2005).

The development of PI interventions has been influenced by the development of non-PI interventions for young children with ASD, as well. For instance, Kasari, Gulsrud, Wong, Kwon, and Locke (2010) report on an intervention targeting joint attention and symbolic play delivered by caregivers that previously had been delivered by trained interventionists (Kasari, Freeman, & Papparella, 2006). Similarly, Ingersoll and Gergans (2007) were able to teach parents to use a method called Reciprocal Imitation Training (RIT) with their toddlers diagnosed with ASD,

whereas previously RIT had been studied only as implemented by professionals (Ingersoll, Lewis, & Kroman, 2007; Ingersoll & Schreibman, 2006).

There is evidence of positive outcomes for young children with ASD from a variety of PI intervention studies, and PI interventions are considered a promising approach to intervention for this population of children (Boyd, Odom, Humphreys, & Sam, 2010). Despite this promise, there remains an overall lack of empirical support for PI interventions, in part because the interventions that have been tested differ in content, focus, and the manner in which parents are coached to deliver the intervention. In addition, although child participants in these studies are typically relatively well defined, there is great variability in the description of parent participants (Wakeford & Odom, unpublished manuscript) and in the transparency with which the intervention itself is described. Researchers continue their efforts to refine and test early interventions for young children with ASD, but there are still multiple questions remaining about which interventions are most efficacious and under what circumstances.

PI interventions for young children at-risk for ASD. Publicity campaigns by the Centers for Disease Control (www.cdc.org/actearly) and organizations like Autism Speaks (www.autismspeaks.org) urging parents, physicians, child-care, and other service providers to “Learn the Signs – Act Early,” and the directive for ASD surveillance from the American Academy of Pediatrics (2001; Johnson & Myers, 2007) have brought greater public awareness to a population of children “at risk” for ASD. In addition, research successes in the detection of behavioral and familial risk factors for ASD and in the development of early screening measures has allowed researchers and health care professionals to identify with greater certainty children who do not meet criteria for diagnosis but who have characteristics that indicate a likelihood of diagnosis at a later time (Boyd, Odom, Humphreys, & Sam, 2010; Johnson & Myers, 2007).

Currently, the primary indicators of risk for diagnosis of ASD in infants/toddlers include having an older sibling diagnosed with an ASD, and/or a combination of specific behavioral characteristics that include social and communicative deficits as well as difficulties in self-regulation or responses to sensory experiences. Recent estimates of risk for siblings indicate that infants with an older sibling diagnosed with ASD have a 25 times greater risk of ASD diagnosis than those in the general population (Abrahams & Geschwind, 2008). Infants and toddlers at risk based on behavioral characteristics typically are identified via screening. Caregiver report measures include tools such as the First Year Inventory (FYI; Reznick, Baranek, Reavis, Watson, & Crais, 2007) and the Modified Checklist for Autism in Toddlers (MCHAT; Robins, Fein, Barton, & Green, 2001), Clinician-administered measures include tools such as the Screening Tool for Autism in Two-year-olds (STAT; Stone, Coonrod, & Ousley, 2000) and the surveillance algorithm described for use by pediatricians in Johnson and Myers (2007). Also, although it is not specific to ASD, the Infant-Toddler Checklist (Pierce, et al, 2011; Wetherby & Prizant, 2002) is also being used by physicians as a screening tool.

As a result of the events and developments noted above within both research and public health arenas targeting early identification of ASD, the need for early intervention has expanded to include a population of infants and toddlers who are not yet diagnosed with ASD, but rather are identified as *at risk*. However, currently there are even fewer published research studies on interventions, PI or otherwise, for this young, at risk population than for those already diagnosed. In addition, the studies that are reported in peer reviewed literature are largely focused on those at risk based on their status as the infant sibling of an older child diagnosed with ASD. For example, in a study by Steiner, Gengoux, Klin and Chawarska (2013), results indicated that a “developmentally appropriate downward extension” (p.92) of PRT was effective in eliciting

more frequent functional communication attempts from three 12-month-olds at risk based on sibling status. The investigators also reported that parents were able to implement intervention strategies with moderate fidelity, and that the parents found the intervention satisfactory in terms of skills taught, progress made, and the overall program. However, the small sample size (n=3) and study design (multiple baseline case series), as well as the relatively narrow focus on communication behaviors, make generalization of both child and parent results difficult. Similarly, Green, et al. (2013) indicated in their preliminary case series study that a PI intervention resulted in changes in parent behaviors (increasing sensitive responding and non-directiveness) when interacting with seven 8-10 month old infants at risk based on sibling status. Measurement of change in the infants occurred across several domains of behavior and cognition using the Autism Observation Scale for Infants (AOSI; Bryson et al 2008), the Mullen Scales of Early Learning (MSEL; Mullen, 1995), and a measure of visual attention shifting called the “Gap/Overlap Task.” Children receiving the study intervention were compared with two no-treatment control groups (a high-risk group and a low-risk group based on sibling status). No trends in infant outcomes were found, though individual infants in the treatment group did show substantial changes on some measures when compared with one or both control groups. Again, the preliminary nature of the study and the small sample size make generalization of any results inadvisable. In the only currently published study in which children aged 12-24 months (n = 98) were identified as *at risk* based on their own demonstration of ASD symptoms rather than sibling status, Rogers, et al (2012) found no difference between a parent-implemented version of the Early Start Denver Model (P-ESDM) and community-based treatment as usual in either parent behavior or child outcomes. However, it was noted that children in the community services group received significantly more hours of treatment than did the P-ESDM group, and that the

parents in the P-ESDM group reported a significantly stronger working alliance with the therapist than did the parents in the community services group. In a pilot randomized controlled study of 16 infants identified as at-risk in a community sample, based on results of the FYI, Baranek, Watson, Turner Brown, Field, Crais, Wakeford, Little, and Reznick (2015) found that the parent/infant dyads receiving the Adapted Responsive Teaching (ART) intervention had better outcomes than did the group referred for community-based early intervention services (control) in several areas. Specifically, children in the ART condition demonstrated greater improvements in receptive language, socialization, and sensory hyporesponsiveness than did children in the control condition, and parents in the ART condition developed a more responsive interactional style than did parents in the control condition. ART is a PI home-based early intervention that is based on Responsive Teaching (Mahoney & MacDonald, 2007) but with adaptations to include content related to sensory processing and self-regulation (Wakeford, Baranek, Crais, Watson, Turner Brown, in preparation).

Measurement of fidelity in parent-implemented interventions for ASD/risk for ASD.

As noted in regard to PI interventions for young children already diagnosed with ASD, PI interventions for young children at risk also have shown positive results for some parents and children in some contexts, but are still lacking in substantive empirical support. Multiple facets of the design, implementation, and outcome measurement of PI intervention for young children with or at risk for ASD need further investigation, and among these facets is the actual fidelity of the parents to the intervention itself. As previously indicated, parent-implemented intervention places a significant responsibility on the parent for the accuracy, frequency and quality of the intervention. However, not all of the intervention studies discussed thus far included measurement of parent fidelity and those studies that have included measurement of this or

related constructs (such as social validity) have done so in different ways and with little or no discussion of the factors that might have influenced parent fidelity. As noted previously, Table 1 provides an overview of research examining PI interventions for children aged 0-5, over a 10-year period (2004-2014), including whether or not parent fidelity and/or interventionist fidelity was measured in the study.

Based on the data in Table 1, 69% of the studies included measurement of parent fidelity. However, just over half of the studies in which parent fidelity was measured ($n=13$) were single case designs with three or fewer participants. In 12 of these 13 single case studies, the investigator was also the interventionist, and the intervention being coached and delivered was based on a behavioral model, so that there were discrete, easily observable steps for implementing the intervention. That is, in nearly half of the studies in which parent fidelity to intervention was measured, that measurement was simplified by the facts that there were few participants and that investigators could easily and readily determine whether or not the parent was adhering to the intervention, allowing them to continue to coach or train the parent until an acceptable level of adherence was achieved. In addition, the published reports of these studies did not include parent fidelity other than adherence, so exposure (dose) and quality are not discernible.

Exposure was the only aspect of fidelity measured in four studies in Table 1, all of which included analysis of intervention results by group; two of these were randomized controlled trials (RCT) (Pajareya & Nopmaneejumrulers, 2011; Wong & Kwan, 2010), one was quasi-experimental (Mahoney & Perales, 2003), and one was single subject with group analysis comparing two interventions (Rogers, Hayden, Hepburn, Charlifue-Smith, Hall, & Hayes, 2006).

Of the 16 RCTs, parent fidelity was measured in eight, although for two mentioned above ((Pajareya & Nopmaneejumruslers, 2011; Wong & Kwan, 2010), only exposure was measured.

Two of the eight RCTs in which parent fidelity was measured included an intervention based on behavioral approaches (Minjarez, Williams, Mercier, & Hardan, 2011; Nefdt, Koegel, Singer, & Gerber, 2010), again simplifying the measurement of adherence. In both of these studies, parent fidelity was determined by coding video of parent-child interactions using a measure specific to the frequency with which parents implemented discrete PRT strategies with their child, and this type of measure was likewise used in the twelve single case design interventions mentioned previously. No assessment or consideration of factors that may have influenced parent fidelity were included in published reports of these studies examining interventions based on behavioral theories. However, in many of the single case studies, parents were coached to at least 90% adherence prior to implementing the intervention with the child, so measuring factors potentially affecting adherence may not have seemed necessary. In a similar vein, because no other aspects of fidelity were measured in these studies, the measurement of influencing factors was moot.

In the intervention studies based on other than behavioral theories (e.g., relationship-based, developmental), parent fidelity was measured in a variety of ways. For those in which only exposure (frequency/duration of parent-implemented intervention) was included, parents were asked to keep a written log of the time spent using the intervention on a daily basis. Casenhiser, Shanker, and Stieben (2013) used a subset of items from an intervention-specific scale used to measure therapist fidelity which was used in both this and a previous study. Rogers, et al. (2012) similarly used a parent fidelity checklist developed specifically to include the parent behaviors targeted by the intervention being tested. Both Kasari, et al (2010) and Schertz, Odom,

Baggett, and Sideris (2013) used multiple methods to measure parent fidelity. These methods included self-report measures using Likert-type scales and coding of video recordings using intervention specific checklists (Kasari, et al, 2010), and activity logs along with interventionist ratings of parent participation (Schertz, et al, 2013). Again, no assessment or consideration of factors that may have influenced parent fidelity were included in published reports of these studies based on other than behavioral theories, although Schertz, et al. (2013) included a measure of social validity.

Overall, parent fidelity in PI intervention studies is not measured consistently, nor is there consistency in the methods used for measurement. Investigations of interventions based on behavioral theories differ from studies of interventions based on other theories in terms of measurement of parent fidelity in several important ways. These differences include 1) behaviorally-based studies typically have clear, specific, observable steps for implementation of intervention, making parent adherence to those procedures obvious and easily quantified, 2) training or coaching of parents is often done by the researcher, eliminating the potential effects of differences in parent-delivered intervention being based on differences between coaches/trainers, and 3) researchers have therefore had the opportunity to train parents to a high level of fidelity prior to parents delivering the intervention to their child. For interventions based on other than behavioral theories, studies by Schertz, et al. (2013) and Kasari, et al. (2010) provide perhaps the best examples for measurement of parent fidelity, but neither of those studies, nor any of the behaviorally-based studies, examined factors that may have influenced parent fidelity.

Parent-implemented early interventions for children with ASD: Summary. PI

interventions have become increasingly prevalent as means by which to address both characteristics of and risk factors for ASD. Research examining the efficacy of these interventions has resulted in promising connections between intervention and child and parent outcomes, but there remains questions about the extent to which these interventions can be replicated successfully. Fidelity to the intervention by both trained interventionists/coaches and by parents delivering the intervention directly are among the issues that need to be addressed with greater attention in order to ascertain effectiveness of interventions and replicability. It is also necessary to examine issues of parent fidelity and the factors that may influence that fidelity in order to determine which interventions may work best for various groups or populations of families and children.

In order to organize an examination of the factors that may influence parent fidelity to a parent-implemented early intervention, it is necessary to have a theory or conceptual model that outlines hypothesized relationships among multiple factors in the intervention situation. Such a conceptual model then provides a foundation for identifying and investigating those hypothesized relationships in a systematic manner. In the next section, this researcher describes the conceptual model used to provide a foundation and structure for this study, which is based on the transactional theory of John Dewey.

Conceptual Framework

Pragmatist philosophy, and more specifically a transactional perspective, speaks specifically to the “continuity of humans and their environments” (Cutchin & Dickie, 2012, p.2). This perspective recognizes the essential ebb and flow of experiences over time, and the ongoing and contingent relationship of person and context. Adopting a transactional perspective

encourages one to take not only a holistic view of human experience, but also a situational one. That is, taking a transactional perspective encourages one to look for and then take into account all potential influences on any given situation, and to understand each “situation” uniquely, even as it is continually evolving and transforming itself. Reductionistic, linear, and hierarchical ways of conceptualizing what is transpiring in the context of human experiences are inadequate, in that they encourage a view in which the relationships between humans and their environments are seen as dyadic and often as unidirectional; they reduce the human experience from global and dynamic to mechanistic, as if that experience is a simple cause-effect, repetitive interaction. A single aspect of the human being is seen in relationship to a single aspect of the environment, with a one-way relationship in which one of the two (human or environment) effects change in the other. For instance, given a mechanistic view of eating a meal at home, one may see only the oral motor capacities of the child as the mechanism by which the demands of eating are met, disregarding any other qualities of the child as a whole and the entire context of the home, over time, as having any explanatory role in mealtime outcomes.

Transactional perspectives, on the other hand, allow one to recognize and come to some understanding of the complexity of human experiences in the world. Expanding on the example above, a transactional perspective encourages one to consider the temporal, cultural, and social qualities of the meal at home and how those qualities have been expressed both over time and on the particular day in question. One considers the more “stable” or consistent characteristics of the child, including current abilities in all areas of development, as well as personality, temperament, and previous experiences, but simultaneously takes into account more transient characteristics such as the child’s current levels of interest, attention, fatigue, hunger and/or emotion. In addition, the home situation is considered, including both consistent and transient characteristics

of parents and siblings, the time of day, the previous experience of the child with eating meals at home, the physical arrangement of the eating area, eating utensils, the food being eaten, etc. The mealtime context and the child are considered together, holistically, both changing and being changed by each other.

Transactional theories in early childhood education have been espoused as means of integrating both nature and nurture, potentially putting to rest the long-standing nature vs. nurture debate regarding child development. As noted by Sameroff (2010), there has been a “cycling of explanations between nature and nurture” (p.9) relative to the primary factors involved in child development. Scientific discoveries in the 1960’s contributed to a “naturistic” cycle in which genetic factors and cognitive capacity (e.g., Piaget’s theory of development) were considered the primary influences on child development. The cycle turned again in the period between 1970 and 1990, a time during which social science research found differences in development between children living in poverty and those who were not, and established that the meaning of various child behaviors could be interpreted differently in different cultures. Given these findings, previously touted factors of nature, i.e., genetics and innate characteristics of the child (e.g. cognitive ability), could not be the only sources of explanation for child behaviors and development. These changes in understanding of influential factors opened the door for Bronfenbrenner’s social ecological theory (1977), which emphasized that the social and societal contexts in which a child was embedded had significant roles in shaping development. Sameroff himself described the use of an ecological perspective on child development (1983, 1999), specifically examining the influence of various risk factors on children and youth (1989, 2006). In 2009, a volume of work edited by Sameroff was published, in which both he and others wrote about child development using a transactional model. This work included explications of the

ways in which parent-child interactions over time serve to regulate both affect and behavior of both parent and child, leading to habits and patterns of behavior in both parties (Olson & Lunkenheimer, 2009). These ideas emphasized a need to consider a more family-centered approach in early intervention and early childhood education (Sameroff & Fiese, 2000), as there were more actors on the stage of challenging child behaviors than just the child. Moving beyond an ecological perspective, which emphasized the influence of context on development, Sameroff's explication of a transactional model introduced a dialectical perspective in which the relationship between child and context (including parents) is characterized as two-way, mutual, and consistently coinciding. That is, as the context influences the child, the child influences the context, each changing the other in an ongoing transaction. Other theorists, such as Barbara Rogoff and Lev Vygotsky, have taken similarly transactive views of development in particular areas, Rogoff in socio-cultural realms and Vygotsky in the realms of learning and cognitive development. However, Sameroff's model is, to date, the most comprehensive conceptualization of child development as a transactional process.

Another educational theorist, John Dewey (1922), also was a proponent of a transactional perspective, albeit not related only to child development. Dewey's application of transaction was exceedingly broader, encompassing not only individual experience but also the experience of groups of people within an endless variety of contexts. As noted previously, Dewey's perspective was one of continuity of "humans and their environments," without specificity or limiting factors in terms of which humans or which environments. This is the transactional perspective upon which the conceptual model for this study is grounded because of its broad applicability. This study seeks to examine parent behaviors (i.e., the extent to which parents do or do not show fidelity to early intervention strategies) in a context that is multifaceted. While

development and learning of the child is the targeted outcome for the intervention being delivered by parents in the study, child behavior is not the focus of this study and so transactional models of child development are not particularly applicable. Dewey's transactional perspective, alternatively, allows examination of multiple factors within the parent-environment relationship that may influence parent fidelity to early intervention.

Using Dewey's transactional perspective, one is able to reason about multiple ways in which the consistency (or lack thereof) within both the context and the person, over time, will have an effect on performance on any one day. Although using this perspective and expanding the number and complexity of possible human-environment transactions in any given context may at times be "messy," the end result may be a more accurate understanding of what is happening in that particular situation. Working from that more nuanced and sophisticated understanding, then, one is able to see more clearly the aspects of the situation that may need to be altered when human experiences or contextual affordances are suboptimal, and the potential (though not certain) "ripple effects" of making that alteration. As a result, a transactional perspective provides a significantly more authentic viewpoint from which to begin designing intervention than do other more mechanistic or reductionistic theoretical models.

A transactional perspective and parent fidelity. The application of a transactional perspective to the concept of parent fidelity to intervention encourages in the viewer an understanding of the intervention situation as existing in a place and time, but influenced by both the past and anticipated future. Therefore, it is not enough to consider the parent and child as they are in the present, to view the current home environment as it is, and then to insert both an intervention and an interventionist and expect to understand why the parent does or does not follow through with the intervention strategies. The parent, the child, and the interventionist are

all bringing themselves and their past experiences with them to this transaction (the intervention situation), and this convergence creates expectations, uncertainties, disruptions of habit, and multiple other complex thoughts and actions on the part of each of those individual people, in a particular environment which has its own influence on the situation.

Consider the following example: A young African-American mother who lives in subsidized housing participates each week in a session in which a 40-ish, white female interventionist explains and models “strategies,” which are different ways of talking to and playing with her 16-month old son. Those different ways of talking to and playing with the little boy often elicit more babbling and focused play behaviors when the interventionist uses them, but the mother seldom tries them herself despite the encouragement of the interventionist. The mother is always welcoming and polite, and often enjoys the time playing with her son. However, between sessions, the mother seldom uses those “strategies.” The mother’s scores for fidelity to the intervention are usually quite low.

Given this information and taking a traditional cause-effect, or linear, view of the situation, one may take the stance that parent fidelity to the intervention is influenced by race, i.e., that the African-American mother is skeptical of taking child-rearing advice from a white woman. Indeed there are research findings to substantiate this hypothesis (Woolfolk & Unger, 2009). However, when one adopts a transactional perspective, there are multiple other factors to consider in answering the question, “What is causing her low fidelity to the intervention?” While the racial difference may indeed be one of the factors influencing her fidelity, another factor may be that many of the strategies conflict with her parenting style. It also may be that she works two jobs and/or has three older children who take up a lot of her time, or the fact that although the interventionist demonstrates the strategies consistently, she has decreased her efforts over time to

get the mother to practice them simply because those efforts are seldom successful. It may also be some combination of these and/or other factors that are preventing the mother from using the intervention strategies herself. However, without examining multiple factors, it is difficult to ascertain if and how this mother could participate more fully in the intervention process and/or how the process could be adapted to fit the mother's style or challenges.

Proposed model of parent implementation fidelity. The *Transactional model of Parent Implementation Fidelity (TPIF; © 2017 Wakeford)* is based on a transactional perspective and was developed by this researcher specifically to help explain the potential interwoven and simultaneous actions occurring in the situation of parent-mediated early intervention for infants/toddlers at risk for ASD. The TPIF is proposed here as a framework for this study and is illustrated in Figure 3. The rendering of the model itself represents an essentially “ideal” process of intervention in which the interventionist and the parent sustain high fidelity to the intervention; the changes that occur in them, in the child, and in the overall situation over time are optimal. However, the model can be rendered in a variety of different ways to represent the process experienced by any individual family/interventionist situation.

Model components. The TPIF model is normative at its starting point, which is to the far left of the rendering. That is, the model could apply to any family within any context. It is only when there is an interruption in a “typical” pattern of family and community that the model can be applied specifically to the factors that influence parent participation in and fidelity to a PI intervention for a young child identified as at-risk for ASD. Within the model, the word “component” is used to denote broad core elements that transact with one another consistently, over time. The word “factor” is used to denote specific aspects of a component that are present in individual situations, and may persist over some time, but are not necessarily constants. For

instance, the child is a *component* of the model that is always active in the transactions that occur, but the motor skill capacity of the child is a *factor* that is not necessarily key in every transaction.

The following description of the model components considers the model first from the normative perspective, then with specific application to the intervention situation which is the context for this study. It should be noted that the model is not designed to evaluate the relative value or “goodness” of any component, human or contextual, but rather to provide a perspective for viewing what “is.” Subsequent to understanding the situation as it currently exists, without judgment, one may reason about what factor or factors within one or more components may be changed in order to create a more optimal situation, if that is desired by the family or interventionist.

TPIF from a normative perspective. As noted above, TPIF begins as normative, applicable to any family within any contexts. Once applied to a specific family, that family’s norm becomes relevant as a point of reflection and reasoning about the ways in which intervention interrupts that norm and introduces additional components to the model (e.g., the interventionist, expectations of strategy use outside the intervention session) that must be integrated in some way. From a transactional perspective, the relationships among persons and their contexts that exist prior to intervention must be considered as intervention is planned and implemented, as those relationships will continue and will influence the intervention in one or more ways. Intervention will, likewise, influence the ongoing relationships among persons and contexts. Therefore, understanding the social and environmental components of the normative end of the model is key to understanding what happens when an intervention is introduced.

Social components. The components that comprise the core horizontal strands of the model include the child, which is the center strand, parents, siblings (collectively), and other key adults/caregivers within the family (collectively). Each strand is inclusive of all aspects of the person or persons included in that strand, including not only innate abilities, but also temperament, interests, preferences, values, beliefs, expectations, etc. These strands are interwoven with one another as they move from left to right in order and represent the relationships that exist between and among family members, and the fact that those relationships touch upon, influence and make changes in each person as the relationships continue over time. In individualizing the model, any of the strands may be eliminated except for the focal child and one parent (e.g., for a single-parent household or one in which there is only one child). The presence of two parents in a model does not imply a heterosexual or married couple, but rather the relatively consistent presence of two adults who identify themselves as the focal child's primary caregivers. Similarly, the strands that represent collectives (the sibling strand and the other key family adults strand) may be divided to represent specific individuals as needed. However, it is important to note in regard to "other key family adults" that those included in this core strand of the model are those that are a usual (but not necessarily daily) part of the child's life and often interact with the child in the child's or their own home environment. This would include family members who live or spend frequent time in the child's home, or with the child in their home, regardless of their actual relationship to the child. For instance, an aunt who often provides care for the child and frequently engages in home and community activities as part of the family would be included in the core strand, whereas a grandparent who comes to visit the family twice a year for a week at a time would not be included. The visiting grandparent would be represented as a strand woven in from the Extended Family thread for a period of time, and

then exited. Of course, this grandparent may have some significant influence on one or both of the parents, and this influence may be longstanding and have effects on the parent/child relationship. However, the effect of the grandparent on the parent is represented as existing within the parent themselves in this model; that is, the grandparent is included as part of the “life experiences” factor of the parent component. This is done for the sake of simplifying the model and allowing it to remain focused around the child and core family members who will be primary participants in an intervention.

Contextual components. The daily life activities, routines, rituals, and habits of family members, individually and as a group, which take place at home are represented by the straight green lines above and below those representing family members. These elements of daily activity at home provide the proximal boundaries and structure for family life, and provide a context in which family relationships develop and evolve. Further above and below lie turquoise lines that represent the activities and routines that occur in environments external to the family’s home but contained within a local community, such as school, work, faith-based organization, grocery stores, parks, shopping malls, doctors’ offices, etc. These are environments in which one or more family members participate on a relatively regular basis, and which present both opportunities and demands that influence the daily life activities and routines of one or more family members. The last set of straight lines running horizontally (light orange) represents the opportunities and demands of the larger socio-cultural context, and include political, legal, economic, geographic and societal factors that influence the family’s participation in both community and home-based activities and routines.

Human-context transactions .The transactions which occur among the human and contextual components of the model are represented by the vertical arrows connecting

components. These arrows are of varying widths and intensity of color in order to account for the length of time and the extent to which a particular transaction has a significant influence on the family or a family member. The arrows may also be going in one or both directions, depending on the extent to which the human(s) involved take action to make changes in the context or allow the context to make changes in them. For instance, Figure 4 illustrates a situation in which a single parent must provide transportation twice daily for a 4-year-old sibling to go to preschool, but shortly creates an opportunity to become part of a carpool arrangement with other parents, necessitating only one day a week of providing transportation. Over time, the carpooling activity becomes an integrated routine for the mother, diminishing even further the effects of this “transportation” demand on overall family life.

TPIF applied to parent fidelity in the Adapted Responsive Teaching intervention.

Details about the content and process of the Early Development Project-2 (EDP-2; the context for this study) and Adapted Responsive Teaching (ART; the intervention tested in EDP-2) are provided in Chapter 3. A brief explanation is offered here in order to facilitate an understanding of how TPIF may be applied to EDP and ART.

Overview of EDP-2 and ART. Recruitment of participants for EDP-2 was initiated by a mass mailing of a letter introducing the study and a parent questionnaire (First Year Inventory; Reznick, et al, 2007) designed to screen for risk of ASD in children at 12 months of age. Birth records were used to develop the mailing list, so that parents of children turning 1 year old, within the study’s catchment area, would receive the mailing. Parents could complete and return the questionnaire and also fill in a form indicating whether or not they were willing to be contacted for further participation in the study (Subsequent Participation form). Returned questionnaires were scored using an algorithm that identified children who scored at the 98th

percentile or higher as at risk for an ASD or other developmental disability. Parents of children scoring at-risk, and who had indicated willingness to continue participating in the study, were contacted by the EDP-2 project coordinator and invited to bring the child in for a comprehensive assessment. Following the assessment portion of the study, parents were offered the opportunity to continue participation by enrolling in the intervention portion of the study. The randomization process was explained, as were the two intervention conditions. Parents who chose to continue in the study and were randomized to the Adapted Responsive Teaching intervention were contacted within a week of the assessment by a study interventionist to schedule the first home visit. The intervention period lasted 6-8 months and included approximately 30 in-home sessions. ART uses a coaching model, and parents are coached to use simple strategies to increase the child's social-communication and decrease sensory-regulatory behaviors that prove challenging and increase those that are facilitating. The families who were randomized to the community services condition (control) were contacted by the project coordinator and given information and support to refer the child to the state's Infant-Toddler Program to determine eligibility for early intervention services delivered by community providers.

TPIF and EDP-2. Using TPIF, and continuing to use Figure 3 as a representation of the process over time, the interruption of family norms actually occurred prior to the introduction of the intervention for the Early Development Project-2. The initial event that may have started to alter the transactional system is the parent or parents opening, reading through, completing and returning the First Year Inventory (FYI; Reznick, et al, 2007) screening tool. The cover letter sent with the FYI indicated that the research in which the tool was being used was targeting infants who may be at risk for autism or other developmental issues. The letter also indicated to parents that if they completed and returned the FYI, it would be scored, and that if they provided

contact information, they may receive a call from the project coordinator if their child's score was of concern. Participating in this screening process may have elicited the parents' reflection on the child's development up through 12 months of age, which may have caused, reinforced, or exacerbated concerns about the child's development. This activity alternatively may have confirmed a lack of concern and the parents' sense of the child as typically developing. In addition, the decision of the parent(s) to complete the subsequent participation form (indicating interest in participation in the research study if contacted) represented one or more values and beliefs on the part of the parent(s), including (but not limited to) a willingness to consider the idea that the child *may* show indicators of atypical development, a hope that their concerns would be affirmed and addressed by the project or that concerns would be nullified, or the willingness to participate in research regardless of child status. Similarly, dismissive actions on the part of the parents by either reading through but not completing the FYI, or completing the FYI but not the subsequent participation form, also reflected parental values and beliefs. However, because those families did not participate any further in the project, the TPIF model potentially ceased to apply to them.

Parents who completed and returned both the FYI and the subsequent participation form had already been changed simply by their participation in the screening process, and this likely was particularly true for those who had concerns about their child's development. For these families, there likely were changes in how they viewed and interacted with the child. Differences between parents in terms of concerns for the child may have become more evident than before, and there may have been an increase in comparing the child's development to that of siblings or other children. There may have been an initiation of or increase in conversations with friends, family, or health care providers about whether or not there was actually cause for concern. The

next potential interruption of the norm was likely to have a significant additional effect on parents and, as a result, on the family system as a whole. That interruption occurred if the child's score on the FYI indicated high risk for ASD or other developmental disability, and the project coordinator contacted one of the parents to inform him/her of this risk, inviting the family to participate in the assessment portion of the study. For the families with whom that contact was made, likely there arose additional discussions to be had, decisions to be made, and concerns heightened, all of which may have created changes in how those in the family system related to one another and viewed the child. In addition, daily habits and routines were disrupted, even if temporarily, in order to schedule and participate in the comprehensive assessment, which often took three to four hours in addition to the travel time required.

As this process continued, the parent and child participated in the assessment, which may have made the parent more aware of his/her child's strengths, needs and potential idiosyncrasies. This awareness on the part of parents may have engendered a number of responses from the parents themselves, including multiple combinations of pride, surprise, disbelief, acknowledgement, increased concern, sadness, anger, and/or the need to act. Each of these (and other) potential responses may have influenced parent behaviors and attitudes, both toward the child and toward other significant family members, once again changing dynamics within the family system. In addition, the results of the assessment that were shared with parents may have elicited other thoughts, feelings and/or behaviors, as the results were not diagnostic, but about risk, offering no clear future implications. The family then received the opportunity to continue participation in EDP-2 by consenting to the intervention portion of the study. Again, changes in the parent's view of the child, including the child's potential need for intervention, as well as other understandings of family life, may have occurred and challenged parents as they made the

decision to accept randomization to one of two treatment groups. Although the intervention provided by EDP-2 staff was offered at no cost to the families, it did require home visits, and some parents may have hesitated to agree to the intervention portion of the study for that reason. In addition, the intervention was provided at least weekly, for 6-8 months, and this also may have caused some hesitation in parents in terms of agreeing to the potential to be randomized to the ART intervention group. Therefore, the concerns of the parents, what they understood about the intervention process, what they knew about ASD, and what they knew about the current status of their lives in home and community settings may have influenced their initial willingness to participate further in the study. In addition, those who consented to further participation and were randomized to the ART intervention had already undergone changes in their thinking and interruptions of their daily lives in many ways, including emotionally. It is this situation into which the interventionist entered.

The interventionist (all of whom were female in this study) brought with her factors that included her own abilities, values/beliefs, personality, culture, life experiences, etc., as well as her specific experiences as an interventionist, her style of delivering intervention, and her fidelity to the content and process of intervention with previous families (among other things). As she entered the family's home for the first time, her appearance, actions and communications, and style of interacting were important in establishing rapport and relationships with the child and his/her family. She was interrupting daily routines with her visit, regardless of the fact that the time was scheduled based on the preferences of the parent, and she was a novel entity within the home environment. She had an effect on the thoughts and behaviors of everyone present in the intervention session, as well as those proximal to it but not present, such as a second parent. The interventionist's effect continued over time as she left the parent with strategies about simple

ways to interact with the child, and an expectation that the parent would implement those strategies between sessions. The parent and child also made changes within the interventionist, as she left each session with knowledge, opinions and ideas about the situation that she did not have before the visit and which she had to consider before the next session. Among her opinions would be thoughts about the likelihood that the parent would be both willing and able to implement intervention strategies between sessions, and whether that would happen readily or would require encouragement and additional effort on her part. These opinions continued forming over time and were based on evolving understanding of what the home environment was like, both physically and socially, what resources the family had, how well the parent seemed to understand both the written and spoken content of the intervention sessions, and what kind of time the parent had at his/her disposal to play or interact with the child using the intervention strategies. These and other considerations influenced the further actions and communications of the interventionist, and those actions and communications had influence on the parent, child, and ongoing intervention process. Each time the interventionist entered and left the family context, everyone in it was changed in terms of how they thought and behaved in regards to moving the child forward in areas of need, and, importantly, the spoken or unspoken potential that the child might indeed be diagnosed with ASD.

TPIF and factors considered in this study. For this study, the specific factors being considered within the TPIF model as potential influences on parent fidelity are identified in bold upper-case lettering in Figure 3. They include interventionist fidelity (adherence and quality), household income (SES), parental stress, parenting style, and the extent to which the child demonstrated characteristics of ASD.

Conceptual model: Summary. As explicated in the application of TPIF to the ART intervention in EDP-2, use of a conceptual model based on Dewey's transactional perspective is essential in understanding the myriad of factors that may influence a parent's ability or willingness to implement strategies with his/her child between interventionist visits. Parents are affected by many factors, simultaneously, as they care for and interact with their child. The addition of a need for and participation in an early intervention creates an even more complex situation, and the ongoing relationships and mutual influences among the people and contexts in this situation may best be examined and understood using a conceptual model that acknowledges that complexity, i.e., a model based on a transactional perspective.

CHAPTER 3: METHODS

Secondary data from the Early Development Project-2 (Watson & Crais, PIs) were used for this study. The Early Development Project-2 was an early intervention research study targeting infants/toddlers determined to be at-risk for ASD based on parent responses to a screening questionnaire. A description of the content and process of both the Early Development Project-2 and the intervention used in that project, Adapted Responsive Teaching, is offered below, followed by more specific information about the data and methods of analysis for this study.

The Early Development Project-2

The Early Development Project-2 (EDP-2) was a randomized controlled trial comparing a parent-mediated intervention to standard early intervention services available in the community for infants screened as at-risk for ASD. This study was funded by the Institute for Education Sciences, U.S. Department of Education for the time period of July, 2010-June, 2014 (Linda Watson and Betsy Crais, PIs). Prior to EDP-2, the project team conducted a 3-year pilot feasibility study, called Early Development Project (EDP), from 2007 to 2010. That study was funded by Autism Speaks for years 2007 -2010 (Grace Baranek, PI).

Participants, recruitment and enrollment. Participants in EDP-2 initially were identified through a mass mailing (using birth records) of the First Year Inventory (Reznick, et al., 2007) in central North Carolina. The FYI is a parent-report questionnaire that screens children at 12 months of age, using items that fit two key developmental domains, social-communication and sensory-regulatory. After the questionnaire was completed and returned by

the parents, risk was calculated using a scoring algorithm that identified risk in those two domains, and a total risk score. Parents of children with high-risk scores in both areas and a total risk score at or above the 98th percentile were contacted. These parents were invited to participate in the study by bringing the child in for a comprehensive developmental assessment. Following the assessment and after discussing the results of the assessment, parents were invited to continue participation in the study by enrolling in the intervention phase. EDP-2 staff explained the randomization process and gave a brief overview of each of the conditions to which they might be randomized, i.e., Adapted Responsive Teaching (ART) or being referred to community services. Parents were informed that if they were randomized to the study intervention (ART), there would need to be at least one parent or other primary caregiver available each week to participate in home visits, and that the purpose of those home visits would be to teach that caregiver(s) things that he/she could do to help the child develop social-communication and/or sensory-regulatory skills. Those parents who agreed to further participation by consenting to the intervention were randomized to receive either the ART intervention provided by EDP-2 interventionists, or information and guidance to refer their child to the early intervention services provided by the North Carolina Infant-Toddler Program (NCITP), which served as the community services control condition. Regardless of group assignment, all families were given information about NCITP, so that any family could pursue early intervention services provided by the State of North Carolina as they wished. Parents in both groups received monthly follow-up calls by the project coordinator to document types and intensity of other intervention or support services families may have been receiving (e.g., speech-language or occupational therapy). These calls were completed throughout a period of six to eight months following the initial assessment. After that period, families returned for a second,

post-intervention (or post-control) comprehensive assessment. Figure 5 provides an overview of the EDP-2 process.

A total of 87 families enrolled in EDP-2, and 44 of those families were randomized to the study intervention (ART). The current study is based on data collected from 36 of those families. Three families were eliminated as participants because a caregiver other than the parent was the primary adult participant in the intervention, and five were eliminated due to missing data in key variables. The remaining sample included families of 24 boys and 12 girls, ages 13-15 months at the start of the intervention. While these families represented some diversity in terms of race, parents' level of education, and household income, the majority was Caucasian, had at least one college degree, and had a yearly pre-tax income of \$70,000 or more. For the remainder of this paper, the word "participant" will be used to denote a family whose data were used in this study; more detailed demographic information about participants is provided in Table 4.

The intervention condition. ART (Wakeford, Baranek, Crais, Watson, & Turner-Brown, 2012), is a PI approach to intervention for very young children (13-24 months of age) at risk for ASD. It was based upon a previously existing, manualized intervention developed by Gerald Mahoney and James MacDonald (2007) called Responsive Teaching (RT), which was delivered in a clinical setting. RT (www.responsiveteaching.org) is a PI intervention that uses a coaching model to teach parents strategies they can use in their interactions with their children on a daily basis. These strategies are based on five core dimensions of (parent) responsivity (reciprocity, contingency, shared control, match, and affect), and are intended to support the child's development in the areas of cognition, communication, and social/emotional functioning. RT has been found to be effective in increasing the social-emotional functioning of young children with ASD (Mahoney & Perales, 2003), and increasing social-emotional, cognitive, and

communicative functions in young children with pervasive developmental delay and other developmental disabilities (Mahoney & Perales, 2005). Increases in parental responsiveness in parent-child interactions as a result of RT intervention also have been documented (Mahoney & Perales, 2003, 2005).

Development of ART. Prior to implementing the initial feasibility study (EDP), the project team made adaptations to both the content and process of RT content in order to create ART. *Content* adaptations were maintained for EDP-2, and included 1) the addition of specific content related to sensory processing, and 2) the addition of content related to object and symbolic play. These additions of content were made in order to address areas of concern that often occur in children with ASD but which were not fully addressed in the original RT curriculum. The sensory processing content was authored by three occupational therapists with expertise in this area, including this researcher, and was based on research and other professional literature related to the sensory processing differences often associated with ASD, and evidence-based interventions to address sensory processing difficulties (e.g., Dunn, 2007; Baranek, Wakeford, & David, 2008; Dunn, Saiter, & Rinner, 2002; Wakeford, 2012). Content related to object and symbolic play was developed by members of the EDP team, based on current research and other literature about the challenges often experienced by young children with ASD in development of play skills (e.g., Kasari, Papparella, & Gulsrud, 2007; Kasari, Freeman, & Papparella, 2006). Following EDP, the project team made additional changes in which ART content was streamlined to eliminate unused or seldom used RT content, and to align the content of ART more transparently with the developmental domains addressed in the FYI used for initial screening (i.e., social-communication and sensory-regulatory functions).

In addition to these adaptations to ART content, the EDP team also adapted the RT *process* prior to EDP by including 1) delivery of intervention services in the family's home rather than in a center or clinic, 2) a parent education component that introduced parents to the five core dimensions of responsivity at the start of the intervention, 3) a functional, routines-based parent interview measure, 4) a measure of parent fidelity to the intervention that was completed by the interventionist, and 5) an individualized notebook provided to parents that allowed them to keep all intervention notes and other related information in one place. As in RT, interventionist fidelity was measured using a fidelity checklist and video-recorded intervention sessions. Further explication of both parent and interventionist fidelity measures is provided in a separate section of this chapter, on pages 66-68.

Service delivery. ART was designed to be delivered over the course of 6-8 months (allowing for missed sessions to be made up), with a total of 30 in-home sessions. Each session lasted 45-60 minutes. Initial sessions occurred twice a week in order to provide greater intensity and help parents begin to develop routines and confidence in implementing the intervention strategies. Following 4-6 weeks of twice weekly visits, the frequency of in-home contact was reduced to once a week, and a weekly "check-in" call or email to parents was added in place of the second home visit. For the final six weeks of the intervention, home visits were reduced to once a week. However, parents were encouraged to call or email interventionists as needed throughout the intervention period.

During the first few sessions, the interventionist introduced parents to the five dimensions of responsivity, providing relevant examples of each dimension based on the incidental behaviors of parent and child in the session. Interventionists covered this material at a depth and rate appropriate to the learning style of the parent, and allowed 3-5 sessions to address all five

dimensions of responsivity. Interventionists also used these early Parent Education sessions to develop rapport with the child and parent, and to get a sense of the home environment and family activities. Following these initial sessions, parents participated in a routines-based interview called the Family Routines Exploration & Description – Revised (FRED-R; Wakeford, et al, 2009) that facilitated identification of the parents’ primary concerns about the child in terms of daily activities and overall behaviors. These concerns, along with results of the initial comprehensive assessment and interventionist observations, contributed to the individualized selection of developmental domain, pivotal behavior, discussion point, and strategy with which to begin the intervention for each parent/child dyad.

Domains of development were defined as the broad areas of child growth and learning that are particularly relevant for children at-risk for ASD, and, as noted previously, were identical to the FYI domains of social-communication and sensory-regulatory functioning for ART. In both the original RT and in ART, *pivotal behaviors* were the specific child behaviors considered necessary for optimal growth and learning in a specific domain of development. Relevant research findings about various aspects of each pivotal behavior were summarized in parent-friendly language, and included as *discussion points*. These discussion points guided conversation and the sharing of information between the interventionist and parent(s) during intervention sessions. *Strategies* consisted of the behaviors or approaches that parents were encouraged to use when interacting with the child in order to elicit specific pivotal behaviors. The *family plan* was developed by the parent and interventionist at the end of each session to support parents in implementing the chosen strategy in naturally occurring activities and routines between sessions. The relationships among these core aspects of ART content are shown in Figure 6.

Content of intervention sessions included discussion of how previous strategies were working to elicit new or desired behaviors in the child, the introduction of new pivotal behaviors and strategies, modeling of the strategies by the interventionist, and coaching of the parent as the parent implemented the strategies with the child. Discussion of the behaviors seen, strategies tried, and child responses was ongoing between parent and interventionist, and the interventionist was expected to model responsive interactions with the child at all times. The case example below of Thomas illustrates how an intervention session may proceed. It should be noted that the participation of both Thomas and his mother, Ann, was essentially ideal for the ART intervention, and is not representative of how all families participated.

Case study: Thomas. At 14 months, Thomas was an active, cheerful little boy who was the only child of married parents. His initial (Time 1) assessment for EDP-2 indicated strengths in overall development as measured by the Mullen Scales of Early Learning (Mullen, 1995), but significant delays in expressive language, and moderate risk for ASD on the Autism Observation Scale for Infants (Bryson, et al, 2008). His parents' primary concerns were that although Thomas used a variety of gestures to get his needs met, he infrequently used sounds and he had no words yet. His hearing had been assessed and was within normal limits. The interventionist's primary concerns were the same as those of the parents, after she got to know Thomas in the first few sessions. Therefore, Thomas' mother, Ann, who was participating in the intervention, and the interventionist agreed that "Vocalization" would be an appropriate pivotal behavior to address first with Thomas.

Figure 7 shows the session plan that the interventionist brought to the home visit on April 28, 2011. The session plan was printed on 2-sheet non-carbon reproducing (NCR) paper so that the interventionist could make notes during the session, leave the top copy with the parent, and

take the bottom copy for EDP-2 records. In this session, the interventionist started by asking Ann if anything new had happened in terms of Thomas's behavior or use of language over the past week, or if he had had any new or unusual experiences and how he had responded to those experiences. Thomas's mother responded that Thomas had begun to babble a bit more, and he also was beginning to try to say some single words. The interventionist also asked for feedback about the strategy from the previous session, which had been "Play back and forth with sounds." Ann reported that she and Thomas had gone to a display of construction equipment at a local children's museum, and that Thomas had repeatedly used the word "Wow" to comment on the vehicles. She also said that she had used a previous strategy of "Imitate my child's actions and communications" to engage Thomas in vocal play with the word "Wow," and that she had used the most recent strategy to encourage making the truck sounds. Ann noted that Thomas really enjoyed this vocal play, along with looking at the construction vehicles, and that even on the way home in the car he was still making vehicle noises. This discussion about the activities of the previous week took place as Ann and the interventionist sat on the floor in the family's den and played with Thomas, using past strategies to encourage communication and social play behaviors in Thomas. Although the description of the discussion between the interventionist and Ann sounds continuous, the actual conversation was interwoven with interactions and engagement with Thomas, and took the first 15 minutes of the session to complete.

Following this initial conversation, Ann and the interventionist agreed that Thomas was responding well to the strategies from the recent past, and that those could continue to be embedded in daily activities. They also agreed that Thomas was becoming more confident in his vocal behaviors and less quiet overall. The interventionist felt confident that the new strategy she had included on the session plan was indeed appropriate to implement, and so she introduced this

new strategy to Ann. Because the pivotal behavior (Vocalization) and discussion point (see Figure 6) were the same as they had been for the past three weeks, the interventionist simply reviewed those briefly with Ann. Had those aspects of content been new, the interventionist would have spent more time introducing them to Ann and being sure Ann understood them before moving on to the strategy. The interventionist explained the ways in which the strategy, “Wait with anticipation” could be implemented and answered Ann’s questions about possible ways to do this that were specific to Thomas. The intent of the strategy was to scaffold the use of a variety of single words that Thomas might be motivated to say.

In the session itself the interventionist demonstrated the strategy as she, Thomas and Ann played with a newspaper from the day before. Thomas had been crumpling and tossing the paper around, so the interventionist, with Ann’s permission, showed him how to rip the paper. The interventionist knew that Thomas liked new sounds, and he did indeed immediately smile, look at the interventionist and engage with her in trying to tear the paper. The interventionist then started modeling the word “rip,” drawing out the first sound and looking at Thomas with anticipation. Thomas became very excited as well, but did not say anything, and the interventionist completed the word while ripping the paper. The interventionist modeled the full word twice more while ripping paper, again drawing out the first sound, and making the “ip” very explosive. The fourth time this interaction was repeated, the interventionist waited with animated anticipation, and Thomas finished the word. They did this several more times, with both of them ripping paper, and Thomas began saying the whole word “rip!” once the interventionist started the “r” sound. Ann had been watching, and the interventionist had provided her brief comments about what she was doing and why. Once the interventionist and Thomas had used the strategy successfully, the interventionist invited Ann to join them. The

three of them played the “rip game” several more times, and then the interventionist pulled out of the game itself and simply offered Ann a couple of pointers about how long to wait for a response from Thomas, and how to keep his attention by remaining face to face with him to play. During this session, two other spontaneous opportunities to practice the strategy occurred, once with the word “dump” in the context of putting all the now very small pieces of newspaper into an empty trash basket (and dumping them out again), and once while singing “Old MacDonald.” Ann and the interventionist then brainstormed other songs that might work for the strategy, and also talked about regular daily routines such as meals/snacks, diaper changes, and riding in the car and how “wait with anticipation,” with a focus on single words or sounds, could be embedded in those routines. These ideas were noted on the session form as the “Family Plan” for use during the next week. Several days later, Ann sent the interventionist a video of Thomas at lunch time, eating a peanut butter and jelly sandwich while Ann sang the “Peanut Butter and Jelly” song and Thomas filled in the word “jelly” each time.

Measures of fidelity in ART. As noted previously, checklist measures of both interventionist and parent fidelity were included as part of the intervention process for EDP-2 participants randomized to ART. Detailed descriptions of these measures are provided in the Data section of this chapter. In addition, at the Time 2 assessment all families participating in EDP-2 completed an additional checklist that asked them to indicate the goals and strategies that were addressed during the 6-8 month period between assessments, which served as a measure of program differentiation. That is, parents who received the ART intervention theoretically would have checked off goals and strategies that were described in terms used in ART intervention, rather than the items that reflected more traditional therapy goals and strategies, if ART was truly different from the traditional therapies offered in the community services condition. These

measures, along with parent report from monthly check-in calls and ART interventionist records of the dates and duration of intervention sessions, were designed to allow the research team additional mechanisms to ascertain the extent to which the ART intervention was delivered with integrity, and could be differentiated from the interventions children may have gotten from community-based intervention providers.

Purpose of the Study

The purpose of this study was to examine factors that influence parent fidelity to parent-mediated early intervention for infants/toddlers at risk for an ASD by analyzing secondary data from the Early Development Project-2. The importance of this study lies in its contribution to a greater understanding of the factors that influence parent fidelity to parent-implemented interventions and the situations in which parents are able to participate in the content and process of such an intervention. To date, there are no published studies specifically examining the factors that influence parent participation in or fidelity to parent-implemented early intervention for children with ASD or ASD risk. Examination and understanding of the factors that influence parent fidelity would not only allow adjustments to interventions in order to optimize parent participation in some cases, but also would allow for discrimination among intervention approaches in terms of which parents may be most likely to use particular interventions successfully. Interventions for young children with or at risk for ASD could then be designed with consideration given to what is most likely to result in positive outcomes based on both child and parent factors, minimizing time spent trying out intervention approaches that only “fit” either the parent or the child, but not both, or do not fit either.

Research Questions

The following research questions are posed in order to assess the influence of specific factors on parent fidelity to the parent-implemented intervention, Adapted Responsive Teaching, and then to determine whether or not a combination of two or more of these factors predicts parent fidelity more parsimoniously than any one factor alone. The first question deals with single factors, and the second question allows for a predictive statistical model to emerge that includes two or more of the factors already examined in question #1.

1. Are any demographic factors, parenting stress, parenting style, child behavioral indicators of ASD risk, and/or interventionist fidelity correlated with parent fidelity to implementation of a parent-mediated intervention for infants at-risk for ASD?
2. Is any combination of demographic factors, parent stress, parenting style, child behavioral indicators of ASD risk, and/or interventionist fidelity predictive of levels of parent fidelity to implementation of a parent-mediated intervention for infants at-risk for ASD?

Data

Quantitative methods were determined to be most appropriate in order to identify the factor or factors that may predict parent fidelity to intervention. Data used for this study were drawn from data from the Early Development Project -2, i.e., is secondary data. Only data pertaining to families randomized to and participating in the ART intervention in EDP-2 were used. As noted previously, families in which a caregiver *other than* a parent (e.g., a grandparent) was the primary participant in the intervention were excluded, as demographic information was collected on parents only. Data used from EDP-2 were as follows:

Independent Variables. Measures and tools used in this study to derive independent variables included a family demographics form, the Parenting Stress Scale (Beery & Jones, 1995), the Maternal Behavior Rating Scale (Mahoney, 1992), the Autism Observation Scale for Infants (Bryson, et al., 2008), and the EDP-2 Interventionist Fidelity Checklist.

Demographics (Appendix A). Demographic data were collected at the time of the initial assessment and updated as needed based on monthly phone calls to participating families by the project coordinator. Only demographic data collected at the Time 1 Assessment were used. All initial demographic data were reported by the mother for each family included in this study.

Parental Stress Scale (PSS; Berry & Jones, 1995; Appendix B). The PSS is an 18- item self-report measure that yields a total stress score. It was completed by parents at both the initial assessment and the post-intervention assessment, but only the initial PSS was used in this study. The PSS total score was used to represent parental stress prior to beginning intervention for all participants.

Maternal Behavior Rating Scale (MBRS; Mahoney, 1992; Appendix C). The Maternal Behavior Rating Scale is a 12- item measure designed to assess maternal interactive behaviors in four areas (Affect/Animation, Responsivity/Child Orientation, Achievement Orientation, and Directiveness). It is administered using a standardized toy set based on the age of the child, and the parent is instructed to play with his/her child as they would normally play. The play interaction is video recorded for approximately 7 minutes, and 5 minutes of the video is coded using the rating scale. Despite the reference to “maternal” behavior in its title, this tool was used broadly by EDP-2 to assess *parental* responsiveness, and it was administered to the parent most likely to be the primary participant in the intervention, should the family be randomized to the study intervention condition. The MBRS was administered at both the initial assessment and the

post-intervention assessment, but only the initial MBRS data were used in this study. Because the MBRS is designed to measure constructs that underlie the ART intervention (i.e., parental responsiveness and affect during parent-child interactions), the mean scores in two areas of parental interaction (*Responsive/Child Oriented*, and *Affect/Animation*) were totaled and used in this study as a measure of parenting style relative to the intervention approach. That is, this totaled point score was used as a measure of the extent to which a parent's style of interaction with his/her child was already responsive with positive affect and animation.

Autism Observation Scale for Infants (AOSI; Bryson, et al, 2008; Appendix D). The AOSI is an 18-item, standardized direct observational assessment designed to detect early signs of ASD in high risk infants, ages 6-18 months of age. Each item is scored on a scale of 0-2 or, for several items, 0-3, with 0 indicating typical behavior, and scores of 1-3 representing increasingly atypical responses. Scores include both a "marker" score, which is the total number of items endorsed (scored 1 or higher) out of 18, and a total score, which is the sum of scores on all items. In both cases, the higher the score the greater the indication for ASD diagnosis at or before age 3; a score of 7 or more markers is considered high risk. The number of markers was used in this study as a variable representing the extent to which the child was exhibiting characteristics of ASD at the beginning of the intervention.

Interventionist Fidelity Checklist (IFC; Appendix E). The IFC is an adapted version of the Interventionist Fidelity Checklist used in Responsive Teaching (Mahoney & MacDonald, 2007). The checklist includes 25 items scored on a 7-point Likert-type scale. Twenty-three of the items were specific to the content and process aspects of interventionist behaviors in delivering the intervention, and the final two items were specific to ART documentation standards and therefore were not directly related to fidelity of implementation. The process by which

interventionist fidelity was measured included monthly video-recordings of an intervention session with each family participating in ART. These recordings typically were made by a research assistant, but occasionally interventionists set up a video camera in the family's home to record the session without a videographer. These video recordings were then transferred to DVDs and placed in a notebook along with a copy of the intervention plan for that session. Each interventionist maintained her own notebook, and also included a self-rated fidelity checklist for each video-recorded session. The self-rating was intended as a reflective tool for the interventionists and as a form of self-monitoring, and was not used in the fidelity measurement process. One of the EDP-2 research assistants (RA) scored each fidelity video using the IFC and the IFC Scoring Guide developed by the intervention team.

The IFC Scoring Guide (see Appendix F) was developed by the intervention team to provide descriptive behavioral scoring anchors for each item on the IFC. Anchors were developed for scoring ranges of 1-2 points, 3-4 points, and 5-6 points. A score of 7 included all behaviors included for the 5-6 range, with exceptional quality. Using this method, a score in the range of 135-157 was considered 90% fidelity, and a score of 127 was used as the 85% cut-off for adequate fidelity.

In order to assure inter-rater reliability in the scoring of the IFC, the Intervention Coordinator scored 20% of all intervention videos after establishing reliability of 90% overall with the RA. In addition, the intervention coordinator established a written procedure for the process of obtaining and scoring intervention fidelity videos, and this procedure included actions to be taken should the fidelity of an interventionist drop below acceptable levels for more than one recorded session. These actions were not necessary at any time during the project, and overall interventionist fidelity to ART averaged 87%.

Dependent Variable. The dependent variable in this study was derived from the Parent Implementation Rating Form, a tool specific to EDP-2, but based on work by Connie Kasari (personal communication, October 2007).

Parent Implementation Rating Form (PIRF; Appendix G). The PIRF is a 10-item checklist, scored on a 7-point scale, which was completed by the interventionist after most home visits. Items #2 and #3 on this checklist assessed parent report of using the previous strategy during the time between sessions. Item #1 and items #4-10 assessed the parent's readiness for and participation in the session that day. The 10-item checklist was completed for all sessions that included a targeted pivotal behavior and intervention strategy, but not for the sessions that were devoted to parent education or administration of the routines-based interview assessment, as most of the checklist items did not apply in those situations.

The intervention team developed a Scoring Guide (Appendix H) for the 10-item checklist that was similar in format to that developed for the IFC. Scoring anchors were drafted by members of the intervention team for scoring ranges of 1-2, 3-5, and 6-7. A score of 63 was considered 90% fidelity, and a score of 59.5 was at the 85% level. The anchors for the Scoring Guide were based on interventionist experiences with parents and viewing intervention session videos, and the final draft of the Scoring Guide was tested by scoring and discussion of parent behaviors by the intervention team after watching a session video. The video used was one that had been recorded for scoring interventionist fidelity.

In order to assess inter-rater reliability, the Intervention Coordinator trained two RAs (to 90% agreement within 1 point) to score the PIRF from session videos for 20% of parent fidelity forms available for the 43 families enrolled in ART for whom PIRFs were available. Both RAs were blind to PIRF scores entered by the interventionists. Videos to be scored for reliability were

selected randomly by a staff member of another study sharing office space with EDP-2 staff. There were a total of 170 PIRF forms, and together the two research assistants scored 34 videos using the PIRF. Overall, inter-rater reliability for the PIRF was calculated at 73% for agreement within 1 point. The average point score for each PIRF was used as a measure of parent fidelity to the intervention.

Data Analysis

Preliminary analysis. Prior to receipt by this researcher, all data were de-identified by one of the Principle Investigators (PI) for the EDP-2 study by removing EDP-2 identification numbers and replacing them with chronological numbers starting with one; the PI also eliminated participants who fell outside the inclusion criteria for this study (caregiver other than a parent participated in the intervention; n=3). Data files were received by this researcher for demographics, the Parent Stress Scale, the AOSI, the MBRS, the IFC and the PIRF for 41 participants. Data were then entered into an SPSS-24 Statistical Software package data base. Those data were examined visually to identify missing data that would necessitate eliminating further participants. As a result of missing data in key variables, five additional participants were eliminated from further analyses, leaving a total of 36 participating families.

Reliability analyses. Because neither the IFC nor the PIRF were previously validated measures, having been designed specifically for use in EDP-2, it was necessary to establish the reliability of each. Inter-rater reliability, internal consistency, and dimensionality were examined for both of these measures.

Parent Implementation Rating Form variable. An average of 22 PIRFs were collected for each participant, with a range from 12 to 28 in the current sample. Reliability of this measure was analyzed based on both variability and dimensionality. Variability was measured using

internal consistency analysis and inter-rater reliability. PCA was used to measure dimensionality. These analyses of the PIRF were conducted using data from 785 forms. The value for Cronbach's alpha was .934, indicating excellent internal consistency. As noted previously, inter-rater reliability was measured using blind coding of 20% of intervention session videos, and yielded an inter-rater reliability of .73 within one point. Results of the PCA (no rotation) indicated that the PIRF was measuring a single component; results of the PCA are provided in Table 5.

Data for the PIRF also were examined in regard to the extent to which there were significant differences in parent fidelity by participant (family). One way analysis of variance statistics (Table 6) indicated that there were significant differences between participants for total fidelity ($p < .001$). Average fidelity scores by participant, across all intervention sessions, ranged from 27.33 to 65.43 (out of 70 possible points), reflecting fidelity percentages ranging from 39% to 94%. Visual inspection of sequence graphs of fidelity percentages for each participant over time resulted in the conclusion that in addition to variability between participants, there also was variability within each participant. While eighteen participants had average total fidelity scores at or above 80%, only 3 participants were in the 80-100% range consistently over time. Ranges and standard deviations for parent fidelity, by participant, are provided in Table 7, and Figure 10 displays visually the trends over time of all participants. The data presented in Figure 10 are not intended to communicate detail, but rather to give a "big picture" perspective of the variability between and within participants over the course of the intervention.

Interventionist Fidelity Checklist variable. An average of 3.7 IFC s were collected for each interventionist/family pair, with a range from 1-5 in the current sample. Visual inspection of

IFC data revealed multiple missing values, a portion of which coincided with items on the IFC for which a score of “Not Applicable” (N/A) was possible. These items included:

17. Involve the parents in interactions with their child
18. Coach parents while they interact with their child
21. Develop a plan to address barriers to follow-through activities, as needed
22. Appropriately address concerns parents have raised (whether or not they are directly related to ART).

Items 17 and 18 were allowed an “N/A” score on the IFC because if the parent was already engaging with the child or implementing the intervention strategy effectively, there was no need for the intervention to use the behaviors described in these items. Items 21 and 22 were allowed “N/A” scores because there were conceivably situations in which no barriers to follow-through seemed to exist or parents did not raise concerns during the session. These “N/A” score selections were not entered into the IFC data file, i.e., those cells were left blank, resulting in missing data. Missing data for IFC items 17, 18, 21 and 22 were replaced using the series mean and creating a new variable that was then used in place of the original variable in subsequent analyses. Missing data for items 4 and 19 (related to the interventionist providing the parent with feedback) also were identified visually, and missing values again were replaced using the series mean and a new variable created. Item 4 was focused on giving parents feedback for their participation and demonstration of skills learned previously, while item 19 was focused on feedback specific to the parent’s use of the current strategy. For both items 4 and 19 it was possible that these scores were missing when the parent did not demonstrate the behavior for which the interventionist would have given feedback.

Following the replacement of missing data, the IFC was examined for both variability and dimensionality using data from 152 completed forms. Internal consistency was analyzed using Cronbach's alpha, with a result of .79, indicating acceptable internal reliability. In addition, as noted previously, inter-rater reliability was measured using blind coding of 20% of intervention session videos, yielding an inter-rater reliability of .87 within one point.

Results of the PCA (no rotation) indicated that the IFC was measuring seven components. Although initial Eigenvalues for all components were greater than 1, the Eigenvalues for the first two components were greater than two, and these two factors accounted for 30.678% of the variance across all factors, with Component 1 explaining 19.897 % of the variance across all variables. Each of the other five factors had two or fewer items with strong positive loadings, and primarily consisted of items with small and/or negative loadings. A components matrix is provided in Table 8, and a scree plot in Figure 8. The twelve items that loaded most strongly on Component 1 are conceptually aligned around the steps or key components of the intervention content (adherence), and the three items that loaded on Component 2 are conceptually aligned around the quality of the interventionist's interactions with the child. Internal consistency for items in these two factors, respectively, were conducted using Cronbach's alpha, with results of $\alpha = .821$ for Component 1, and $\alpha = .726$ for Component 2. Because these two factors included items most aligned with interventionist fidelity in the areas of adherence and quality, and because internal consistency within each factor was similar to or better than internal consistency of the IFC as a whole, IFC data were divided into two variables, IFC-Adherence and IFC-Quality. These two variables included only the items from Components 1 and 2, respectively, and the rest of the original IFC was dropped from further analyses. Average point scores were used to represent interventionist adherence and quality.

Data for the IFC also were examined in regard to the extent to which there were significant differences in interventionist fidelity based on interventionist, family, or occasion. The occasion variable was an indication of intervention session in which fidelity was measured and ordered chronologically starting with 1. There were large differences in the number of IFCs collected for each interventionist, with a range from 8 to 55; details are provided in Table 9. These differences in volume of IFCs is largely due to differences in interventionist “caseloads” in addition to whether or not the interventionist served families included as participants in this study. For instance, one interventionist worked full-time for EDP-2, and therefore worked with a consistently larger number of families than did any of the other interventionists. In addition, two of the interventionist were also doctoral students when they worked for EDP-2, and these two interventionists worked with relatively few families. Total fidelity (including all 23 IFC items), IFC-Adherence fidelity (12 items loading on Factor 1), and IFC-Quality (three items loading on Factor 2) were all examined. One way analysis of variance statistics (Table 10) indicated that there were significant differences among interventionists for total fidelity ($p < .001$), and IFC-Adherence ($p < .001$), and IFC-Quality ($p < .001$). These same levels of significance were found for interventionist fidelity by family, but no statistically significant differences were found for interventionist fidelity by occasion.

Data reduction. Because of the large number of demographic variables available in the data file, and the small sample size for this study, demographic data needed to be reduced to fewer variables. Demographic variables that were considered to have potential relevance to parent fidelity to intervention included mother’s age, mother’s and father/partner’s level of education and employment status, number of children in the family, and household income for the previous year. Because of the small sample size and very small percentage (25%) of

participants whose race was other than Caucasian, parent and child race were not included as independent variables for this study. Similarly, because nearly 90% of mothers were married or living with a partner, mother's marital status was excluded as an independent variable. Bivariate and partial correlations were computed for the remaining variables in order to reduce the number of demographic variables entered in the final analyses. Bivariate correlations reflected that household income was significantly correlated ($p < .01$) with number of children in the family (negative correlation), mother's level of education and father's level of education. There also were significant negative correlations ($p < .01$) between number of children in the family and both mother's and father's level of education. Because of these significant correlations between household income and 3 of the other 6 variables (those just listed) partial correlations were computed controlling for household income. This analysis reflected no significant correlations among any of the remaining variables when controlling for household income. As a result of these analyses, it was decided that only the variable "Household Income" would be used in further analyses. Results of bivariate and partial correlations of demographic variables are shown in Table 11.

Examination of study variables. Prior to conducting analyses designed to answer the research questions, data for all ordinal variables were examined both visually and statistically using histograms, Q-Q plots, visual scanning of the data base, and descriptive statistics, in order to identify outliers and assess veracity in the assumption of normal distribution of those variables. Descriptive statistics are presented in Table 12. Data for household income were examined using histograms and Q-Q plots. Descriptive statistics related to case distribution were not conducted on the household income variable, as numbers only represented a category or

range, rather than having quantitative meaning. Table 13 provides frequency data for household income, based on dollar amounts.

Data for the variable Parenting Style (MBRS Affect/Animation score + Responsiveness Score) were normally distributed, with minimal skewness or kurtosis. Data for the AOSI (total markers) and PSS (total score) were normally distributed in terms of skewness (symmetry), but both had negative kurtosis statistics in excess of -1, indicating some “flattening” of the data. However, this measure of kurtosis is still between +2 and -2, which is considered acceptable for establishing normal distribution (George and Mallery, 2010). The PIRF, IFC-Adherence, and IFC-Quality were negatively skewed, indicating some tendency toward high scores, but these statistics were not outside the range for normal distribution. The kurtosis statistic for both the PIRF and IFC-Quality reflected some tendency toward a point or peak, rather than a curve, in the distribution of cases with those variables, but again, these values were within the range considered acceptable for normal distribution. The kurtosis statistic for IFC-Adherence was near zero.

Study analyses. Correlational analysis was used to examine the extent of the relationship between and among all variables (household income, parent stress, child indicators of ASD, parenting style, intervention fidelity-adherence, interventionist fidelity-quality, and parent fidelity). In order to answer Question #2, independent variables with moderate to high correlations with parent fidelity were entered into a step-wise multiple regression analysis, beginning with the variable most highly significantly correlated with parent fidelity and ending with the variable with the lowest significant correlation to parent fidelity.

CHAPTER 4: RESULTS

Using secondary data from 36 families who participated in EDP-2, answers to two research questions were explored. These questions were posed in order to assess the influence of specific factors on parent fidelity to the parent-implemented intervention, Adapted Responsive Teaching, and then to determine whether or not a combination of two or more of these factors predicts parent fidelity more parsimoniously than any one factor alone. Those questions are as follows:

1. Are any demographic factors, parenting stress, parenting style, child behavioral indicators of ASD risk, and/or interventionist fidelity correlated with parent fidelity to implementation of a parent-mediated intervention for infants at-risk for ASD?
2. Is any combination of demographic factors, parent stress, parenting style, child behavioral indicators of ASD risk, and/or interventionist fidelity predictive of levels of parent fidelity to implementation of a parent-mediated intervention for infants at-risk for ASD?

Research Question 1

In answer to the first research question, correlational analysis among all variables, shown in Table 13, yielded significant positive correlations between the measure of parent fidelity (PIRF average score) and household income ($p < .001$), parenting style ($p < .001$), and interventionist fidelity-adherence (IFC-Adherence; $p < .005$). These results suggest that high parent fidelity may be related to high household income, to a responsive parenting style, and to high adherence fidelity by the interventionist. The parenting style variable in this study is a

measure of the parents' responsiveness and use of positive affect and animation in interactions with their children, with higher scores indicating greater responsiveness and positive affect. However, it is important to recall that for this study, the intervention being provided was based on developing and reinforcing responsive parenting interactions with children. Therefore the relationship with parent fidelity may be related to both parenting style and the extent to which the intervention is consistent with the parents' natural style of parenting. Other variables examined, i.e., the Parent Stress Scale total score, the number of autism risk markers the child received on the AOSI, and interventionist fidelity – quality (IFC-Quality) did not show significant correlations with the PIRF scores.

Other significant correlations yielded in this analysis included strong positive relationships between household income and parenting style ($p < .001$), between household income and interventionist fidelity – quality ($p < .001$), and between parenting style and interventionist fidelity – quality ($p < .005$). The relationship between household income and parenting style is not surprising, and is consistent with a long history of research literature in which it has been shown that parents in Western cultures who are in middle and upper levels of socioeconomic status (SES) generally are more child-focused, lenient and accepting than are parents of lower SES (Zilberstein, 2016). Those parents in lower SES strata tend to be more directive, focusing on obedience in their children.

The relationships between the interventionist fidelity-quality and both household income and parenting style suggest that interventionist behaviors with the children in the study were related to both a family's SES and the behaviors of the parent in parenting, such that higher quality of interventionist implementation occurred in situations of higher family SES and

responsive parenting styles. These results suggest a dynamic that will be explored further in the discussion chapter of this paper.

Research Question 2

Multiple regression analysis using household income, parenting style, and IFC-Adherence as predictors of PIRF average score indicated that the most parsimonious model included all 3 predictor variables, $R^2 = .440$, adjusted $R^2 = .388$, $F(3,32) = 8.38$, $p < .001$. Full results of the analysis are shown in Tables 14-16. Although the significance of the contributions of the household income variable decreased with the addition of each of the other two variables, models eliminating any one of the three variables were not as strong a predictor of PIRF scores as the model including all variables, regardless of the order in which those variables were entered into the regression analysis. Partial correlations of each predictor with the criterion, controlling for the effects of the other predictors, indicated that there were moderate positive correlations (.227 - .392). Using the Adjusted R^2 statistic to adjust for the small sample size, the 3-predictor model accounted for approximately 39% of the variance in the PIRF scores, and allowed for prediction of PIRF scores with the following equation:

$$PIRF\ scores = .448\ Household\ income + .810\ Parenting\ Style + 4.55\ IFC\ Adherence + 4.27$$

These results suggest that the combination of household income, parenting style, and interventionist adherence to the intervention predicted parent fidelity to the intervention such that higher levels of household income, responsive parenting, and interventionist adherence resulted in higher parent fidelity. However, as noted previously in regard to correlational data, the parenting style variable is also essentially an indicator of the extent to which the parent-implemented intervention is consistent with the parents' natural style of parenting. Therefore, it is reasonable to consider the interpretation that in this case, the predictive equation may more

accurately include the extent to which the intervention is consistent with the parents' ways of parenting than simply the parenting style itself.

Summary

In the current sample, the parent fidelity scores were significantly positively correlated with household income, parenting style (or the extent to which the intervention was consistent with parents' natural style of parenting), and interventionist adherence to the intervention. A combination of these three variables was found to be predictive of 39% of the variance in parent fidelity scores.

CHAPTER 5: DISCUSSION

The current study explored the relationships between parental stress, child risk for ASD, parenting style, household income, interventionist fidelity, and parent fidelity in a sample of 36 families enrolled in a parent-mediated home-based early intervention for infants and toddlers at risk for ASD. The study also examined the potential for predicting parent fidelity based on a combination of parental stress, child risk for ASD, parenting style, household income, and interventionist fidelity. Primary results of this study indicate that parent fidelity may be affected by a combination of factors related to socio-economic status (household income), parenting style, and the adherence fidelity of the interventionist to the method and content of the intervention. These factors are discussed below. Other findings of this study also are discussed, including a brief examination of factors that were included in the analyses but not found to have significant relationships with other factors, and significant results in the relationship between interventionist quality of implementation and family factors.

Socioeconomic Factors

Parents from households with higher levels of income were found to demonstrate higher overall levels of fidelity to the ART intervention than were parents from lower income households. This is consistent with findings in other research related to interventions or programs in which parents were key participants and child outcomes were targeted (Haine-Schlagel and Walsh, 2015; Reyno and McGrath, 2006; Spoth, Redmond, Khan, and Shin, 1997) but is in contrast with other studies that indicated that SES is not among the most significant predictors of parent participation (e.g., Danko, Brown, Van Shoick, & Budd, 2016; Morawska, Ramadewi, &

Sanders, 2014) . Because household income was the only demographic variable used in this study, and it was highly correlated with other demographic variables, i.e., level of education of both parents (positive correlation) and number of children in the family (negative correlation), it is important to consider the possibility that parent educational level and the number of children in the home may also have influence on the ability of the parent to implement intervention with fidelity. As noted in the literature review of fidelity, parent levels of education also have been linked to levels of parent participation (Haine-Schlagel & Walsh, 2015; Reyno & McGrath, 2006).

Parenting Style

Although there is prior research evidence consistent with the findings of this study that household income, an indicator of socioeconomic status, is related to and may be predictive of parent fidelity to intervention in and of itself, there also is a large body of research that explicates differences in parenting style between parents of different levels of SES. That is, parents of lower SES may parent differently than parents of higher SES because of factors related to living with financial challenges. As noted by Zilberstein (2016), “Low-income environments differ significantly from high resource ones and parents adopt different strategies to increase the probability of success in each setting” (p. 360). In fact, household income and parenting style were significantly correlated in the current study, even though each contributed uniquely to the overall predictive model.

In the current study, parents who interacted with their children in a highly responsive manner and with positive affect and animation demonstrated higher fidelity to the ART intervention than did parents who were less responsive and used less positive affect and animation with their children. This finding is somewhat confounded in this study because the

intervention itself was based on the use of responsive parenting strategies, meaning that potentially both *parenting style* and the *extent to which the intervention was consistent with parenting style* had an effect on parent fidelity. That is, are parents who use a responsive parenting style better implementers of the intervention outright, or is parent fidelity more related the extent to which the intervention already “fits” the parent/family ways of doing things? Or is it some combination of both of these interpretations? This draws attention to two related but separate considerations regarding parent fidelity to early intervention: the ways in which existing parenting behaviors may affect the parent’s ability to deliver an intervention, and the social validity, or acceptability, of the intervention to the parents.

Parent behaviors. Zilberstein (2016) documented that in low income families, parents are more likely to use parenting behaviors that encourage obedience, interdependence, family cohesiveness, persistence, and respect, and that parent and child spheres of activity tend to be separate. For parents who adhere to these parenting behaviors and attitudes, strategies such as those in the ART intervention that encourage responsivity on the part of the parent, like following the child’s lead, taking the child’s perspective, or allowing the child to make choices, may be unlikely to be used outside an intervention session, if even then. Similarly, these parents may be unlikely to set aside more parent-child time if this interferes with the usual separation of parent activities from child activities. In contrast, in families with greater financial resources, parents tend to use strategies that promote autonomy, individuality, collaborative decision-making, and self-promotion (Zilberstein, 2016). In these contexts, following the child’s lead, supporting choice-making, and other responsive parenting behaviors may create fewer challenges to the parents, and require fewer changes in parent behaviors, than they would for low-income families. Responsive parents, in this case, would already be used to attending to,

guiding and interacting with their children in ways that would support high fidelity to intervention.

Social validity. The parenting style factor in this study may have been predictive of parent fidelity, at least in part, because the intervention delivered was based on responsive parenting, as was the measure of parenting style. That is, parents with high fidelity scores may have found the intervention more consistent with their own parenting style, and therefore more acceptable in terms of both concepts and ease of implementation.

As noted, in the current study the intervention implemented by parents, ART, was based on responsive parenting behaviors. The broad behaviors in which parents were coached in ART included reciprocity in parent-child interactions, parents reading and responding to child behaviors contingently, the use of positive affect and animation, “matching” activity demands to the abilities and interests of the child, and sharing control, including allowing the child to make frequent choices. These behaviors are well-supported in the early childhood literature as among those that positively facilitate child learning across all domains of development (Feldman, 2007; Jaegerman & Klein, 2010; Mahoney & Wiggers, 2007). However, they also are aligned with parenting values that include the desirability of having frequent, positive play and social interactions with the child, actively providing opportunities for child-directed learning, and the goal of rearing a child who is self-sufficient and can reason and make decisions on his or her own. These behaviors also are aligned with beliefs that the child is an equal partner with the parent in learning and development, that the child should become increasingly independent, and that the role of the parent is, at least in part, to assure that the child has opportunities to learn and grow in multiple ways. For parents in the current study who held these or similar values and beliefs, the intervention provided may have been very acceptable, as it didn’t require significant

changes in parent behaviors, and the strategies didn't conflict with how parents usually behave in interactions with their children. These parents may have been able to achieve relatively high fidelity to the intervention simply because it was congruent with their natural ways of doing things with their children. In contrast, for parents who value and believe that children and parents should have largely separate spheres of activity, that even minor disobedient behaviors should not be ignored (Zilberstein, 2016), that the successful functioning of the family hinges on interdependence rather than independence (Chao & Kanatsu, 2008; Calzada, Huang, Anicama, Fernandez, & Brotman, 2012), or that the primary role of the parent is to assure the survival of the child (Richman, Miller, & LeVine, 1992), the ART intervention may have conflicted with these values and beliefs. Parents with these contrasting values who participated in the ART intervention would have been challenged not only to change their own parenting behaviors significantly, but also to enact behaviors that felt "at odds" with their value systems. These parents likely would have had much greater difficulty achieving high levels of fidelity than did parents whose value systems and parenting styles were not challenged by the intervention. Additional issues with social validity may have been related to parents' beliefs about the actual necessity of the intervention (i.e., did the child really need treatment?), or ambiguity about what positive changes could be expected in the child.

Interventionist Fidelity

In the current study, interventionist adherence to the intervention was significantly correlated ($p < .05$) with parent fidelity, and was an additive predictive factor when added to the model including household income and parenting style. Given the conceptual alignment of items on the parent fidelity measure (PIRF) and the interventionist fidelity measure (IFC) (see Table 18) this is not an unexpected result. However, the variations in interventionist fidelity were

notable, along with number of ICFs available for each (previously explained as largely due to the number of families served overall). In addition, the number of IFC forms was significantly smaller than the number of PIRF forms for each family, giving a much better estimation of parent fidelity and perhaps over or under estimating the fidelity of the interventionist. Specific qualities of the interventionist as described in the literature review, such as personality, extroversion, beliefs about the efficacy of the intervention, experience, motivation or organizational skills, were not explicitly measured in the current study, and therefore cannot be used to interpret results.

Additional Findings

In addition to the primary finding that a combination of household income, parenting style, and interventionist adherence fidelity was predictive of parent fidelity to the ART intervention, there were several additional findings that warrant discussion. These include the lack of any significant relationship between either the child's risk for ASD or parental stress, and parent fidelity, and the significant positive relationships discovered between interventionist fidelity – quality and both household income and parenting style.

Risk for ASD. The child's risk for ASD, as measured by the number of markers the child received on the AOSI, was not significantly related to parent fidelity in this sample. This finding is in contrast to results of other studies in which the child's severity of or susceptibility for behavioral or mental health symptoms had direct or indirect effects on parent adherence to intervention (Stadnick, Haine-Schlagel, & Martinez, 2016; Pereira, Muris, Mendonca, Barros, Goes, & Marques, 2015; Salari & Filus, 2017). In addition, in their study of parent attendance and adherence to an early intervention for children with ASD, Carr, et al. (2016) found that indicators of the child's level of function (i.e., non-verbal IQ scores) were predictive of adherence, with

parents of children with lower non-verbal IQs demonstrating greater adherence fidelity. However, there are potentially a number of explanations for this discrepancy in findings with the current study. First, the sample for EDP-2 was drawn from the community at large, rather than from families of older children already diagnosed with ASD or from families who had expressed developmental concerns about their infants. Also, the AOSI was administered and results interpreted when families were just entering the EDP-2 study, so parents may not have understood fully the child's risk for ASD based on these scores, particularly if the parents did not have pre-existing concerns. Therefore, parents may not have had enough concern about their child's symptoms or diagnostic risk to influence the extent to which they participated in or had fidelity to the ART intervention. This issue may be more prominent in studies of at-risk children versus those identified through parental concerns and/or already diagnosed.

Parental stress. Parental stress, as measured by the PSS, also was not related to parent fidelity in this sample, which is in contrast to prior research. For example, Carr, et al. (2016) found that parents who reported higher levels of parenting stress as measured by a "daily hassles" survey demonstrated higher levels of both attendance and adherence to an early intervention for young children with ASD. However, reported parental stress in this sample was relatively low. Within the possible range of scores from 18 to 90, the mean score was 38.11, with a range from 21-52. This mean is consistent with the mean score (37.1) for parents of children without behavior problems in an initial validation study of the PSS (Beery & Jones, 1995). Again, the fact that families were recruited from the community, and many had no prior concerns about their young children may have resulted in a sample unlikely to report significant stress related to caregiving demands, parent-child relationships, or satisfaction in the parent role. Lower reported stress theoretically could be predictive of higher parent fidelity due to parents feeling they had

time, energy, and/or inclination to implement intervention strategies consistently. Conversely, lower parental stress also could be predictive of lower fidelity, if parents were not concerned or dissatisfied with their parent-child interactions to the point of motivation to participate. In the current study, either of these hypotheses could have been true for some of the participating families, thus possibly cancelling out an overall effect. However, results from this study do not support either of these hypotheses, and in fact PSS scores had almost no relationship with parent fidelity in any direction. It also is possible that, in addition to the reasons already noted, the PSS items simply did not have the specificity to capture the types of stress that were being felt by parents in this study because the tool was designed to measure several stress-related constructs across only 18 items.

Interventionist fidelity-quality, household income, and parenting style. Results of the current study revealed significant positive relationships between the quality of interventionist-child interactions and both household income and parenting style, although the quality of these interactions did not affect parent fidelity. The IFC items assessing quality included the following: (#1) interacts warmly with parents and child, (#3) demonstrate positive attitude toward child, and (#13) engage responsively when interacting with the child. The correlation of IFC-Quality with household income and parenting style was an unexpected result, and so data were examined again. Overall, the mean score across all interventionists for IFC-Quality was high, at 6.0 (out of a possible 7), with a standard deviation of .55. This put the majority of scores in an acceptable range of fidelity between 5.5 and 6.5, although the lowest score overall was 4.3. Similarly, mean scores by item ranged from 5.8 (Item 1) to 6.2 (Item 13); the mean score for Item 3 was 6.1. However, there was a difference between Item 1 and Items 3 and 13. Scores of interventionists on Items 3 and 13 were at the level of 6 or higher for 88.5% of IFC forms, whereas scores on

Item 1 were only at a level of 6 or higher in 79.8% of forms. That is, overall, interventionists scored lower on the item, “Interacts warmly with parent and child.” Given that this item includes interactions with children *and* parents, and the other two include *only* interventionist-child interactions and consistently score higher, it is possible that there were instances in which interventionists found it more difficult to interact warmly with parents than with children. This challenge may have been due to a somewhat non-responsive style of the parent, or to differences in attitude or behavior that were influenced by socioeconomic factors. However, this is simply a hypothesis for further investigation, as the veracity in those statements is not fully discernable with the data used in the current study, primarily due to sample size.

The Predictive Model and a Transactional Perspective

Each of the variables, household income, parenting style, and interventionist adherence fidelity, contributed uniquely to the prediction of parent fidelity of implementation to early intervention for young children at risk for ASD. This three-factor model, and particularly the significant correlation between household income and parenting style, supports the use of a transactional model to understand parent behaviors related to fidelity in parent-mediated interventions. The TPIF model proposed in Chapter 2 included socio-cultural factors (such as household income and other socioeconomic constructs), parent factors (including parenting style, beliefs and values), and interventionist factors, which may include adherence fidelity. The parent factor “parental stress” was included in the TPIF based on research indicating that parents of children with ASD often experience stressors that are in excess of or different from parents of other children, but results of the current study did not include parental stress in the final predictive model. Similarly, the child factor of ASD-risk was included because parent participation in intervention has been empirically linked to the severity of the child’s behaviors

or diagnostic issues. However, results of the current study did include ASD-risk in the final predictive model.

Limitations

The generalizability and validity of this study are limited by characteristics of the sample, reliability and validity of the parent and interventionist fidelity measures, and extent to which study variables potentially represented more than one construct. The sample size was relatively small for the number of variables examined, and did not include adequate numbers of non-Caucasian and non-married (or partnered) parents to examine race/ethnicity or marital status as predictors of parent fidelity. This limitation in diversity in turn limited the overt examination of possible cultural effects on fidelity, although this was explored to some extent as an influence on parenting style. The parent fidelity measure had high internal consistency and measured a single dimension, but inter-rater reliability was fairly low. This may have been due to difficulty scoring parent fidelity from videos that were intended to measure interventionist fidelity. That is, in the videos the focus was on what the interventionist was doing, so there were situations in which it was not possible to determine for sure the behaviors of the parent. The interventionist fidelity measure had good inter-rater reliability, but was multi-dimensional, necessitating examination of eight factors, finding reasonable cohesiveness of items in two of them, and splitting this single variable into two variables. Those two variables had good internal consistency, but the IFC-Quality variable only contained three items. Also, demographic variables were correlated such that household income was the only one used in the analyses, which benefited the study in terms of data reduction, but also presented a barrier to fully understanding the potential influence of parent education and the number of children in the home on parent fidelity. Parenting style also had the potential to represent more than one idea, in that the intervention was based on concepts

on which the measure of parenting style also was based. This resulted in the possibility that the relationship between parent fidelity and parenting style occurred because parents with more responsive parenting styles are actually better implementers of the intervention, or because the intervention was consistent with their parenting style and therefore had higher social validity, or both.

CHAPTER 6: CONCLUSIONS

Results of the current study help bring to the forefront the need to consider multiple factors in designing parent-implemented early intervention for young children with or at-risk for ASD and other developmental disabilities, and to consider the transactional nature of the early intervention situation. Although this study examined only a few of the factors that may influence a parent's willingness and ability to implement intervention strategies on a regular basis with his or her child, previous research literature makes it clear that there are indeed many parent, child, interventionist, and context characteristics that have the potential to affect parent fidelity. In addition, given both the research literature and the results of the current study, those characteristics are likely to be intertwined in various ways.

Future research and practice implications include 1) investigating influences on parent fidelity using mixed and qualitative methods in addition to quantitative methods, using a transactional perspective, 2) continuing to refine the measurement of fidelity, 3) assessing carefully the effect of both interventionist and parent fidelity on child outcomes, and 4) expanding and diversifying participant samples.

Going forward, it will be important to consider using both quantitative and qualitative methods to examine factors that influence parent fidelity and parent participation in intervention, and mixed methods examinations of these factors may provide a greater depth of understanding than either method alone. Also, the use of a transactional model may be an important foundation for considering and selecting specific factors to examine in their relationship to parent fidelity. For instance, the TPIF model includes the community in which a family lives as a potential

influence on parent fidelity. Quantitative measures of the types of physical space, materials, activities, and environments present within a particular neighborhood or local community may allow researchers to understand whether or not there are particular types or quantities of space, materials, or available activities that support parent fidelity to or participation in parent-mediated interventions. For instance, if parents have few opportunities to take their children into a variety of safe, interesting environments, how likely are they to be invested in or to implement fully strategies that are designed to build the child's vocabulary by talking about objects and actions in one's environment. Limited access to some variety of environments may limit parent fidelity to such strategies. But what is the basis of that limitation, and for whom? Qualitative examination of that same factor (community) can then add depth and detail to the quantitative data. For instance, asking for parent's "stories" or experiences related to how they do and do not access the community environments available to them, with their children, may add key information about why parents are able to implement some intervention strategies and not others. Some parents may intentionally avoid certain environments that could provide rich opportunities for vocabulary development because their children are overly sensitive to certain qualities of those environments. Other parents may report that safety concerns limit how many local environments they visit with their children, or that having older children who need to be taken places dictates daily routines and limits not only the variety of environments but also the time for focused parent-child interactions. Based on even these few examples of what parents may report qualitatively, it seems clear that the quantitative information about what is available in the community and the extent to which parents access it does not provide a full enough understanding of the family's situation to begin to address issues of parent fidelity to a particular strategy. The parent's voice, heard in the qualitative work and in combination with the

quantitative data, is what points the researcher or interventionist in a particular direction for designing or adapting intervention.

Qualitative methods may be useful in other circumstances as well, in terms of understanding parent behaviors (fidelity) in early intervention. For example, TPIF includes extended family members, who may have particular ideas about child-rearing, about parent roles, or about the specific needs of the child. The communication of those ideas to the parent may influence the extent to which the parent chooses to be an active participant in intervention. However, the influence of one person's values and behaviors on another often are difficult to measure quantitatively. In the interactions of an extended family member (e.g., a grandparent) and parent, it is likely the narrative and reflection of the parent that is most likely to reveal how and why that grandmother's communicated values influence the parent's behaviors. Understanding the parent's behavior through the parent's own perspective perhaps is accomplished better with qualitative methods than with methods that seek to measure that quantitatively.

In addition to the use of a transactional perspective and a variety of research methods, the current study has implications related to the measurement of fidelity. Careful organization and attention to detail will be required to measure fidelity of both parents and interventionists, including the extent to which interventionist fidelity influences parent fidelity, and vice versa. In the current study, the conceptual relationships between the items on the parent fidelity measure and the interventionist fidelity measure reflect not only an overtly transactional relationship, but also the complexity of measuring both parent and interventionist fidelity to the same intervention. Given the importance of intervention fidelity in *interpreting* parent and child outcomes, it is important for both researchers and interventionists to continue to increase focus

on defining both key elements of an intervention *and* the adaptations that may be necessary to address variability in the parent and family factors, and to involve parent and interventionist stakeholders in the planning of parent-mediated early interventions.

Related to better measurement of fidelity than is currently available is the issue of examining the extent to which the fidelity of the interventionist, the parent, or both actually influences child outcomes. Again, a transactional perspective may be helpful in considering the multiple factors that support or hinder positive changes in young children as a result of parent-mediated early interventions. Interventionist and parent fidelity are among those factors, perhaps, but are not the only factors. Qualities of the child, the intervention, and the “learning environment” are among other factors that influence child outcomes. Researchers and practitioners, *and* parents, do not yet have a good understanding of how to determine how high fidelity must be to any particular intervention in order to optimize outcomes for the child. In addition, when changes in parent behavior are targeted by the intervention as well, to what extent do parents need to “permanently” adopt a behavior in order to optimize outcomes for the long term? The concept and measurement of parent and interventionist fidelity are clearly important for early intervention, but what is the minimum adherence, exposure (dosage), and quality required? Parent fidelity is an important aspect of parent-mediated intervention approaches, but researchers, practitioners and parents need to understand the role that parent fidelity plays in child outcomes, along with the roles of other factors, in order to design and implement effective parent-mediated interventions.

Lastly, given that a transactional model introduces multiple factors in complex relationships to one another, the examination of those multiple factors, particularly using quantitative methods, requires large sample sizes in research studies. Multi-site and multi-year

studies with ongoing enrollment of participants is one method of building sample sizes, as is expanding into larger geographical regions, potentially using telehealth methods to involve families living in rural areas. In addition, it seems imperative that efforts continue to include as much diversity in family participant demographics as possible, in areas such as racial/ethnic, socioeconomic status, and family structure (e.g., LGBTQ parents, grandparents as parents, and foster parents).

APPENDIX A: EDP-2 DEMOGRAPHICS FORM

EARLY DEVELOPMENT PROJECT -2
Family Demographic Information Form

This form needs to be completed by the child's primary caregiver.

ID#: _____

Date completed: _____ / _____ / _____
month day year

1. Child's birth date: _____ / _____ / _____
month day year
2. Child's gender: 1: Male 2: Female
3. Child's race: (select one or more)

1: American Indian/Alaska Native	4: Black or African American
2: Asian	5: White
3: Native Hawaiian or Other Pacific Islander	6: More than one race Please describe: _____
4. Child's ethnicity: (select one)

1: Hispanic or Latino	3: Unknown or Not Reported
2: Not Hispanic or Latino	
5. Biological mother's birth date: _____ / _____ / _____
month day year
6. Biological mother's race: (select one or more)

1: American Indian/Alaska Native	4: Black or African American
2: Asian	5: White
3: Native Hawaiian or Other Pacific Islander	6: More than one race Please describe: _____
7. Biological mother's ethnicity: (select one)

1: Hispanic or Latino	3: Unknown or Not Reported
2: Not Hispanic or Latino	
8. Biological father's birth date: _____ / _____ / _____
month day year
9. Biological father's race: (select one or more)

1: American Indian/Alaska Native	4: Black or African American
2: Asian	5: White
3: Native Hawaiian or Other Pacific Islander	6: More than one race Please describe: _____
10. Biological father's ethnicity: (select one)

1: Hispanic or Latino	3: Unknown or Not Reported
2: Not Hispanic or Latino	

11. Child's position in the family: Child was born _____ of _____ In the family.
12. Your relationship to this child:
- | | |
|------------------------|------------------------|
| 1: Mother (biological) | 6: Father (biological) |
| 2: Step-mother | 7: Step-father |
| 3: Adoptive mother | 8: Adoptive father |
| 4: Grandmother | 9: Grandfather |
| 5: Foster mother | 10: Other _____ |

If you answered 1 or 6 for question 12, skip ahead to question 16. For all other responses, please continue with item 13.

13. Your race: *(select one or more)*
- | | |
|--|--|
| 1: American Indian/Alaska Native | 4: Black or African American |
| 2: Asian | 5: White |
| 3: Native Hawaiian or Other Pacific Islander | 6: More than one race
<i>Please describe: _____</i> |
14. Your ethnicity: *(select one)*
- | | |
|---------------------------|----------------------------|
| 1: Hispanic or Latino | 3: Unknown or Not Reported |
| 2: Not Hispanic or Latino | |
15. Your birth date: _____ / _____ / _____
month day year
16. Highest level of education you have completed:
- | | |
|---|--------------------------------------|
| 1: less than 8 th grade | 6: Courses toward college degree |
| 2: 9 th -11 th grade | 7: College degree |
| 3: High School Degree or GED | 8: Master's degree |
| 4: Vocational or trade degree after High School | 9: Professional Degree (MD, PhD, JD) |
| 5: Associates or 2 year degree | |
17. Your marital status:
- | | |
|--|---------------------------|
| 1: Married | 4: Separated |
| 2: Remarried | 5: Divorced |
| 3: "Living with" partner (not married) | 6: Single (never married) |
| | 7: Widowed |
18. Are you:
(circle all that apply)
- | |
|--|
| 1: Working at a full-time paid job (35 or more hours a week) |
| 2: Working at a part-time paid job (less than 35 hours a week) |
| 3: Full-time student (3 or more classes a semester) |
| 4: Part-time student (1 or 2 classes a semester) |
| 5: Not currently working |
| 6: Other, please describe: _____ |

27. Highest level of education your spouse/partner has completed:
- | | |
|---|------------------------------------|
| 1: less than 8 th grade | 5: Associates or 2 year degree |
| 2: 9 th -11 th grade | 6: Courses toward college degree |
| 3: High School Degree or GED | 7: College degree |
| 4: Vocational or trade degree after High School | 8: Master's degree |
| | 9: Professional Degree (MD,PhD,JD) |
28. Is your spouse or partner (circle all that apply)
- 1: Working at a full-time paid job (35 or more hours a week)
 - 2: Working at a part-time paid job (less than 35 hours a week)
 - 3: Full-time student (3 or more classes a semester)
 - 4: Part-time student (1 or 2 classes a semester)
 - 5: Not currently working
 - 6: Other, please describe: _____
29. What is your spouse's occupation? _____
30. How involved is your spouse/partner in caring for your child?
- | | | | |
|---------------------|-------------------|---------------|--------------------|
| 0 | 1 | 2 | 3 |
| Not at all involved | Somewhat involved | Very involved | Extremely involved |
31. Which languages are spoken in your home? Please list: _____
32. How often do you and your spouse speak to your child in English?
- 1: We *always* address him/ her in English.
 - 2: We address him/ her in English *some of the time*.
 - 3: We address him/ her in English *about half the time*.
 - 4: We *sometimes* address him/ her in English.
 - 5: We *rarely* address him/ her in English.

SEE NEXT PAGE FOR QUESTION #33

Question #33

MEDICAL CONDITIONS – EDP2

Please review this list of medical and developmental conditions.

Write 'YES' in an applicable box to indicate if any of your child's relatives have any of these conditions.

_____ Check here if none of your child's relatives/family members listed below have any of the conditions listed.

[Note that the mother's or father's sister or brother would be the child's aunt or uncle, and the mother's or father's mother or father would be the child's grandmother or grandfather.]

Condition	Child's				Mother's				Father's			
	Sister	Brother	Mother	Father	Sister	Brother	Mother	Father	Sister	Brother	Mother	Father
Autism or autism spectrum disorder												
Fragile X Syndrome												
ADHD												
Genetic Condition: (specify:)												
Neurologic Condition: (specify:)												
Language delay or other developmental delay												
Mental retardation/ Intellectual disability												

APPENDIX B: PARENTAL STRESS SCALE ITEMS

Parental Stress Scale Items (Berry & Jones, 1995)

ITEM	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I am happy in my role as parent.	1	2	3	4	5
There is little or nothing I wouldn't do for my children.	1	2	3	4	5
Caring for my children sometimes take more time than I have.	1	2	3	4	5
I sometime worry whether I am doing enough for my children.	1	2	3	4	5
I feel close to my children.	1	2	3	4	5
I enjoy spending time with my children.	1	2	3	4	5
My children are an important source of affection for me.	1	2	3	4	5
Having children gives me a more certain view for the future.	1	2	3	4	5
The major source of stress in my life is my children.	1	2	3	4	5
Having children leaves little time and flexibility in my life.	1	2	3	4	5
Having children has been a financial burden.	1	2	3	4	5
It is difficult to balance responsibilities because of my child.	1	2	3	4	5
The behavior of my children is often embarrassing to me.	1	2	3	4	5
If I had it to do over, I might decide not to have children.	1	2	3	4	5
I feel overwhelmed by the responsibility of being a parent.	1	2	3	4	5
Having children has meant too few choices in my life.	1	2	3	4	5
I am satisfied as a parent.	1	2	3	4	5
I find my children enjoyable.	1	2	3	4	5

APPENDIX C: MATERNAL BEHAVIOR RATING SCALE

Maternal Behavior Rating Scale

Maternal Behavior Rating Scale (Revised - 1999)

Gerald Mahoney

Note: The 12 Maternal Behavioral Scale Items assess four Interactive Style Factors (Boyce, Marfo, Mahoney, Spiker, Price & Taylor, 1996). The following organizes this scale according to the interactive factors they contribute to. Factor scores are computed by calculating the average (Mean) Likert ratings of all items on each factor. We recommend that this scale be used to assess the impact of of intervention procedures on parent-child interaction (i.e., program evaluation). *This scale should not be used in its current form for Evaluation or Family Assessment purposes* (Mahoney, Boyce & Spiker, 1996).

RESPONSIVE/CHILD ORIENTED

1. SENSITIVITY TO CHILD'S INTEREST.

This item examines the extent to which the parent seems aware of and understands the child's activity or play interests. This item is assessed by the parent's engaging in the child's choice of activity, parent's verbal comments in reference to child's interest and parent's visual monitoring of child's behavior or activity. Parents may be sensitive but not responsive - such as in situations where they describe the child's interests but do not follow or support them.

Rating of [1]: Highly insensitive. Parent appears to ignore child's show of interest. Parent rarely comments on or watches child's behavior and does not engage in child's choice of activity.

Rating of [2]: Low sensitivity. Parent occasionally shows interest in the child's behavior or activity. Parent may suddenly notice where child is looking or what child is touching but does not continue to monitor child's behavior or engage in activity.

Rating of [3]: Moderate sensitivity. Parent seems to be aware of the child's interests; consistently monitors child's behavior but ignores more subtle and hard-to-detect communications from the child.

Rating of [4]: High sensitivity. Parent seems to be aware of the child's interests; consistently monitors the child's behavior but is inconsistent in detecting more subtle and hard-to-detect communications from the child.

Rating of [5]: Very high sensitivity. Parent seems to be aware of the child's interests; consistently monitors the child's behavior and follows interest indicated by subtle and hard-to-detect communications from the child.

Maternal Behavior Rating Scale

2. RESPONSIVITY.

This item rates the appropriateness of the parent's responses to the child's behaviors such as facial expression, vocalizations, gestures, signs of discomfort, body language, demands, intentions.

Rating of [1]: Highly unresponsive. There is a chronic failure to react to the child's behaviors such as facial expression, vocalizations, gestures, signs of discomfort, body language, demands, intentions.

Rating of [2]: Unresponsive. Parent's responses are inconsistent and may be inappropriate or slow.

Rating of [3]: Consistently responsive. Parent responds consistently to the child's behavior but may at times be slow or inappropriate.

Rating of [4]: Responsive. Parent responds to the child's behavior appropriately and promptly throughout the interaction.

Rating of [5]: Highly responsive. This parent responds promptly and appropriately to even subtle and hard-to-detect behavior of the child.

3. EFFECTIVENESS (RECIPROCITY).

This item refers to the parent's ability to engage the child in the play interaction. It determines the extent to which the parent is able to gain the child's attention, cooperation and participation in a *reciprocal* exchange characterized by balanced turntaking in play or conversation.

Rating of [1]: Very ineffective. Parent is very ineffective in keeping the child engaged in the interaction. The parent makes attempts to elicit the child's cooperation, but almost invariably fails. Most of the attempts are characterized by poor timing, lack of clarity or firmness, and/or appear to be half-hearted. Parent may give the appearance of helplessness where the child is concerned.

Rating of [2]: Ineffective. Parent mostly ineffective in keeping the child engaged in the interaction. In a few instances only, the parent is able to gain the child's cooperation, but is most often unsuccessful.

Rating of [3]: Moderately effective. Parent is successful in keeping the child engaged in the interaction but there is not reciprocal exchange of turns.

Rating of [4]: Highly effective. Parent keeps the child engaged throughout most of the interaction and often there is a reciprocal exchange of turns in play or conversation.

Rating of [5]: Extremely effective. Parent is able to keep the child engaged willingly throughout the entire interaction. Additionally, the interaction will be characterized by balanced turntaking in play or conversation.

AFFECT/ANIMATION

1. ACCEPTANCE

This item assesses the extent to which the parent approves of the child and the child's behavior. Acceptance is measured by the intensity of positive affect expressed toward the child and the frequency of approval expressed either verbally or nonverbally.

Rating of [1]: Rejecting. This parent rarely shows positive emotion. Parent is continually disapproving of the child and the child's behavior.

Rating of [2]: Low acceptance. This parent shows little positive affect toward the child. Parent may show some disapproval of the child and the child's behavior but mostly remains neutral.

Rating of [3]: Accepting. This parent indicates general acceptance of the child; parent approves of the child and child's behavior in situations where approval would normally be appropriate. Moderate intensity of positive affect is displayed throughout the interaction.

Rating of [4]: Very accepting. Emphasis is on approval; this parent shows higher than average positive affect and is generous with approval.

Rating of [5]: High acceptance. This parent is effusive with approval and admiration of the child. Parent approves and praises even ordinary behavior; intense positive affect is displayed throughout the interaction.

2. ENJOYMENT.

This item assesses the parent's enjoyment of interacting with the child. Enjoyment is experienced and expressed in response to the child himself – his spontaneous expressions or reactions, or his behavior when interacting with his parent. There is enjoyment in child's being himself rather than the activity the child is pursuing.

Rating of [1]: Enjoyment is absent. Parent may appear rejecting of the child as a person.

Rating of [2]: Enjoyment is seldom manifested. Parent may be characterized by a certain woodenness. Parent does not seem to enjoy the child per se.

Rating of [3]: Pervasive enjoyment but low-intensity. Occasionally manifests delight in child being himself.

Rating of [4]: Enjoyment is the highlight of the interaction. Enjoyment occurs in the context of a warm relaxed atmosphere. Parent manifests delight fairly frequently.

Rating of [5]: High enjoyment. Parent is noted for the buoyancy and display of joy, pleasure, delighted surprise at the child's unexpected mastery.

Maternal Behavior Rating Scale

3. EXPRESSIVENESS.

This item measures the tendency of the caregiver to express and react emotionally toward the child. It assesses the voice quality to express a range of emotions toward the child. Both intensity, animation and frequency are considered in these ratings.

Rating of [1]: Highly inexpressive. Caregiver may inhibit body language appearing rigid; almost motionless. Caregiver exhibits flat affect; voice quality is dull and facial expression varies little.

Rating of [2]: Low overt expressiveness. Parent appears bland but does exhibit some affective quality in body language, voice quality and facial expression. May not respond to situations that would normally elicit an emotional reaction.

Rating of [3]: Moderate overt expressiveness. Parent responds to situations that would normally elicit an emotional reaction.

Rating of [4]: Overtly expressive. Parent uses body language, voice quality and facial expression in an animated manner to express emotion toward the child. Parent is generally enthusiastic but not extreme in expressiveness.

Rating of [5]: Highly expressive. Parent is extreme in expression of all emotions using body language, facial expression and voice quality. Appears very animated, these parents are "gushers."

4. INVENTIVENESS.

This item assesses the range of stimulation parents provide their child; the number of different approaches and types of interactions and the ability to find different things to interest the child, different ways of using toys, combining the toys and inventing games with or without toys. Inventiveness is both directed toward and effective in maintaining the child's involvement in the situation. Inventiveness does not refer merely to a number of different, random behaviors, but rather to a variety of behaviors which are grouped together and directed towards the child.

Rating of [1]: Very small repertoire. Parent is unable to do almost anything with the child, parent seems at a loss for ideas, stumbles around, is unsure of what to do. Parent's actions are simple, stereotyped and repetitive.

Rating of [2]: Small repertoire. Parent does find a few ways to engage the child in the course of the situation, but these are of limited number and tend to be repeated frequently, possibly with long periods of inactivity. Parent uses the toys in some of the standard ways, but does not seem to use other possibilities with toys or free play.

Rating of [3]: Medium repertoire. Parent performs the normal playing behaviors of parenthood, shows ability to use the standard means of playing with toys, and the usual means of free play. Parent shows some innovativeness in play and use of toys.

Rating of [4]: Large repertoire. Parent shows ability to use all the usual playing behaviors of parenthood, but in addition is able to find uses which are especially appropriate to the situation and the child's momentary needs.

Maternal Behavior Rating Scale

Rating of [5]: Very large repertoire. Parent consistently finds new ways to use toys and/or actions to play with the child. Parent shows both standard uses of toys as well as many unusual but appropriate uses, and is continually able to change his/her behavior in response to the child's needs and state.

5. WARMTH.

This item rates the demonstration of warmth to a child which is positive attitude revealed to the child through pats, lap-holding, caresses, kisses, hugs, tone of voice, and verbal endearments. Both the overt behavior of the parent and the quality of fondness conveyed are included in this rating. It examines positive affective expression; the frequency and quality of expression of positive feelings by the parent and the parent's show of affection.

Rating of [1]: Very low. Positive affect is lacking. Parent appears cold and reserved, rarely expresses affection through touch, voice.

Rating of [2]: Low. Parent occasionally expresses warmth through brief touches and vocal tone suggests low intensity of positive affect.

Rating of [3]: Moderate. Pervasive low-intensity positive affect is demonstrated throughout the interaction. Fondness is conveyed through touch and vocal tones.

Rating of [4]: High. Affection is expressed frequently through touch and vocal tone. Parent may verbalize terms of endearment.

Rating of [5]: Very high. Parent openly expresses love for the child continually and effusively through touch, vocal tone and verbal endearments.

ACHIEVEMENT ORIENTATION

1. ACHIEVEMENT.

This item is concerned with the parent's encouragement of sensorimotor and cognitive achievement. This item assesses the amount of stimulation by the parent, which is overtly oriented toward promoting the child's developmental progress. This item assesses the extent to which the parent fosters sensorimotor and cognitive development whether through play, instruction, training, or sensory stimulation and includes the energy which the parent exerts in striving to encourage the child's development.

Rating of [1]: Very little encouragement. Parent makes no attempt or effort to get child to learn.

Rating of [2]: Little encouragement. Parent makes a few mild attempts at fostering sensorimotor development in the child but the interaction is more oriented to play for the sake of playing rather than teaching.

Rating of [3]: Moderate encouragement. Parent continually encourages sensorimotor development of the child either through play or training but does not pressure the child to achieve.

Rating of [4]: Considerable encouragement. Parent exerts some pressure on the child toward sensorimotor achievement, whether as unilateral pressure or in a pleasurable interactional way and whether wittingly or unwittingly.

Rating of [5]: Very high encouragement. Parent exerts much pressure on the child to achieve. Parent constantly stimulates him toward sensorimotor development, whether through play or obvious training. It is obvious to the observer that it is very important to the parent that the child achieve certain skills.

2. PRAISE (VERBAL)

This scale assesses how much verbal praise is given to the child. Examples of verbal praise are "good boy," "thatsa girl," "good job." Praise in the form of smiles, claps or other expressions of approval are not included unless accompanied by a verbal praise. Praise may be given for compliance, achievement or for the child being himself.

Rating of [1]: Very low praise. Verbal praise is not used by the parents in the interaction even in situations which would normally elicit praise from the parent.

Rating of [2]: Low praise. Parent uses verbal praise infrequently throughout the interaction.

Rating of [3]: Moderate praise. Parent uses an average amount of verbal praise during the interaction. Parent praises in most situations which would normally elicit praise.

Rating of [4]: Praises frequently. Parent verbally praises the child frequently for behavior which would not normally elicit praise.

Rating of [5]: Very high praise. Very high frequency of verbal praise from the parent even for behavior which would not normally elicit praise.

Maternal Behavior Rating Scale

MATERNAL BEHAVIOR RATING SCALE (MBRS)

SCORING SHEET

MBRS ITEM	Observation 1	Observation 2	Observation 3	Observation 4
	Date _____	Date _____	Date _____	Date _____
RESPONSIVE/CHILD ORIENTED				
1. Sensitivity				
2. Responsivity				
3. Effectiveness				
Scale Score (Sen + Res + Eff)/3				
AFFECT/ANIMATION				
1. Acceptance				
2. Enjoyment				
3. Expressiveness				
4. Inventiveness				
5. Warmth				
Scale Score (Acc + Enj + Exp + Inv + War)/5				
ACHIEVEMENT ORIENTATION				
1. Achievement				
2. Praise				
Scale Score (Ach + Pra)/2				
DIRECTIVE				
1. Directiveness				
2. Pace				
Scale Score (Dir + Pac)/2				
COMMENTS				

APPENDIX D: EDP-2 PARENT IMPLEMENTATION RATING FORM (PIRF)

sticker

A.R.T. Session Log and Parent Implementation Rating Form
(Revised 4/9/2012)

Child Initials _____ Child ID _____ Session Date: ___/___/___ Interventionist initials _____

Location/Method: Home visit Email/text Phone call Other _____

Was the session held? Yes No (Reason: _____) Duration of Session: ___ min.

Participating adult: Mother^{1, 2} Father^{1, 2} Both parents Other _____

Session content

<input type="checkbox"/> Parent Education/FRED-R (no parent ratings needed)	<input type="checkbox"/> Social play	<input type="checkbox"/> Self-regulation
<input type="checkbox"/> NEW pivotal behavior(s)	<input type="checkbox"/> Joint activity	<input type="checkbox"/> Attention and arousal
<input type="checkbox"/> CONTINUATION of previous pivotal behavior(s)	<input type="checkbox"/> Joint attention	<input type="checkbox"/> Exploration
<input type="checkbox"/> REVIEW of recent content, progress, needs	<input type="checkbox"/> Vocalization	<input type="checkbox"/> Engagement
	<input type="checkbox"/> Intentionality	<input type="checkbox"/> Adaptability & coping
	<input type="checkbox"/> Conversation	<input type="checkbox"/> Cooperation
	<input type="checkbox"/> Symbolic play	<input type="checkbox"/> Object Play

STRATEGIES used: _____
(Enter strategy numbers, not names)

Overall, how effective was this session?

	Minimally		Moderately		Maximally
	1	2	3	4	5
					6
					7

Please indicate (circle) the extent to which the parent/caregiver did the following during this session:

Parent Participation and Implementation Behaviors	Minimally			Moderately			Maximally	
1. Was prepared for the session (present, child and parent ready to engage and focus attention on session, space made available for play)	1	2	3	4	5	6	7	NA
2. Confirmed use of intervention strategies since last session	1	2	3	4	5	6	7	NA
3. Reflected on success/difficulties of implementation and any changes noted in child behaviors	1	2	3	4	5	6	7	NA
4. Actively participated in the session (engaged and attentive during entire session, interacting with child and/or interventionist throughout)	1	2	3	4	5	6	7	NA
5. Interacted frequently and appropriately with the child	1	2	3	4	5	6	7	NA
6. Asked relevant questions and/or made relevant comments	1	2	3	4	5	6	7	NA
7. Practiced new strategies with coaching from interventionist	1	2	3	4	5	6	7	NA
8. Demonstrated understanding of the intervention strategies	1	2	3	4	5	6	7	NA
9. Indicated adequate level of comfort in implementing new strategies	1	2	3	4	5	6	7	NA
10. Collaborated with interventionist in generating ideas for implementation of strategies during daily activities and routines between intervention sessions	1	2	3	4	5	6	7	NA

Adapted from: Mahoney, G.J. & MacDonald, J. (2007). Autism and Developmental Delays in Young Children: The Responsive Teaching Curriculum for Parents and Professionals Manual. Austin: PRO-ED, Inc. ©2006 Early Development Project, UNC-Chapel Hill

APPENDIX E: PIRF SCORING GUIDE

ITEM		Minimally (1-2)	Moderately (3-5)	Maximally (6-7)
1	Was prepared for the session (present, child and parent ready to engage and focus attention on session, space made available for play)	No space available, left the room for long periods, did another activity, parent did not want to wake up child, 15 minutes or more late	Took phone call & came back, left & came during session, parent needed to feed child before session, child just woke up, other scheduled things at the house at the same time, parent was slightly late	Remembered session, made space, had materials out, child had been fed, changed, session could begin on time
2	Confirmed use of intervention strategies since last session	Reported no, or gave a vague response ("maybe a few times") without being able to think of examples; child sick; out of town; child's at grandma's	Reported that they tried it once or twice, and gave specific example(s)	Expressed that they had tried it a number of times, gave examples of when he/she used it
3	Reflected on success/difficulties of implementation and any changes noted in child behaviors	Could not offer any reflection – or just said they didn't do it	Parents could not explain why strategy was difficult or successful, or why they could or could not implement it; just said, e.g., "it went really well" or not, without going beyond that	Talked with interventionist about child's behavior in response to strategy across multiple attempts; specific analysis of how that strategy impacted the child's behavior
4	Actively participated in the session (engaged and attentive during entire session, interacting with child and/or interventionist throughout)	Physically removed for much of session (sitting on couch, did other tasks, etc.); may have observed but interacted minimally with child and interventionist	May have been less engaged physically (e.g., sitting on sofa) but interacted consistently and appropriately with child and interventionist OR sat with child/ interventionist, but only intermittently engaged in interactions	Sat on floor or where child was, engaged and attentive during entire session, interacted with child and/or interventionist throughout
5	Interacted frequently and appropriately with the child	Little or no parent interaction with child, or most interactions with child are disciplinary or conflictual in some way	Parent interacted frequently and with positive affect but expectations of child were sometimes or frequently developmentally inappropriate or contextually inappropriate (requested actions inappropriate to the situation); and/or interactions with child were appropriate when they occurred, but were only moderate in number	Interactions with child were frequent, positive, and developmentally and contextually appropriate
6	Asked relevant questions and/or made relevant comments	No questions or comments about the content of the session OR all questions and comments seemed off-topik, tangential, or irrelevant OR made numerous	Questions and comments were relevant, but off-hand or were not really intended to generate further discussion of session topic, or questions and comments were inconsistent in relevance	Made several comments and/or asked several questions; questions and/or comments pertained directly to session content and reflected good understanding of the

		comments/asked multiple questions that were tangential or unrelated to session content		content or a desire to understand more fully or to support discussion
7	Practiced new strategies with coaching from interventionist	Did not practice the strategy, even with interventionist encouragement; did not comment on or ask questions about the strategy after it was modeled; not present in session	Practiced strategy with moderate to maximal encouragement from interventionist; sometimes did not alter behaviors based on interventionist coaching; or did not actively practice strategy but commented or asked questions that were relevant	Got on the floor (or wherever play is taking place) and practiced strategy with little to no encouragement, after the strategy was modeled by the interventionist; responded to interventionist coaching by altering behaviors
8	Demonstrated understanding of the intervention strategies	Did not indicate verbally, with gestures or actions, or with facial expressions that strategy was understood, despite multiple attempts by interventionist to review or explain	Indicated verbally and/or with gestures and/or with facial expressions that strategies were understood; may have asked some clarifying questions but did not give examples or act in a way that really reflected that understanding	Indicated understanding of how the strategy is enacted, & what behaviors it targets; may have made note of child responses; offered examples and/or asked pertinent questions for clarification of understanding; enacted strategy and adjusted responses to child in a way that demonstrated understanding
9	Indicated adequate level of comfort in implementing new strategies	Did not try strategies or expressed discomfort with or dislike of the strategy, or indicated that he/she would have trouble implementing	Initially seemed unsure, but with coaching became more confident; OR demonstrated strategy with moderate confidence but indicated it may be challenging to do	Enacted the strategy with confidence (even if coaching needed to refine) and indicated verbally that he/she felt he/she could continue to implement the strategy fairly well; positive and enthusiastic when trying the strategy
10	Collaborated with interventionist in generating ideas for implementation of strategies during daily activities and routines between intervention sessions	Did not offer any ideas for routines or activities in which the strategy could be used, despite interventionist efforts to elicit collaboration; did not contribute to problem-solving to address barriers to implementation	Provided some ideas, but with significant prompting from interventionist; mostly agreed with ideas from interventionist or offered ideas that he/she has offered before (not context specific); made some minimal contribution to problem-solving to address barriers to implementation	Participated in reciprocal conversation with interventionist regarding weekly plan and contributed appropriate ideas; contributed substantively to problem-solving to address barriers to implementation

APPENDIX F: EDP-2 INTERVENTIONIST FIDELITY CHECKLIST (IFC)

A.R.T. INTERVENTION FIDELITY CHECKLIST (Version 3d)

(Revised 7/16/12)

Child Initials _____ Child ID _____ Session Date _____ Length of Session _____ min.

Interventionist's Initials _____ Rater's Initials _____ Date Rating completed _____

Please indicate (circle) the extent to which the interventionist engaged in the following behaviors:

Phases and Activities	Minimally	Moderately	Maximally	NA				
A. RAPPORT AND REVIEW								
1. Interact warmly with parents and child	1	2	3	4	5	6	7	
2. Review and encourage parents to talk about information from previous session	1	2	3	4	5	6	7	
3. Demonstrate positive attitude toward child	1	2	3	4	5	6	7	
4. Provide positive feedback to parents regarding their participation or demonstration of new skills (may include use of past strategy, but for current strategy score at # 19)	1	2	3	4	5	6	7	
5. Be attentive to parents	1	2	3	4	5	6	7	
B. PURPOSE AND RATIONALE								
6. Describe purpose and focus of today's session	1	2	3	4	5	6	7	
7. Discuss rationale for the strategy being presented	1	2	3	4	5	6	7	
8. Assess or describe the child's current use of the pivotal behavior objective	1	2	3	4	5	6	7	
9. Speak at parents' level of understanding	1	2	3	4	5	6	7	
10. Assess parents' understanding of information	1	2	3	4	5	6	7	
11. Encourage parents' comments, questions, and concerns	1	2	3	4	5	6	7	
C. DEMONSTRATION AND PRACTICE OF A.R.T. STRATEGIES								
12. Have session plan sheets and/or videos ready	1	2	3	4	5	6	7	
13. Engage responsively when interacting with the child	1	2	3	4	5	6	7	
14. Model ART strategy that is the focus of today's session	1	2	3	4	5	6	7	
15. Explain strategy during and/or after it is modeled	1	2	3	4	5	6	7	
16. Demonstrate and explain the impact of ART strategy on child's behavior	1	2	3	4	5	6	7	
17. Involve the parents in interactions with their child	1	2	3	4	5	6	7	NA
18. Coach parents while they interact with their child	1	2	3	4	5	6	7	NA
19. Give parents feedback regarding their use of the focal strategy	1	2	3	4	5	6	7	
D. FAMILY ACTION PLANNING								
20. Develop with parents a written plan for follow-through activities (on session plan)	1	2	3	4	5	6	7	
21. Develop a plan to address barriers to follow-through activities, as needed	1	2	3	4	5	6	7	NA
22. Appropriately address concerns parents have raised (whether or not they are directly related to A.R.T.)	1	2	3	4	5	6	7	NA
23. Summarize discussion points, strategies, and plans that were covered during the session	1	2	3	4	5	6	7	
E. DOCUMENTATION								
24. Contents of session notes accurately summarize key contents of session	1	2	3	4	5	6	7	
25. Interventionist rating form completed	1	2	3	4	5	6	7	
Column Totals								
Total Points _____ /150 = _____								

Adapted from Mahoney, G.J. & MacDonald, J. (2007). Autism and Developmental Delays in Young Children: The Responsive Teaching Curriculum for Parents and Professionals Manual. Austin: PRO-ED, Inc. by Linn Wakeford, M.S., OTR/L, and Linda Watson, Ed.D., CCC-SLP. ©2008 Early Development Project, University of North Carolina at Chapel Hill (revised 7/16/2012)

APPENDIX G: IFC SCORING GUIDE

INTERVENTIONIST FIDELITY CHECKLIST SCORING ANCHORS (revised 9-13-12)

	1-2	3-4	5-6	7
<p>RAPPORT AND REVIEW</p> <p>1. Interact warmly with parents and child</p>	<p>Fails to greet parent or child. Offers no openings for social conversation with parent. Does not respond to parent social conversation openings. Does not seem interested in parent or child. Affect appears flat or negative within this particular interpersonal context.</p>	<p>Greets parent and child upon arrival. Offers at least one opening for social conversation, or responds to parent social conversation at least one time. Positive affect is clearly seen several times during the session. Generally conveys interest in parent and child, but some inconsistency is apparent.</p>	<p>Greets parent and child upon arrival. Offers two or more openings for social conversation during the session, and engages in social conversation of multiple turns if parent offers the opportunity. Positive affect is clearly seen on frequent occasions during the session. Consistently conveys interest in parent and child.</p>	
<p>2. Review and encourage parents to talk about information from previous session (s)</p>	<p>The interventionist does not ask or probe about information from the previous session, or does not "dig" for more information on what went wrong, and does not attempt to problem solve for what might have gone wrong.</p>	<p>The interventionist asks briefly about how the past week has gone in regard to ART, but does not appropriately respond to the parent's feedback, or asks the parent for feedback but does not briefly review the information from the previous session.</p>	<p>The interventionist asks if there are questions from the previous session, and how it's been going in general. The interventionist responds appropriately to feedback from the parent; revisiting content from the previous session and problem solving (when necessary) before moving to today's session objectives.</p>	
<p>3. Demonstrate positive attitude toward child</p>	<p>Interventionist frequently ignores the child and/or does not interact with the child. Interventionist directs negative and/or derogatory comments and facial expressions towards the child. Interventionist makes negative comments about the child or the child's behavior. Interventionist does not seem to enjoy interacting with the child.</p>	<p>Interventionist occasionally directs positive behaviors and comments towards the child during the session. Interventionist seems to enjoy playing with the child on a few occasions, but not on a consistent basis or during every opportunity.</p>	<p>Interventionist clearly communicates liking for or care about the child by directing frequent smiles and positive comments towards the child. Interventionist also makes positive comments about the child and what he or she is doing both during the session and per parent report. When interventionist interacts and plays with the child, s/he demonstrates genuine enjoyment in these interactions. There is evident warmth and acceptance consistently directed from the interventionist towards the child.</p>	

<p>4. Provide positive feedback to parents regarding their participation or demonstration of new skills (includes use of past strategies; for current strategy score at #19)</p>	<p>No feedback provided despite parents' participation and use of previously learned strategies</p>	<p>A few general positive statements (e.g., great job!; nice way with X; you're really having fun with X), but no concrete examples of parents' improvement in quality and/or quantity of participation (e.g., I see you are using XX strategy and CHILD is really responding by XX)</p>	<p>Positive statements with tangible, concrete examples of what you are observing parent do with child; names a particular strategy or skill parent is using more frequently and fluently; comments on how parent-child relationship, child's skills and PBs (play, language, engagement, etc.) are shifting or looking different because of parent's use of strategies and skills</p>
<p>5. Be attentive to parents</p>	<p>Interventionist does not engage in a reciprocal manner with parents. Interventionist is inattentive to parents: does not respond to questions, or address concerns -- or does so in inappropriate manner.</p>	<p>Overall the interventionist is attentive to parents, but tends to focus a bit more on the child.</p>	<p>Interventionist engages in reciprocal manner with parents-Listens attentively to new joys, concerns, thoughts, questions, comments.</p>
<p>PURPOSE AND RATIONALE</p>	<p>1-2</p>	<p>3-4</p>	<p>5-6</p>
<p>6. Describe purpose and focus of today's session</p>	<p>Does not state PB and strategy Does not define PB Does not elaborate on strategy Does not connect PB to dimensions of ART Does not use discussion point to elaborate on PB and strategy</p>	<p>States PB and/or strategy, but not both, or talks about them in a way that makes it difficult to understand what the strategy and PB are Defines/elaborates on PB and/or strategy, but not both Starts to give background information with discussion point, but gets interrupted and doesn't return to it Makes some connections to ART</p>	<p>Clearly states PB and strategy Defines PB Elaborates on strategy Ties PB and strategy together (e.g., how does the strategy get at that PB) Gives examples of behaviors we would look for in child and/or parent to better illustrate PB and strategy Uses discussion point to elaborate on purpose of session</p>
<p>7. Discuss rationale for the strategy being presented</p>	<p>Interventionist does not introduce the strategy or introduces the strategy, but does not address why and how the particular strategy was chosen. The strategy is not explained, and no specific reasons are given</p>	<p>Interventionist introduces the strategy and explains how and why the strategy was decided on with at least one example specific to the child. Interventionist discusses what the strategy means, why the strategy is important, and how the strategy will</p>	<p>Interventionist introduces the strategy and explains how and why the strategy was decided on with at least one example specific to the child. Interventionist discusses what the strategy means, why the strategy is important, and how the strategy will</p>

	as to why the strategy would be a good fit for the child.	describe what the strategy means, but no specific examples involving the child and his or her behavior are given. Incomplete ideas and explanations would also fall here.	help the child increase his or her skills in relation to the pivotal behavior addressed. (i.e. <i>You have mentioned that you would like ___ to cooperate in a more appropriate manner. Since he responds so well to silly games, I thought we could try the strategy "Turn routines into games" to increase his cooperation during less preferred activities</i>)
8. Assess or describe the child's current use of the pivotal behavior objective	Meets none or only 1 of the criteria for score of 5-6.	Meets 2 of 3 criteria for score of 5-6, but not all 3	After clearly stating the PB, the interventionist 1) reflects on the child's current use of the PB, 2) includes at least one example of this, and 3) encourages parent to talk about child's use of PB, using open-ended questions or other overt behavior.
9. Speak at parents' level of understanding	Interventionist uses jargon, and/or vocabulary that is unfamiliar to the parent without explanation of new terms or concepts. Or the interventionist speaks at a speed inappropriate to the parents' comprehension processing time (whether too fast or too slow).	Interventionist speaks at a level of understanding that exceeds the rating of a 1-2 but does not meet the all the qualifications for a rating of 5-6.	Interventionist is aware of the parents' overall education level, background in child development, and time needed to process new information, and works to explain and converse in a way that is understandable (i.e., using clear, complete sentences delivered at an appropriate speed).
10. Assess parents' understanding of information	Does not ask the parent if they understand, or asks the parent if they understand only once, or lacks an appropriate response to a parent sharing (either verbally or through facial expressions) that they do not understand the purpose and/or meaning of the PB or strategy.	Asks on one or two occasions if parent understands, but does not	Asks the parent(s) on 3 or 4 separate occasions throughout the session if they understand the content. Especially asking after giving an explanation, or demonstrating an example of the PB or strategy.

<p>11. Invite parents' comments, questions, and concerns</p>	<p>Makes no verbal bid to parent(s) to express concerns, questions or comments, and leaves little to no time for parent to interject any thoughts or questions and/or interrupts parents to add own thoughts</p>	<p>Invites parent input once or twice; seems interested in parent input but doesn't leave enough time for parents to respond</p>	<p>Verbally invites parent comments, questions or concerns twice or more during session; is clearly interested in and open to parent input throughout the session and leaves time for parents to process and respond</p>	
<p>DEMONSTRATION AND PRACTICE OF A.R.T. STRATEGIES</p> <p>12. Have handouts (session plan sheets) and/or videos ready</p>	<p>1-2 No session plan sheets were used to document PB, discussion point, strategies, parent comments, ways to use strategies (family plan), OR using a blank sheet and everything is written during the session (i.e., no clear prep ahead of time)</p>	<p>3-4 Session plan form ready but not referred to during the session – is not a resource used during the session</p>	<p>5-6 Session plan sheet is used during the session to document PB, discussion point, strategies, parent comments, ways to use strategies, and is referred to overtly at least once.</p>	<p>7</p>
<p>13. Engage in responsive, balanced interactions with the child throughout the session</p>	<p>Interventionist seldom engages with the child or uses interaction approaches that are directive, coercive or dominating most of the time</p>	<p>Interventionist only interacts with child occasionally, but interactions are responsive OR Interventionist interacts frequently with child, but style of interaction fluctuates and about half the interactions include directiveness or interventionist-dominated exchanges</p>	<p>Interventionist often engages in interactions with the child, and those interactions reflect reciprocity, contingency, shared control, match and/or affect. Note: Interventionist-child interactions do not have to occur consistently throughout session, as parent-child and parent-interventionist interactions must also occur, but the interventionist's style of interacting with the child is consistently responsive</p>	

14. Model ART strategy that is the focus of today's session	Did not model the ART strategy	The interventionist models the art strategy, but only once; misses multiple opportunities to model the strategy	The interventionist models the strategy with the child and takes multiple opportunities to use it throughout session.	
15. Explain strategy during and after it is modeled	Interventionist doesn't explain the strategy during or after modeling it. OR Interventionist gives an incorrect explanation for the strategy being modeled.	Interventionist models the strategy but only partially explains what s/he is doing and/or does not let the parents know that the strategy was just modeled. Interventionist may name and explain the strategy at another time during the session, but not while s/he is modeling. Or, interventionist explains the strategy only during the model, but not after; or after the model, but not during.	During at least one period of modeling, interventionist provides comments and explanations as s/he is modeling the strategy. Following most models, interventionist summarizes what s/he did in implementing the strategy.	
16. Demonstrate and explain the impact of ART strategy on child's behavior	In the context of demonstrating the strategy with the child, the interventionist never explains how the strategy changes (or could change) the child's behavior, or provides a confusing or inaccurate explanation.	In the context of demonstrating the strategy with the child, the interventionist articulates clearly how the strategy changes (or could change) the child's behavior once during the session (even if child does not respond as expected).	In the context of demonstrating the strategy with the child, the interventionist articulates clearly how the strategy changes (or could change) the child's behavior, and does so 2-3 times during the session (even if child does not respond as expected).	
17. Involve the parents in interactions with their child	Interventionist did not attempt to get the parent and child engaged together in any interaction during the session.	The interventionist encourages interactions between parent and child, but only once OR Tried to involve parent/child in an interaction, but was not successful, and did not attempt again	The interventionist encourages and facilitates parent-child interactions several times during the session, by either support the parent in interacting with the child OR encouraging the child to interact with the parent	

18. Coach parents while they interact with their child	Interventionist does not pay close attention while parent is trying strategy or interacting with child. Interventionist does not provide cues or suggestions to parent, or guide parent through the strategy when appropriate and/or necessary. Or, interventionist provides inaccurate directions as to how to implement the strategy.	Interventionist watches while parent tries the strategy, or while the parent is interacting with the child. However, interventionist does not consistently provide cues or suggestions to parent when appropriate.	While parent is interacting with child and especially while parent is trying focal strategy, interventionist provides appropriate and relevant cues and suggestions in a positive manner. Interventionist carefully observes parent and coaches them when there is something parents can do to make the strategy or interaction more successful. Comments are not overly elaborate so that parents can respond while interacting with their child.	
19. Give parents feedback regarding their use of a strategy	Fail to provide positive statements about parents use of strategy; Fail to provide clear examples of what parent was doing to illustrate strategy; Fail to provide feedback on child's behavior in response to strategy	Provide general positive statements, but no concrete examples of parents' and/or child's behaviors related to strategy; Or provides an example of parents' use of strategy, but not child's response/role in the strategy, or vice versa; Fail to address parents' lack of or misuse or misunderstanding of the strategy;	Cites examples of what parent did AND how child's behavior was affected/how he or she responded; uses positive statements first but addresses parent's misuse or misunderstanding of strategy. References how strategy elicited PB in child. If parent used strategy well, but child did not respond, note that and offer suggestions/ problem solve together while interacting with their child.	
FAMILY ACTION PLANNING 20. Develop with parents a written plan for follow-through activities	1-2 No plans for follow-through activities are discussed or documented on the session plan form	3-4 Follow-through activities discussed, but session plan form does not clearly reflect that discussion – form may include comments about activities that worked well during the session, but it's not clear whether those are follow-through activities or what the follow-through activities are OR Session plan form includes ideas from interventionist about follow-through activities, but none were generated by or discussed with the parent	5-6 Session notes directly reflect plans discussed during session for use of strategy until the next session, includes the routines or activity in which the strategy will be used, and who will use it if other than the parent present at the session; follow-through activities are generated by a collaborative discussion between parent and interventionist	7

<p>21. Develop a plan to address barriers or obstacles to follow-through activities</p>	<p>If parent brings up potential barriers to implementing the intervention between sessions, interventionist offers no possible solution or states/ implies that the barrier is to be avoided or should not stop the parent from using the strategy with the child</p>	<p>If parent (or interventionist) brings up potential barriers to implementing the intervention between sessions, interventionist acknowledges the barrier and generates possible solutions to the problem, but not in collaboration with parent; interventionist may be somewhat directive toward parent or may imply that the parent should try to find a way to use the strategies regardless of barriers</p>	<p>If parent (or interventionist) brings up potential barriers to implementing the intervention between sessions, interventionist acknowledges the barrier and its significance and brainstorm with parent to generate possible solutions to the problem; interventionist is not directive or demanding of the parent, but rather communicates an understanding of the situation</p>	
<p>22. Appropriately address concerns parents have raised (whether or not they are directly related to A.R.T.)</p>	<p>If parent raises concerns about the intervention, the child, family situation and its effect on the child, other services, daycare situations, etc., the interventionist acknowledges those concerns and begins to try to generate solutions to the program and allows session content to become overly focused on these concerns to the extent that ART is not implemented in that session</p> <p>OR</p> <p>Interventionist does not acknowledge the concerns, acts as if the concerns are frivolous, or quickly indicates he/she can't address those concerns, offers no support to parent</p>	<p>If parent raises concerns about the intervention, the child, family situation and its effect on the child, other services, daycare situations, etc., the interventionist acknowledges those concerns, listens attentively, offers support, but offers no information or ideas about other resources, AND/OR allows session to become focused on these concerns to the extent that some aspects of ART are not implemented in that session</p> <p>AND/OR offers ideas or resources in a manner that reflects a bias toward or against a particular service provider, agency, website or other source</p>	<p>If parent raises concerns about the intervention, the child, family situation and its effect on the child, other services, daycare situations, etc., the interventionist acknowledges those concerns, listens attentively, offers support, and offers objective/unbiased information or ideas about other resources, but does not allow session content to become overly focused on these concerns to the extent that ART is not implemented in that session</p>	
<p>23. Summarize discussion points, strategies, and plans that were covered during the session</p>	<p>No summary of session content is offered.</p>	<p>Interventionist offers a brief summary of session, but does not include either strategy or plan (i.e., if either of these is missing, score 3-4)</p>	<p>Interventionist offers summary of session, including pivotal behavior, strategy, and plans (discussion point may not be included) and does so in a manner that is clear and concise</p>	

DOCUMENTATION	1-2	3-4	5-6	7
24. Contents of session notes accurately summarize key contents of session	No session notes or session notes include only PB, discussion point and strategy, with no notes from session process	Session notes include PB, discussion point, strategy but other notations are single words or short phrases with no explanation, do not include comments/input from parents, and/or are difficult to understand relevance or connection to session content	Session notes include PB, discussion point, strategy, include comments/input from parents, plan and are clearly relevant to or connected with session content	
25. Interventionist rating form completed	No rating form completed and in notebook after 2 weeks	A completed rating form is not in the interventionist's fidelity notebook within 2 weeks of the session and/or requires more than one reminder to complete the form and put it in the notebook.	A completed rating form is not in the interventionist's fidelity notebook within 1 week of the session and/or requires a reminder to complete the form and put it in the notebook.	

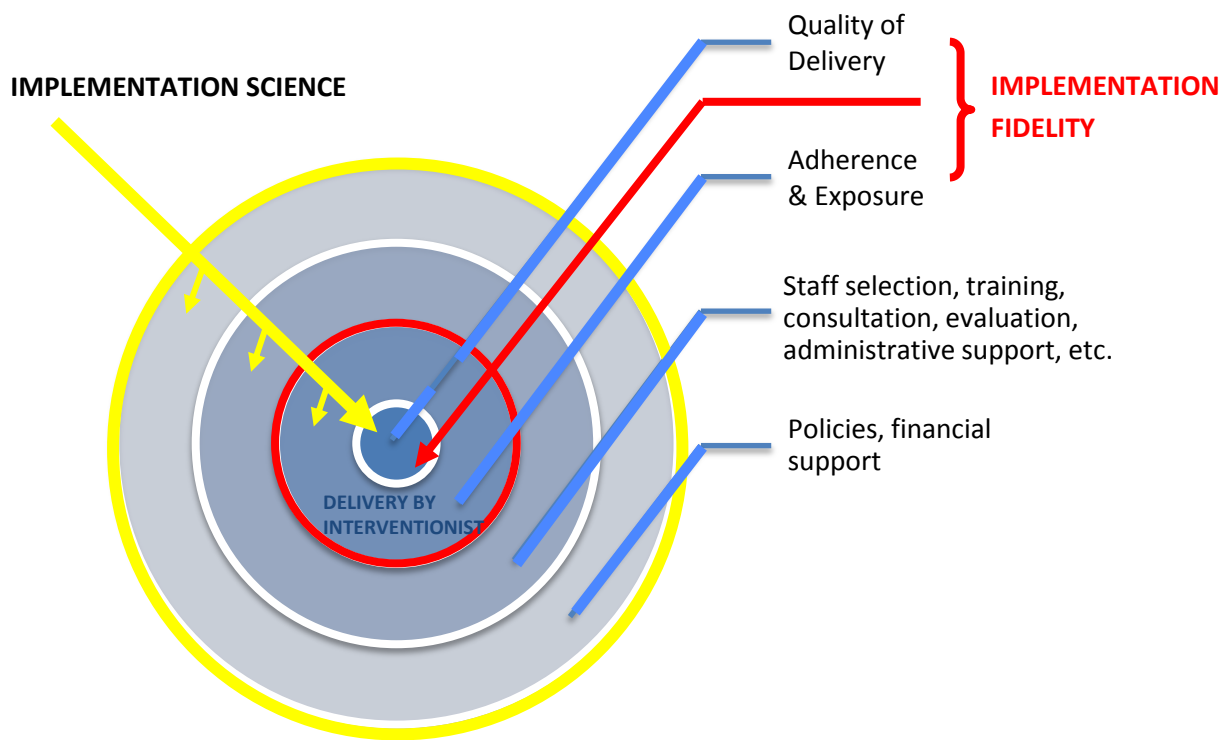


Figure 1. Relationships among components of Implementation Science and Implementation Fidelity, based on Darrow, 2011.

		RESPONSIVENESS	
		High	Low
DEMANDINGNESS	High	Authoritative parenting style	Authoritarian parenting style
	Low	Indulgent parenting style	Indifferent or Rejecting parenting style

Figure 2: Parenting style, conceptualized as intensity along responsiveness and demandingness continua, based on Maccoby & Martin, 1983, as cited in Fletcher, Walls, Cook, Madison, & Bridges (2008).

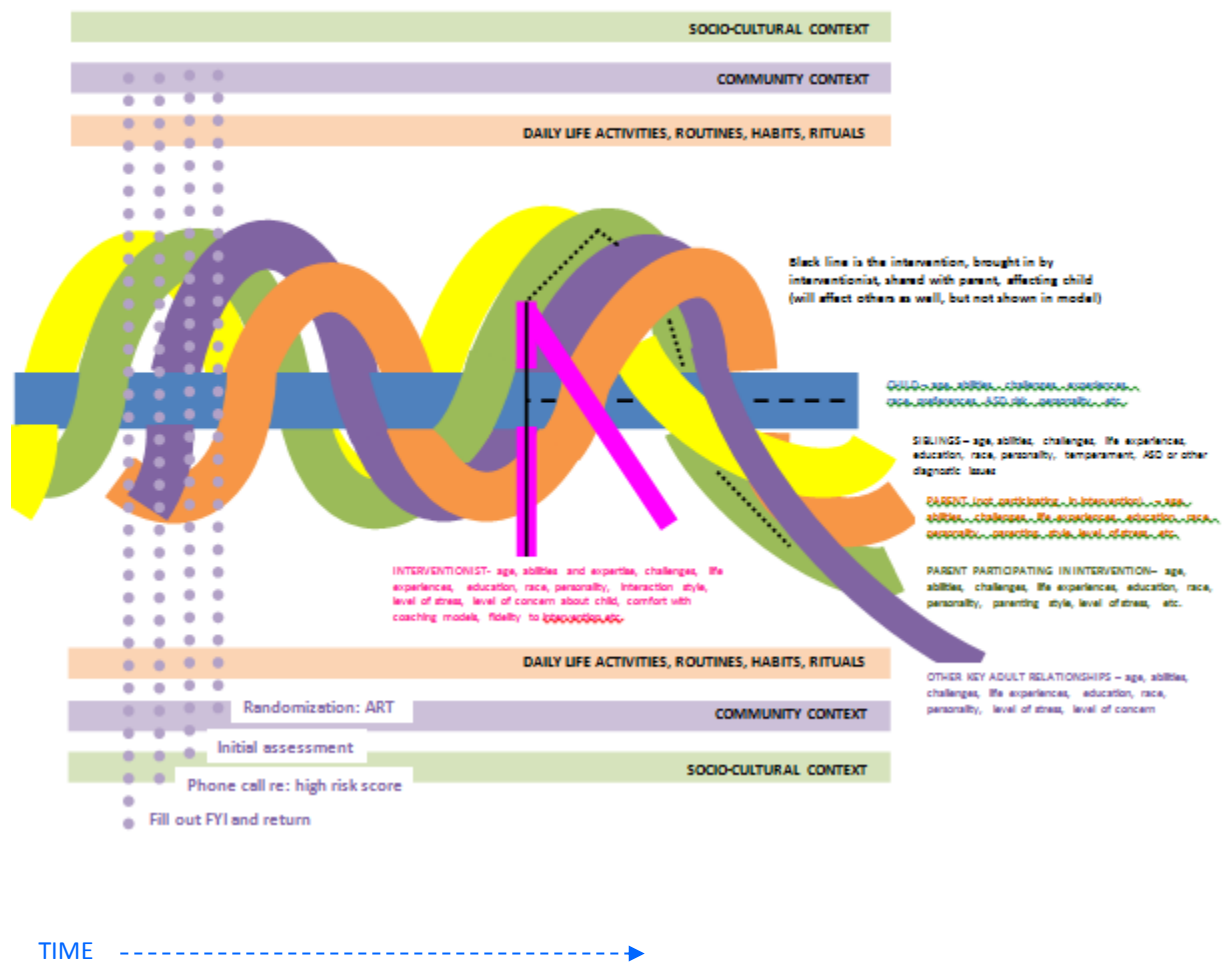


Figure 3: Transactional Model of Parent Implementation Fidelity

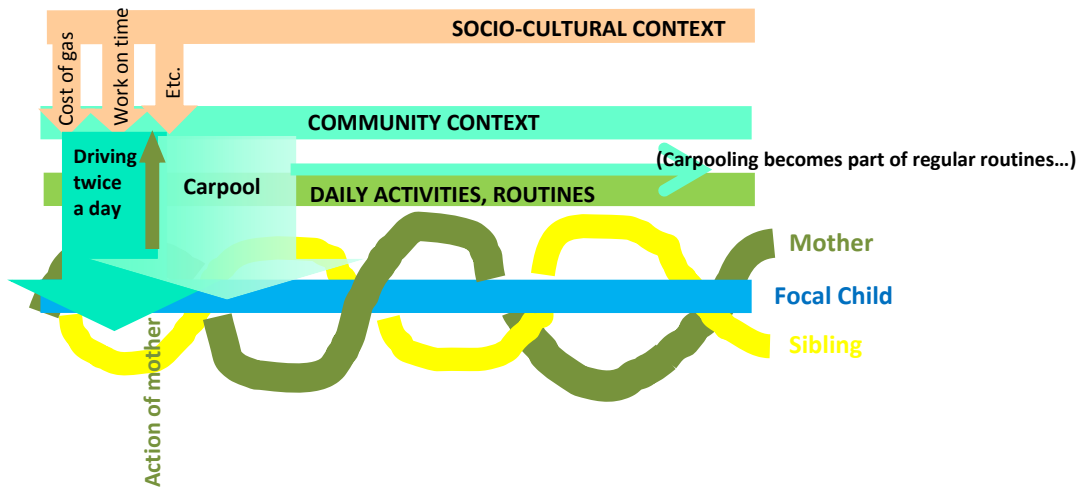


Figure 4: Diminishing demands of community context (need for preschool transportation) on family life as a result of mother’s actions (joining carpool) and development of new habits and ways of managing time.

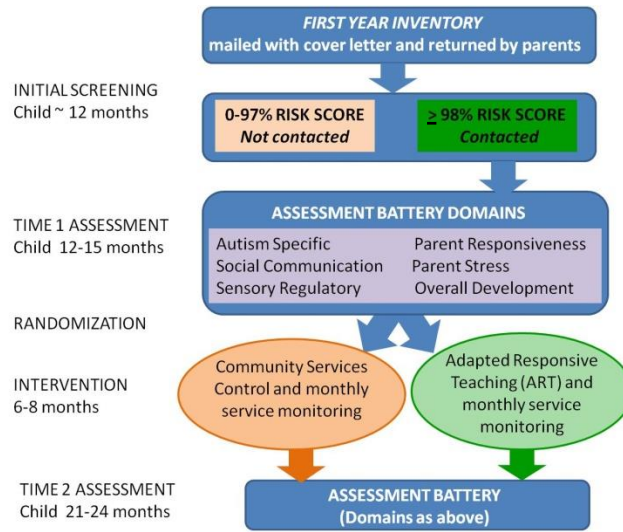


Figure 5: Study process for Early Development Project-2

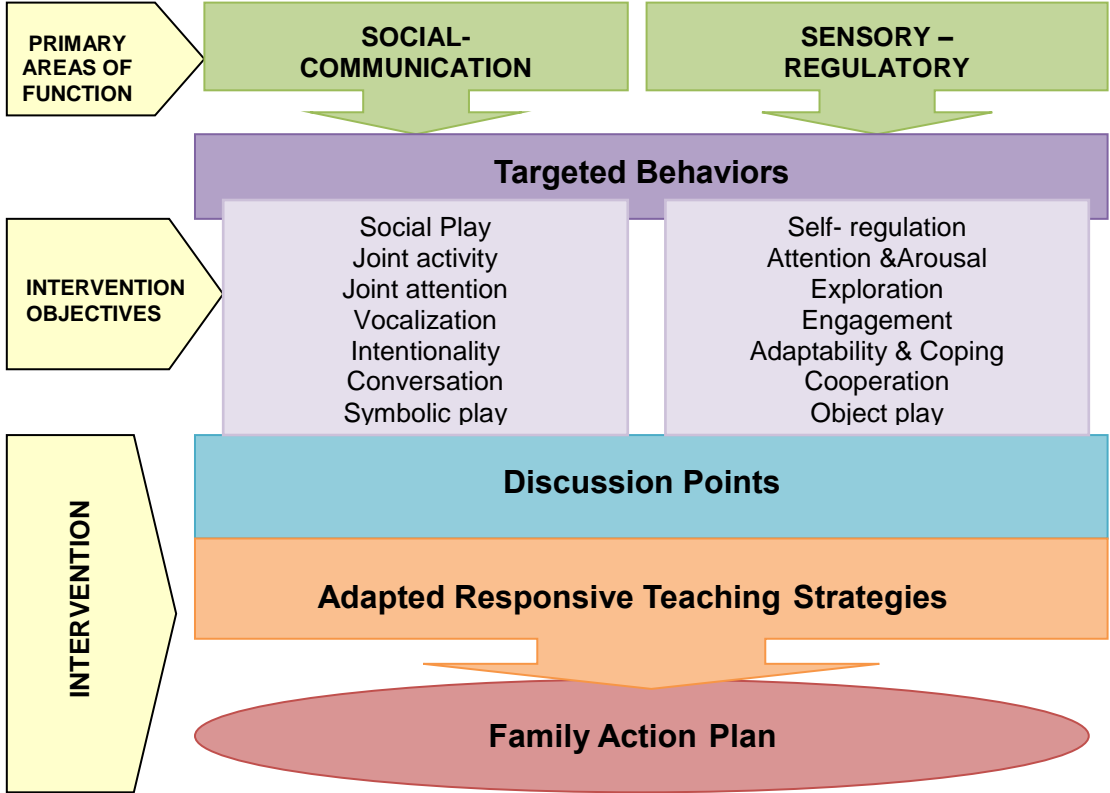


Figure 6: Content of Adapted Responsive Teaching (Adapted from Mahoney, G.J. & MacDonald, J. (2007).

ADAPTED RESPONSIVE TEACHING: SESSION PLAN
Early Development Project, University of North Carolina at Chapel Hill

Child Name Thomas Date: 4/28/2011 Location: home

Present : _____

Current or New:

Feedback Related to Last Week's Session/ Weekly Plan:

Session Objectives (including Pivotal Behavior addressed):

Vocalization — refers to the degree to which children practice or repeat sounds including grunting, vocalizations, singing, or words. Children vocalize frequently when they are alone and when they are with others. Vocalization refers only to the frequency of sound production, without regard to its complexity or meaning.

Discussion Points:

Children learn to produce sounds by practicing their vocalizations. Initially children's sound production is an automatic, biological response. Children's long-term vocal development depends on receiving vocal feedback to their sounds, which encourages them to practice and produce more complex vocalizations.

ART Strategies:

412. Wait with anticipation.

When you are waiting for your child to initiate or respond to you, show with your eyes, face, and body that you are attending to your child and that you expect your child to stay and do something back with you.

Practical Suggestions

- Some children may have very slow reaction times and can take as long as 5 seconds before doing something. If your child acts like this, silently count to 5 before initiating some other action.
- Make sure you do not wait so long that you disrupt the flow of interaction.

Adapted from: Mahoney, G.J. & MacDonald, J. (2007). Autism and Developmental Delays in Young Children: The Responsive Teaching Curriculum for Parents and Professionals Manual. Austin: PRO-ED, Inc.

Figure 7. ART session plan for Thomas.

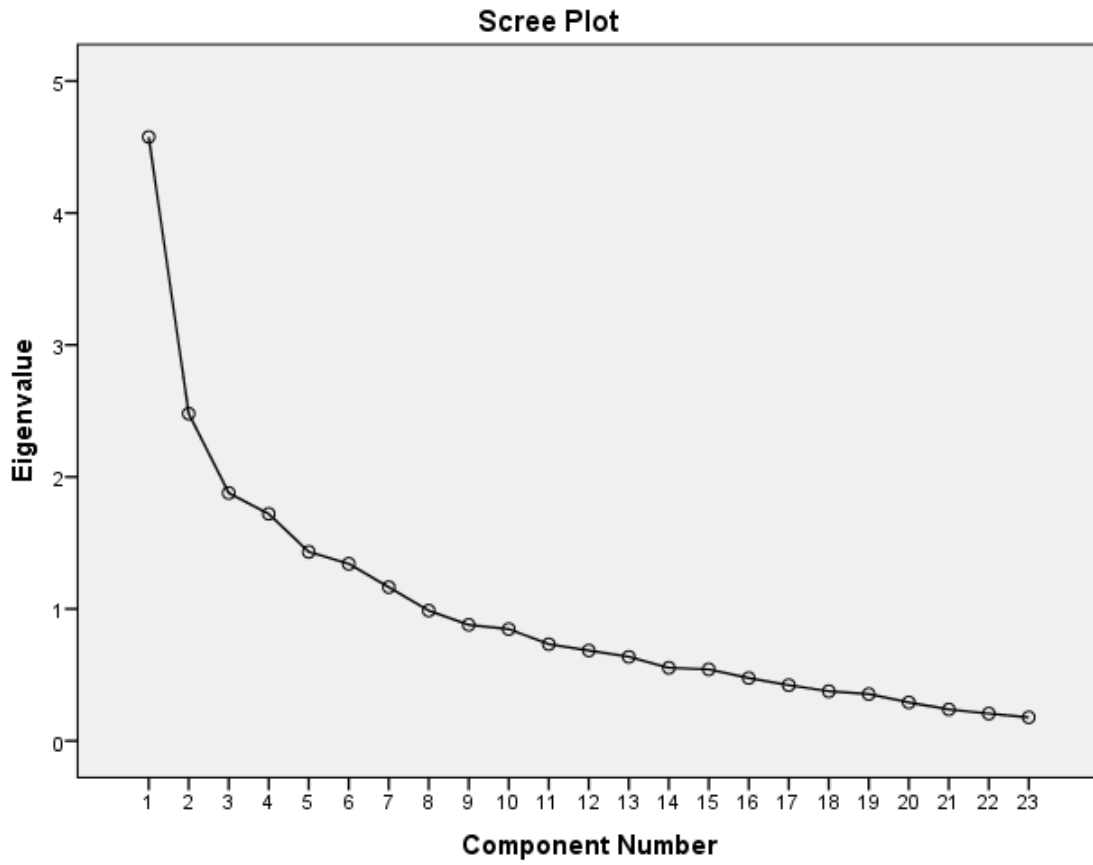


Figure 8. Scree plot for Principle Components Analysis of the Interventionist Fidelity Checklist (created in SPSS-24).

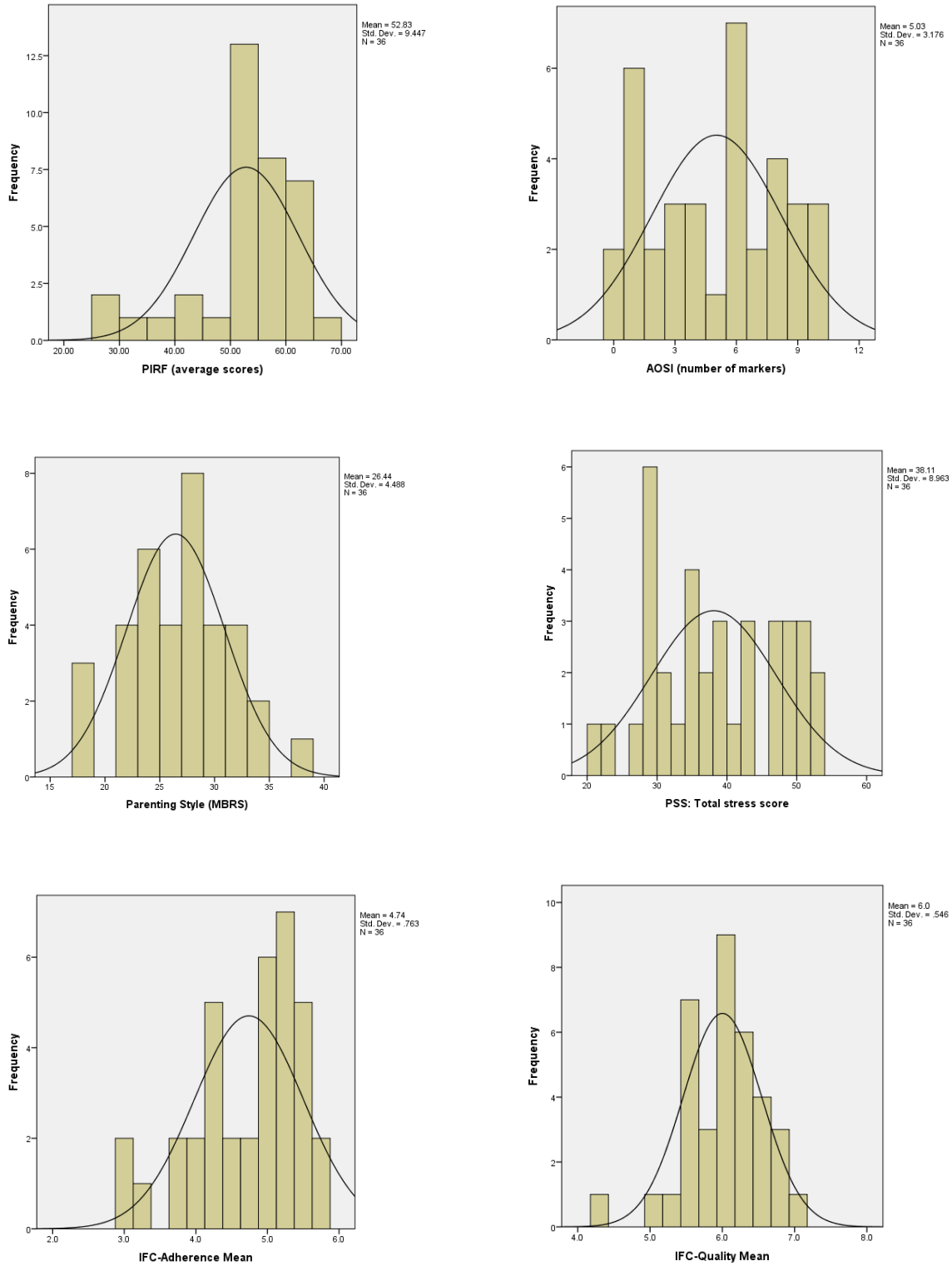


Figure 9. Histograms representing distribution of ordinal variables with overlaid normal distribution line for comparison. All variables meet acceptable criteria for normal univariate distribution.

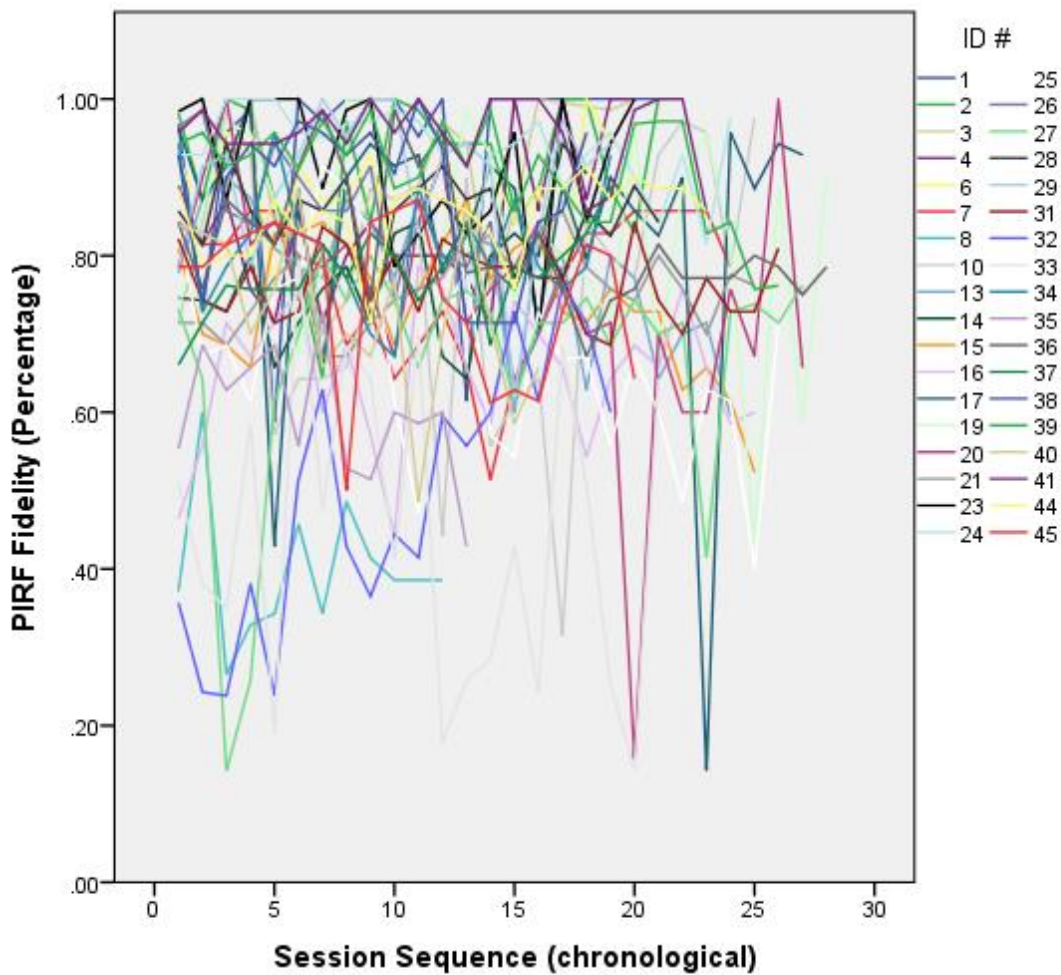


Figure 10: PIRF fidelity by participant over time, with the majority of data points indicating 80% fidelity or higher, but also with multiple data points below 80% fidelity. This variability is notable over the entire course of intervention sessions.

Table 1:

Parent- Implemented intervention studies targeting children with or at-risk for ASD, ages 0-5, published in peer-reviewed journals, in English, between January, 2004 and June, 2014 (n=35).

Author/Year of Publication (Full citations included in References)	Research Design	# Participating Families	Method or approach	Location of Intervention	Target of Intervention	Intensity of Services	Parent Implementation measured	Intervention fidelity measured
Aldred, Green, & Adams, 2004	RCT	28 (14/14)	Developmental, Behavioral	Clinic	Social communication	1x month for 6 months, then less frequently for 6 months	No	No
Ben Chabane, Alber- Morgan, & DeBar, 2009	Single subject RCT	2	Behavioral	Home	Communication		Yes	No*
Carter, Messinger, Stone, Celmi, Nabrusak, & Yoder, 2011	RCT	62 (32/30)	Hansa	Clinic and home	Social Communication	8 group (parents only) and 3 individualized session for each family over 3.5 months	No	Yes
Casenhiser, Shanker, & Stieben, 2013	RCT	51 (25/26)	Based on DIR/ Floortime	Unclear home for parents	Social Communication	2 hrs/wk therapist & parent; 3 hrs daily parent/child, over 12 months	Yes	No
Dawson, Rogers, Munson, Smith, Winter, Greenson, et al., 2010	RCT	48 (24/24)	Early Start Denver Model	Home	All developmental domains	2 hrs 5 days/wk for 2 years with therapist; additional time spent by parents with child	Yes	No
Elder, Valcante, Yarandi, White, & Elder, 2005	Single subject; group analysis	18	Behavioral	Home	Social communication	14-22 sessions over 10-12 wks.	Yes	No*
Gentry & Laiselli, 2008	Single subject	1	Behavioral	Home	Feeding	4 hrs/wk. for approx. 12 wks.	No	No*
Gillett, & LeBlanc, 2007	Single subject	3	Behavioral	1 Home 1 Preschool 1 Other	Communication, play	30-60 min. 1-2 times/wk.	Yes	No*
Green, Charman, McConachie, 2010	RCT	152 (77/75)	PACT	93% Clinic 7% Home	Communication	Parent, therapist & child 2 hrs biweekly for 6 months, then 1x month/ parent 30 min. daily with child	No	Yes
Green, et al, 2013	Single case series	8	Developmental, relationship based	Home	Parent-infant interactions, infant atypical behavior, visual attn, cognition	12 in-home sessions over 5 months, initially weekly; video-aided, 30 min/day by parents	No	No

Author/Year of Publication (Full citations included in References)	Research Design	# Participants	Method or Approach	Location of Intervention	Target of Intervention	Intensity of Services	Parent Implementation	Interventist Fidelity measured
Ingersoll, & Gergans, 2007	Single subject	3	Reciprocal Imitation Training	Clinic – probes at home	Social communication (imitation)	2x/wk., 10 wks.	Yes	No*
Jull, & Mirenda, 2010	Single subject	2	Behavioral, in context	Home	Social communication, peer interactions	Not clear	Yes	No*
Kasari, Gulsrud, Wong Kwon, & Locke, 2010	RCT	38 (19/19)	Behavioral, developmental	Clinic;	Joint engagement	40 min. 3x/wk., 8 wks.	Yes	Yes
Kroeger & Sorensen, 2010	Single subject	2	Behavioral, naturalistic	Home	Toilet training	6 consecutive hrs/day for 4-5 days, primarily by parent	Yes	No*
Mahoney & Perales, 2005	Quasi- experi- mental	50	Relationship based, Responsive Teaching	Parent choice	Social- emotional functioning	1 hr./wk. for 11-12 months	Expos- ure only	No
Minjarez, Williams, Mercier, & Hartman, 2011	RCT	26	PRT	Clinic	Language	Over 10 weeks: 10 90-min. group sessions, 1 50-min. individual session	Yes	No*
Nefdt, Koegel, Singer, & Gerber, 2010	RCT	34 (17/17)	PRT, self- directed learning	Home	Parent behaviors and implementation; child communication	Time required to view and implement the PRT DVD (variable)	Yes	No**
Nunes & Hanline, 2007	Single subject	1	Naturalistic	Home	Use of assistive technology for communication	Not clear	Yes	No*
Pajareya & Nopmaneejumrutsers, 2011	RCT	32 (16/16)	Comparing DIR/Eloortona + TAU to TAU (behavioral)	Clinic and Home	Overall development, severity of ASD symptoms	1 day parent workshop followed by 1.5 hrs parent training with child; 20 hrs/wk by parent	Expos- ure only	No
Park, Alher-Morgan & Cannella-Malone, 2011	Single subject	3	Behavioral	Home	Use of PECs to support communication	10-22 sessions; frequency and duration unclear	Yes	No*
Reagon & Higbee, 2009	Single subject	3	Script-fading	Home	Verbal initiating	Not clear	Yes	No*
Rocha, Schreiber, & Stahmer, 2007	Single subject	3	Behavioral	Clinic	Joint attention	17 hours over 6 weeks	Yes	No*
Rogers, Estes, Lord, Vismara, Winter, Fitzpatrick, Guo, Dawson, 2012	RCT	98 (49/49)	Early Start Denver Model	Clinic	Social communication; overall development	1 hr/week for 12 weeks	Yes	Yes

Author/Year of Publication (Full citations included in References)	Research Design	Participating Families #	Method or approach	Location of Intervention	Target of Intervention	Intensity of Services	Parent Implementation	Intervention Fidelity measured
Rogers, Hayden, Hepburn, Charlaine-Smith, Hall, & Hayes, 2006	Single subject; group analysis	10 (5/5)	Comparing Denver Model and PROMPT	Clinic	Useful speech	1x/wk., 12 wks.	Exposure only	Yes
Schertz & Odom, 2007	Single subject	3	Developmental	Home	Joint attention	1-2 x/week	Yes	No*
Schertz, Odom, Baggert, & Sidaris, 2013	RCT	23 (11/12)	Developmental	Home	Joint attention, social communication	1 x/week for at least 16 weeks	Yes	Yes
Silva, Schalock, Ayres, Bunge, & Budden, 2009	RCT	46 (23/23)	Qigong massage	Clinic and home	Sensory impairments, digestion, sleep	20 treatment parent training sessions over 5 months, plus daily massage by parents	No	Yes
Steiner, Gengoux, Klin, & Chavarria, 2013	Single subject	3	PRT (adapted for dev. Level)	80% clinic 20% home	Functional communication	10 1-hr sessions over 3 months	Yes	No
Siller, Hutman, Sigman, 2012	RCT	70 (36/34)	Relationship- based, play-based	Home	Social communication	90 min session 1x/wk for 12 weeks	No	Yes
Symon, 2005	Single subject	3	Pivotal Response Treatment (PRT)	Clinic, community	Social communication	5 days, 5 hrs/day intensive PRT	Yes	No
Tarbox, Schiff, & Najdovski, 2010	Single subject	1	Behavioral	Home	Feeding	2 meals/day over 14 days; follow up at 1, 2, 4 & 9 wks.	No	No*
Jonge, Brereton, Kiomall, Mackinnon, King, & Rinehart, 2006	RCT	105 (35/35/3 5 TAU)	Parent educ, vs cog. behavioral	Clinic	Social communication, behavior	10 90-min small group alternating with 10 60-min. individual sessions with each family, over 20 weeks	No	Yes
Yimara, & Lyons, 2007	Single subject	3	PRT	Parent choice	Joint attention	2.5 hrs. 2x/wk., 12 wks.	Yes	No*
Wetherby, & Woods, 2006	Quasi- experi- mental	35 (17 ESU/18 contrast)	Early Social Interaction (naturalistic)	Parent choice	Social interaction	1-2x/wk. for 12 months	No	Yes
Wong & Kwan, 2010	RCT, crossover	17 (9/8)	Behavioral, social-pragmatic	Clinic and home	Eye contact, use of gestures, vocalization/words	30 min/day, 5 days/wk for 2 weeks with interventionist, and 5-10 min every hour (awake) at home	Exposure only	No
Yenker, McDuffie, Weismer, & Abbeduto, 2012	RCT	14 (7/7)	Adapted Hanen "More Than Words"	Clinic	Social communication	Over 6 wks: 5 2-hr parent educ. sessions, 2 1.5-hr. individual sessions, 12-14 1- hr. small group sessions	No	Yes

* Interventionist fidelity was not measured because one of the study investigators was the interventionist

** There was no interventionist as the intervention was delivered via DVD

Table 2:

Comparison of conceptual frameworks and terms used for fidelity of implementation of intervention.

Dane & Schneider, 1998	Dunst, Trivette, Raab, 2013	Powell & Diamond, 2013	Sutherland, McLeod, Conroy, and Cox, 2013	Carroll, Patterson, Wood, Booth, Rick, & Balain, 2011	Gearing
					Intervention Design
	Implementation	Coaching			Interventionist Training
Exposure	Intervention		Frequency (Quant)	Coverage Frequency	Receipt: Dose
Adherence	Intervention		Discriminated Use	Duration Content	Delivery: Components
Quality	Intervention		Discriminated Use	(Moderator of Adherence)	Delivery: Interventionist Behaviors & Competence
Participant Responsiveness	(Outcome)	(Outcome)	(Outcome)	(Moderator of Adherence)	Receipt: Dose and Comprehension
Program Differentiation			Discriminated Use	(Result of Evaluating Fidelity and Outcomes)	Delivery: Differentiation

Table 3.

Summary of recommendations for measurement of fidelity in reviewed literature.

Recommendations	Source(s)
Development and use of conceptual models or sound theoretical bases to guide fidelity practices and measurement	Dunst, Trivette, & Raab, 2013; Ogden & Fixsen, 2014
Measure fidelity for: 1. Trainers, coaches 2. Those delivering intervention	Barton & Fetting, 2013; Dunst, et al, 2013
Measure fidelity for all participants	Ledford & Wolery, 2013; Moncher and Prinz, 1991
Measure baseline and intervention phase fidelity (in single case designs)	Ledford & Wolery, 2013
Consider research designs that allow detailed measurement of fidelity <i>and</i> adequate sample sizes	Glasgow, Magid, Beck, Ritzwoller, & Estabrooks, 2005; Ogden & Fixsen, 2014
Use of measures of fidelity that include direct counts or other methods of precise measurement	Ledford & Wolery, 2013
Link measure of fidelity to key components (active ingredients) of training/coaching	Barton & Fetting, 2013; Dunst, et al, 2013; Snyder, Hemmeter, Fox, Bishop, & Miller, 2013; Sutherland, McLeod, Conroy, and Cox, 2013
Link measure of fidelity to key components (active ingredients) of intervention delivery	Barton & Fetting, 2013; Dunst, et al, 2013; Snyder, et al, 2013; Sutherland, et al, 2013
Link key components to empirical support for those components	Dunst, et al, 2013; Snyder, et al, 2013; Sutherland, et al, 2013
Link coach/trainer fidelity to interventionist fidelity	Barton & Fetting, 2013; Dunst, et al, 2013;
Measure contextual factors (that may influence implementation or receipt of intervention)	Barton & Fetting, 2013; Ogden & Fixsen, 2014;
Measure quantitative (dose, adherence, differentiation) and qualitative (quality of delivery, participant responsiveness) aspects of fidelity	Schulte, Easton and Parker, 2009
Measure adaptations to intervention made during delivery	Dulak & DuPre, 2008
Measure and report fidelity with specificity	Ledford & Wolery, 2013

TABLE 4

Demographic characteristics of participant families.

Child's gender	Male: 66.7%	Female: 33.3%			
Mother's marital status	Married/living with partner: 88.9%	Single/Never Married: 8.3%	Widowed: 2.8%		
Number of children in family	1 child: 47.2%	2 children: 36.1%	3+ children: 16.7%		
Mother's age	21-29 yrs: 33.3%	30-34 yrs: 38.8%	35-39 yrs: 19.4%	40+ yrs: 8.3%	
Mother's race	Native American: 2.8%	African American: 22.2%	Caucasian: 75%	Mixed: 0	
Father's race	Native American: 0	African American: 27.8	Caucasian: 69.4%	Mixed: 2.8%	
Mother's employment status	Full time: 27.8%	Part time: 16.7%	Full time student: 2.8%	Not working outside the home/other: 52.7%	
Father/spouse/partner employment status (n=32)	Full time: 84.4%	Part time: 6.3%	Full time student: 0	Not working outside the home/other: 9.3%	
Mother's level of education	High school: 8.3%	Vocational/trade/ associate's degree: 8.3%	Some college: 11.1%	Bachelor's degree: 27.8%	Master's or Professional degree: 44.4%
Father/spouse/partner level of education (n=32)	High school: 12.5%	Vocational/trade/ associate's degree: 12.5%	Some college: 3.1%	Bachelor's degree: 28.1%	Master's or Professional degree: 44%
Household income (yearly, pre-tax)	\$5000-25,000: 11%	\$25,001-50,000: 17%	\$50,001-100,000: 39%	100,001-200,000: 28%	200,001+ : 5%
Family history of conditions (n=22)*	ASD: 18.2%	Language/develop-mental delay or intellectual disability: 41%	Neurological condition: 27.2%	ADHD: 36.3%	Genetic condition: 18.1%

* Percentages total more than 100 because some families reported history of more than one condition.

Table 5

Results of Principle Components Analysis of the Parent Implementation Rating Form

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	6.339	63.388	63.388
2	.864	8.644	72.032
3	.728	7.281	79.313
4	.505	5.047	84.360
5	.421	4.213	88.573
6	.325	3.246	91.819
7	.297	2.973	94.792
8	.225	2.247	97.039
9	.155	1.548	98.588
10	.141	1.412	100.000

Table 6

Results of ANOVA for PIRF Scores (Parent Fidelity) by Family

	Sum of Squares	Degrees of Freedom	Mean Square	<i>F</i>	Significance
TOTAL FIDELITY (10 items)					
Family					
Between groups	11.820	35	.338	29.063	.000
Within groups	8.692	748	.012		

Table 7:

Descriptive statistics for PIRF fidelity scores by participant (N = number of PIRF forms collected)

ID	N*	Minimum	Maximum	Mean	Std. Deviation
1	21	.59	1.00	.94	.12773
2	22	.64	1.00	.92	.09187
3	18	.70	1.00	.90	.09360
4	20	.71	1.00	.84	.09546
6	19	.76	1.00	.88	.06871
7	24	.51	.86	.77	.09229
8	12	.27	.60	.40	.08630
10	25	.31	.99	.76	.17453
13	24	.60	.90	.78	.08806
14	18	.64	.94	.77	.08082
15	25	.52	.87	.74	.08460
16	25	.44	.79	.65	.08952
17	27	.14	1.00	.84	.17964
19	28	.43	1.00	.83	.13404
20	27	.16	1.00	.75	.15716
21	25	.67	.86	.76	.04972
23	20	.70	1.00	.91	.09000
24	24	.76	1.00	.93	.05970
25	26	.40	.91	.67	.12656
26	17	.63	.99	.84	.09337
27	27	.14	.80	.67	.15472
28	21	.71	.94	.85	.05239
29	19	.62	1.00	.90	.09442
31	26	.69	.84	.77	.04528
32	19	.24	.76	.50	.16670
33	21	.14	.79	.45	.19819
34	19	.67	.96	.81	.07819
35	13	.43	.73	.60	.08225
36	27	.67	.99	.82	.08006
37	19	.66	.89	.78	.05436
38	18	.71	1.00	.88	.09630
39	26	.76	.99	.91	.06511
40	16	.49	.89	.73	.10612
41	23	.86	1.00	.96	.04508
44	23	.71	.91	.85	.04927
45	20	.50	.87	.75	.10282

Table 8

Principle Components Analysis Component Matrix for the Interventionist Fidelity Checklist, with High Positive Loadings for Components 1 and 2 in Bold

	Component						
	1	2	3	4	5	6	7
Item1	.048	.565	-.088	.500	.267	.026	.060
Item2	.523	-.313	-.062	.022	.272	.483	-.036
Item3	-.056	.840	-.130	.088	.138	-.169	-.068
Item4	.298	.113	.335	-.022	-.236	.163	.464
Item5	.139	-.045	-.100	.603	.107	-.007	-.392
Item6	.642	-.272	.121	.320	-.205	-.148	.017
Item7	.436	-.308	.010	.342	-.158	-.527	-.102
Item8	.550	-.136	.147	.104	.226	-.418	-.046
Item9	.037	-.034	.318	.638	-.277	.341	.113
Item10	.680	-.179	-.377	-.030	.256	.134	.274
Item11	.388	-.088	-.373	.094	.287	.009	.546
Item12	.302	.090	.547	-.229	.248	.228	-.237
Item13	.074	.819	-.125	.052	.030	-.120	.110
Item14	.556	.434	-.105	-.362	.018	-.024	-.120
Item15	.771	.044	-.250	-.266	-.098	.051	-.079
Item16	.719	.045	-.058	-.161	-.264	-.213	-.212
Item17	.466	.133	.341	.135	.333	.124	-.212
Item18	.533	.183	.411	-.225	-.145	.236	-.126
Item19	.433	.203	.278	-.013	-.428	-.157	.336
Item20	.166	.114	.589	.059	.377	-.220	.230
Item21	.215	.259	-.222	.307	-.219	.418	-.064
Item22	.185	.239	-.205	.030	-.448	.100	-.124
Item23	.598	-.110	-.341	.014	.102	.029	-.088

Table 9

Number of Interventionist Fidelity Checklists (Frequency) Available for Each Interventionist

Interventionist*	Number of IFCs	Valid Percent	Cumulative Percent
1	55	41.0	41.0
2	31	23.1	64.2
4	28	20.9	85.1
5	12	9.0	94.0
6	8	6.0	100.0
TOTALS	134	100.0	

*Interventionist 3 only served families which were eliminated from the study due to missing demographic data.

Table 10

Results of ANOVA Statistics for the Interventionist Fidelity Checklist

	Sum of Squares	Degrees of Freedom	Mean Square	F	Significance
TOTAL FIDELITY (23 items)					
Interventionist					
Between groups	.305	4	.076	31.917	.000
Within groups	.309	129	.002		
Family					
Between groups	.441	35	.013	7.123	.000
Within groups	.173	98	.002		
Occasion					
Between groups	.003	4	.001	.168	.954
Within groups	.611	129	.005		
IFC-ADHERENCE (Factor 1; 12 items)					
Interventionist					
Between groups	.902	4	.225	37.303	.000
Within groups	.780	129	.006		
Family					
Between groups	1.261	35	.036	8.394	.000
Within groups	.421	98	.004		
Occasion					
Between groups	.017	4	.004	.337	.853
Within groups	1.664	129	.013		
IFC-QUALITY (Factor 2; 3 items)					
Interventionist					
Between groups	.177	4	.044	6.608	.000
Within groups	.864	129	.007		
Family					
Between groups	.613	35	.018	4.011	.000
Within groups	.428	98	.004		
Occasion					
Between groups	.023	4	.006	.728	.574
Within groups	1.018	129	.008		

Table 11

Bivariate and Partial Correlations among Demographic Variables

BIVARIATE CORRELATIONS							
	Mother's age	Number of children in family	Mother's level of education	Mother's employment status	Household income	Father/spouse/partner level of education	Father/spouse/partner employment status
Mother's age	1						
Number of children in family	.199	1					
Mother's level of education	.139	-.511**	1				
Mother's employment status	-.052	-.160	-.215	1			
Household income (yearly, pre-tax)	.112	-.684**	.607**	.069	1		
Father/spouse/partner level of education (n=32)	.177	-.664**	.477**	.194	.782**	1	
Father/spouse/partner employment status (n=32)	.151	.002	.078	.369*	-.007	.051	1
PARTIAL CORRELATIONS							
Mother's age	1						
Number of children in family	.298	1					
Mother's level of education	.111	-.312	1				

Mother's employment status	-.054	-.179	-.368	1			
Father/spouse/ partner level of education (n=32)	.018	-.327	.015	.265		1	
Father/spouse/ partner employment status (n=32)	.157	-.003	.104	.370		.091	1

** $p < .001$, * $p < .05$ for bivariate correlations; ** $p < .002$, * $p < .05$ for partial correlations

Table 12

Descriptive Statistics for Ordinal Variables

	Mean	Standard Deviation	Min.	Max.	Skewness		Kurtosis	
						Std. Error		Std. Error
<i>Dependent Variable</i>								
PIRF	52.83	9.45	27.33	65.43	-1.232	.393	1.442	.768
<i>Independent Variables: Measurement Tools</i>								
AOSI	5.03	3.176	0	10	-.044	.393	-1.272	.768
MBRS Parenting Style	26.44	4.488	18	37	-.021	.393	-.115	.768
PSS	38.11	8.963	21	52	.013	.393	-1.109	.768
ICF-Adherence	4.740	.7632	3.0	5.8	-.749	.393	-.206	.768
ICF-Quality	6.001	.5456	4.3	7.0	-.723	.393	1.484	.768

Table 13

Frequency Distribution of Household Income Data, with Variable Category Labels Replaced with Actual Dollar Amounts

Household Income (pre-tax, previous year)	Frequency	Percent	Cumulative Percent
\$5,000-25,000	4	11.1	11.1
\$25,001-50,000	6	16.7	27.8
\$50,001-100,000	14	38.8	66.6
\$100,001-200,000	10	27.8	94.4
\$200,001-300,000	1	2.8	97.2
>\$300,001	1	2.8	100
Totals	36	100%	

Table 14

Results of Bivariate Correlations between Study Variables (N=36)

		PIRF	AOSI	Parenting Style	PSS	Household income	IFC-Adher.	IFC-Quality
PIRF (Average points)	Pearson Correlation	1						
	Significance							
AOSI (Number of markers)	Pearson Correlation	-.078	1					
	Significance	.651						
Parenting Style (MBRS Affect/Animation + Responsiveness)	Pearson Correlation	.444**	.069	1				
	Significance	.007	.688					
PSS (Total stress score)	Pearson Correlation	-.016	.075	-.183	1			
	Significance	.926	.663	.285				
Household income (Pre-tax previous year)	Pearson Correlation	.543**	.247	.479**	-.114	1		
	Significance	.001	.147	.003	.510			
IFC-Adherence	Pearson Correlation	.397*	.243	-.135	-.055	.357*	1	
	Significance	.017	.153	.432	.750	.033		
IFC-Quality	Pearson Correlation	.249	.105	.340*	-.041	.518**	.098	1
	Significance	.144	.543	.042	.811	.001	.568	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 15

Summary of Models for Prediction of Parent Implementation Fidelity Scores by Household Income, Parenting Style, and IFC-Adherence (Interventionist Adherence Fidelity)

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.543 ^a	.295	.274	8.05052	.295	14.200	1	34	.001
2	.582 ^b	.339	.298	7.91288	.044	2.193	1	33	.148
3	.663 ^c	.440	.388	7.39359	.101	5.798	1	32	.022
a. Predictors: (Constant), Household income									
b. Predictors: (Constant), Household income, Parenting style									
c. Predictors: (Constant), Household income, Parenting style, IFC-Adherence									

Table 16

Analysis of Variance for Regression Models for Prediction of Parent Implementation Fidelity Scores by Household Income, Parenting Style, and IFC-Adherence (Interventionist Adherence Fidelity)

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	920.286	1	920.286	14.200	.001 ^b
	Residual	2203.570	34	64.811		
	Total	3123.856	35			
2	Regression	1057.604	2	528.802	8.445	.001 ^c
	Residual	2066.253	33	62.614		
	Total	3123.856	35			
3	Regression	1374.569	3	458.190	8.382	.000 ^d
	Residual	1749.287	32	54.665		
	Total	3123.856	35			
a. Dependent Variable: PIRF average points						
b. Predictors: (Constant), Household income						
c. Predictors: (Constant), Household income, Parenting style						
d. Predictors: (Constant), Household income, Parenting style, IFC-Adherence						

Table 17

Beta (β) and Correlation Coefficients for Regression Models for Prediction of Parent Implementation Fidelity Scores by Household Income, Parenting Style, and IFC-Adherence (Interventionist Adherence Fidelity)

Coefficients ^a										
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for β		Correlations	
		β	Std. Error	β			Lower Bound	Upper Bound	Partial	Part
1	(Constant)	39.526	3.778		10.463	.000	31.849	47.203		
	Household income	1.069	.284	.543	3.768	.001	.493	1.646	.543	.543
2	(Constant)	29.034	7.999		3.630	.001	12.761	45.308		
	Household income	.844	.318	.428	2.656	.012	.197	1.490	.420	.376
	Parenting Style	.503	.340	.239	1.481	.148	-.188	1.194	.250	.210
3	(Constant)	4.268	12.714		.336	.739	-21.629	30.165		
	Household income	.448	.339	.227	1.319	.197	-.244	1.139	.227	.174
	Parenting Style	.810	.342	.385	2.369	.024	.114	1.507	.386	.313
	IFC-Adherence	4.550	1.890	.368	2.408	.022	.701	8.399	.392	.319

a. Dependent Variable: PIRF average points

Table 18

Conceptual alignment of items on the IFC and PIRF.

* ITEMS FROM FULL ICF, EXCEPT “DOCUMENTATION”	ITEMS FROM PIRF
	1. Was prepared for the session (present, child and parent ready to engage and focus on session, space made available for play)
1. <i>Interact warmly with parents and child</i>	
2. Review and encourage parents to talk about information from previous session	2. Confirmed use of intervention strategies since last session 3. Reflected on success/difficulties of implementation and any changes noted in child behaviors
3. <i>Demonstrate positive attitude toward child</i>	
4. Provide positive feedback to parents regarding their participation or demonstration of new skills	
5. Be attentive to parents	
6. Describe purpose and focus of today’s session	
7. Discuss rationale for the strategy being presented	
8. Assess or describe the child’s current use of the pivotal behavior objective	
9. Speak at parents’ level of understanding	
10. Assess parents’ understanding of information	8. Demonstrated understanding of the intervention strategies 9. Indicated adequate level of comfort in implementing new strategies
11. Encourage parents’ comments, questions, and concerns	6. Asked relevant questions and/or made relevant comments
12. Have session plan sheets and/or videos ready	
13. <i>Engage responsively when interacting with the child</i>	
14. Model ART strategy that is the focus of today’s session	
15. Explain strategy during and/or after it is modeled	
16. Demonstrate and explain the impact of ART strategy on child’s behavior	
17. Involve the parents in interactions with their child	4. Actively participated in the session (engaged and attentive during entire

	session, interacting with child and/or interventionist throughout) 5. Interacted frequently and appropriately with the child
18. Coach parents while they interact with their child	7. Practiced new strategies with coaching from interventionist
19. Give parents feedback regarding their use of the focal strategy	7. Practiced new strategies with coaching from interventionist
20. Develop with parents a written plan for follow-through activities (on session plan)	10. Collaborated with interventionist in generating ideas for implementation of strategies during daily activities and routines between intervention sessions
21. Develop a plan to address barriers to follow-through activities, as needed	10. Collaborated with interventionist in generating ideas for implementation of strategies during daily activities and routines between intervention sessions
22. Appropriately address concerns parents have raised (whether or not they are directly related to A.R.T.)	
23. Summarize discussion points, strategies, and plans that were covered during the session	

* Items in **bold** comprise ICF-Adherence, and items in *italics* comprise ICF-Quality. Blue blocks indicate items from ICF and PIRF that are conceptually related.

REFERENCES

- Abrahams, B.S. & Geschwind, D.H. (2008). Advances in ASD genetics: On the threshold of a new neurobiology. *Nature Reviews: Genetics*, 9, 341-355.
- Aldred, C., Green, J., & Adams, C. (2004). A new social communication intervention for children with ASD: Pilot randomized controlled treatment study suggesting effectiveness. *Journal of Child Psychology and Psychiatry*, 45, 1420–1430.
- American Academy of Pediatrics, Committee on Children with Disabilities (2001). The pediatrician's role in the diagnosis and management of autistic spectrum disorder in children. *Pediatrics*, 107, 1221–1226.
- Ardyson, B. & Wakeford, L. (2017). *Mothers' experiences of therapists' use of self in early intervention occupational therapy*. Manuscript in preparation.
- Baker, C.N., Kupersmidt, J.B., Voegler-Lee, M.E., Arnold, D.H., & Willoughby, M.T. (2010). Predicting teacher participation in a classroom-based, integrated preventive intervention for preschoolers. *Early Childhood Research Quarterly*, 25, 270–283.
- Baranek, G.T., Watson, L.R., Turner Brown, L., Field, S.H., Crais, E.R., Wakeford, L., Little, L.M., & Reznick, J.S. (2015). Preliminary efficacy of Adapted Responsive Teaching for infants at-risk for autism spectrum disorder in a community sample. *Autism Research and Treatment*. <http://dx.doi.org/10.1155/2015/386951>.
- Baranek, G., Wakeford, L., & David, F. (2008). Understanding, assessing, and treating sensory-motor issues in young children with ASD. In K. Chawarska, F. Volkmar, & A. Klin, (Eds.) *ASD Spectrum Disorders in Infancy and Early Childhood*; Guilford Press.
- Barton, E.E. & Fettig, A. (2013). Parent-implemented interventions for young children with disabilities: A review of fidelity features. *Journal of Early Intervention*, 35, 194-210.
- Ben Chaabane, D.B., Alber-Morgan, S.R., & DeBar, R.M. (2009). The effect of parent-implemented PECS training on improvisation of mands by children with ASD. *Journal of Applied Behavior Analysis*, 42, 671–677.

- Berry, J. O. & Jones, W. H. (1995). The Parental Stress Scale: Initial psychometric evidence. *Journal of Social and Personal Relationships, 12*, 463-472.
- Bonder, B.R., Martin, L., & Miracle, A.W. (2004). Culture emergent in occupation. *American Journal of Occupational Therapy, 58*, 159-168.
- Boyd, B.A., Odom, S. L., Humphreys, B. P., Sam, A. M. (2010). Infants and toddlers with autism spectrum disorder: Early identification and early intervention. *Journal of Early Intervention, 32*, 75-98.
- Breitenstein, S.M., Fogg, L., Garvey, G., Hill, C., Resnick, B., & Gross, D. (2010). Measuring implementation fidelity in a community-based parenting intervention. *Nursing Research, 59*, 158-165.
- Breitenstein, S.M., Gross, D., Garvey, G., Hill, C., Fogg, L., & Resnick, B. (2010). Implementation fidelity in community-based interventions. *Research in Nursing & Health, 33*, 164-173.
- Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist, 32*, 513-531.
- Bryson, S.E., Zwaigenbaum, L., McDermott, C., Rombough, V., & Brian, J. (2008). The Autism Observation Scale for Infants: Scale development and reliability data. *Journal of Autism and Developmental Disorders, 38*, 731-738.
- Butler, A.M. & Titus, C. (2015). Systematic review of engagement in culturally adapted parent training for disruptive behavior. *Journal of Early Intervention, 37*, 300-318.
- Calzada, E. J., Huang, K. Y., Anicama, C., Fernandez, Y., & Brotman, L. M. (2012). Test of a cultural framework of parenting with Latino families of young children. *Cultural Diversity & Ethnic Minority Psychology, 18*, 285-296. doi:10.1037/a0028694
- Carr, T., Shih, W., Lawton, K., Lord, C., King, B., & Kasari, C. (2016). The relationship between treatment attendance, adherence, and outcome in a caregiver-mediated intervention for low-resourced families of young children with autism spectrum disorder. *Autism, 20*, 643-652.

- Carroll, C., Patterson, M., Wood, S., Booth, A., Rick, J., & Balain, S. (2007). A conceptual framework for implementation fidelity. *Implementation Science*, 2, 40. doi:10.1186/1748-5908-2-40
- Casenhiser, D.M., Shanker, S.G., & Stieben, J. (2013). Learning through interaction in children with ASD: Preliminary data from a social-communication-based intervention. *Autism*, 17, 220-241.
- Chao, R. & Kanatsu, A. (2008). Beyond socioeconomics: Explaining ethnic group differences in parenting through cultural and immigration processes. *Applied Developmental Science*, 12, 181–187.
- Chung, M., Snodgrass, M.R., Meadan, H., Akamoglu, Y., & Halle, J.W. (2016). Understanding communication intervention for young children with autism and their parents: Mixing behavioral and social validity findings. *Journal of Developmental and Physical Disabilities*, 28, 113-134.
- Cutchin, M. P., & Dickie, V. A. (2012). Transactionalism: Occupational science and the pragmatic attitude. In G. Whiteford & C. Hocking (Eds.), *Critical Perspectives on Occupational Science: Society, Inclusion, Participation* (pp. 23–37). London: Wiley.
- Dane, A.V. & Schneider, B.H. (1998). Program integrity in primary and early secondary prevention: Are implementation effects out of control? *Clinical Psychology Review*, 18, 23-45.
- Danko, C.M., Brown, T., Van Schoick, L., & Budd, K.S. (2016). Predictors and correlates of homework completion and treatment outcomes in Parent–Child Interaction Therapy. *Child & Youth Care Forum*, 45, 467–485. doi:10.1007/s10566-015-9339-5
- Darrow, C. (February 15, 2011). Personal communication.
- Dawson, G., Rogers, S., Munson, J., Smith, M., Winter, J., Greenon, J., et al. (2010). Randomized controlled trial of an intervention for toddlers with autism: The Early Start Denver Model. *American Academy of Pediatrics: Pediatrics*, 125, e17–23.
- Dewey, J. (1922). *Human Nature and Conduct: An Introduction to Social Psychology*. New York: Henry Holt and Company.

- Dunlap, G., Ester, T., Langhans, S., & Fox, L. (2006). Functional communication training with toddlers in home environments. *Journal of Early Intervention, 28*, 81-96.
- Dunn, W. (2007). Supporting children to participate successfully in everyday life by using sensory processing knowledge. *Infants & Young Children, 20*, 84-101.
- Dunn, W., Saiter, J., & Rinner, L. (2002). Asperger syndrome and sensory processing: A conceptual model and guidance for intervention planning. *Focus on Autism and Other Developmental Disabilities, 17* (3), 172-185.
- Dunst, C.J., Trivette, C.M., & Raab, M. (2013). An implementation science framework for conceptualizing and operationalizing fidelity in early childhood intervention studies. *Journal of Early Intervention, 35*, 85-101.
- Durlak, J.A. (2010). The importance of doing well in whatever you do: A commentary on the special section, "Implementation research in early childhood education." *Early Childhood Research Quarterly, 25*, 348–357.
- Durlak, J. A., & DuPre, E. P. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American Journal of Community Psychology, 41*, 327–350.
- Elder, J. H., Valcante, G., Yarandi, H., White, D., & Elder, T. H. (2005). Evaluating in-home training for fathers of children with ASD using single-subject experimentation and group analysis methods. *Nursing Research, 54*, 22–32.
- Feldman, R. (2007). Parent–infant synchrony and the construction of shared timing; physiological precursors, developmental outcomes, and risk conditions. *Journal of Child Psychology and Psychiatry, 48*, 329–354.
- Fletcher, A.C., Walls, J.K., Cook, E.C., Madison, K.J., & Bridges, T.H. (2008). Parenting style as a moderator of associations between maternal disciplinary strategies and child well-being. *Journal of Family Issues, 29*, 1724-1744.
- Gearing, R.E., El-Bassel, N., Ghesquiere, A., Baldwin, S., Gillies, J., & Ngeow, E. (2011). Major ingredients of fidelity: A review and scientific guide to improving quality of intervention research implementation. *Clinical Psychology Review, 31*, 79-88.

- Gentry, J.A., & Luiselli, J.K. (2008). Treating a child's selective eating through parent implemented feeding intervention in the home setting. *Journal of Developmental and Physical Disabilities, 20*, 63-70.
- George, D., & Mallery, M. (2010). *SPSS for Windows Step by Step: A Simple Guide and Reference, 17.0 update*. Boston: Pearson.
- Gillett, J.N. & LeBlanc, L. A. (2007). Parent-implemented natural language paradigm to increase language and play in children with ASD. *Research in Autism Spectrum Disorders, 1*, 247–255.
- Glasgow, R.E., Magid, D.J., Beck, A., Ritzwoller, D., & Estabrooks, P.A. (2005). Practical clinical trials for translating research to practice: Design and measurement recommendations. *Medical Care, 43*, 551–557.
- Green, J., Wan, M.W., Guiraud, J., Holsgrove, S., McNally, J., Slonims, V., Elsabbagh, M., Charman, T., Pickles, A., Johnson, M., & the BASIS Team (2013). Intervention for infants at risk of developing autism: A case series. *Journal of Autism and Developmental Disorders*. Advance online publication. doi:10.1007/s10803-013-1797-8.
- Green, L. W. (2008). Making research relevant: If it is an evidence-based practice, where's the practice-based evidence? *Family Practice, 25*, 20–24.
- Haine-Schlagel, R. & Walsh, N.E. (2015). A review of parent participation engagement in child and family mental health treatment. *Clinical Child and Family Psychology Review, 18*, 133-150.
- Hamre, B.K., Justice, L.M., Pianta, R.C., Kilday, C., Sweeney, B., Downer, J.T., & Leach, A. (2010). Implementation fidelity of My Teaching Partner literacy and language activities: Association with preschoolers' language and literacy growth. *Early Childhood Research Quarterly, 23*, 329-347.
- Hardan, A.Y., Gengoux, G.W., Berquist, K.L., Libove, R.A., Ardel, C.M., Phillips, J., Frazier, T.W., & Minjarez, M.B. (2015). A randomized controlled trial of Pivotal Response Treatment Group for parents of children with autism. *Journal of Child Psychology and Psychiatry, 56*, 884–892.

- Harrison, C., Romer, T., Simon, M.C., & Schulze, C. (2007). Factors influencing mothers' learning from paediatric therapists: A qualitative study. *Physical & Occupational Therapy in Pediatrics, 27*, 77-96.
- Hendrick, D. R. (2009). Overview of parent-implemented intervention. Chapel Hill, NC: The National Professional Development Center on ASD, Frank Porter Graham Child Development Institute, University of North Carolina.
- Hock, R., Kinsman, A., & Ortaglia, A. (2015). Examining treatment adherence among parents of children with autism spectrum disorder. *Disability and Health Journal*,
- Holtrop, K., Chaviano, C.L., Scott, J.C., & Smith, S.M. (2015). Identifying relevant components to include in a parenting intervention for homeless families in transitional housing: Using parent input to inform adaptation efforts. *American Journal of Orthopsychiatry, 85*, 600 – 611.
- ICEBeRG. (2006). Designing theoretically-informed implementation interventions. *Implementation Science, 1*, 4.
- Ingersoll, B., & Gergans, S. (2007). The effect of a parent implemented imitation intervention on spontaneous imitation skills in young children with ASD. *Research in Developmental Disabilities, 28*, 163–175.
- Ingersoll, B., & Schreibman, L. (2006). Teaching reciprocal imitation skills to young children with autism using a naturalistic behavioral approach: Effects on language, pretend play, and joint attention. *Journal of Autism and Developmental Disorders, 36*, 487–505.
- Jaegermann, N. and Klein, P.S. (2010). Enhancing mothers' interactions with toddlers who have sensory-processing disorders. *Infant Mental Health Journal, 31*, 291–311.
- Johnson, C.P. & Myers, S.M. (2007). Identification and evaluation of children with autism spectrum disorders. *Pediatrics, 120*, 1183-1216.
- Justice, L.M., Skibbe, L.E., McGinty, A.S., Piasta, S.B., & Petrill, S. (2011). Feasibility, efficacy, and social validity of home-based storybook reading intervention for children with language impairment. *Journal of Speech, Language, and Hearing Research, 54*, 523–538.

- Kaiser, A.P. & Hemmeter, M.L. (2013). Treatment fidelity in early childhood special education research: Introduction to the special issue. *Journal of Early Intervention, 35*, 79-84.
- Kasari, C. (October, 2007). Personal communication.
- Kasari, C., Freeman, S., & Paparella, T. (2006). Joint attention and symbolic play in young children with autism: A randomized controlled intervention study. *Journal of Child Psychology and Psychiatry, 47*, 611-620.
- Kasari, C., Gulsrud, A.C., Wong, C., Kwon, S., & Locke, J. (2010). Randomized controlled caregiver mediated joint engagement intervention for toddlers with autism. *Journal of Autism & Developmental Disorders, 40*, 1045-1056.
- Kasari, C., Paparella, T., & Gulsrud, A. (2007). *Treatment Manual: Teaching Joint Attention and Symbolic Play to Toddlers with Autism and Their Parents*. (Unpublished).
- Kashinath, S., Woods, J., & Goldstein, H. (2006). Enhancing generalized teaching strategy use in daily routines by parents of children with autism. *Journal of Speech, Language, and Hearing Research, 49*, 466-485.
- Kinard, J.L., Sideris, J., Watson, L.R., Baranek, G.T., Crais, E.R., Wakeford, L., Turner-Brown, L. (2017). Predictors of parent responsiveness to 1-year-olds at-risk for autism spectrum disorder. *Journal of Autism and Developmental Disorders, 47*, 172-186.
- Klimes-Dougan, B., August, G.J., Lee, C.S., Realmuto, G.M., Bloomquist, M.L., Horowitz, J.L., & Eisenberg, T.L. (2009). Practitioner and site characteristics that relate to fidelity of implementation: The Early Risers prevention program in a going-to-scale intervention trial. *Professional Psychology: Research and Practice, 40*, 467-475.
- Knoche, L.L., Sheridan, S.M., Edwards, C.P., & Osborn, A.Q. (2010). Implementation of a relationship-based school readiness intervention: A multidimensional approach to fidelity measurement for early childhood. *Early Childhood Research Quarterly, 25*, 299-313.
- Koegel, R. L., Bimbela, A., & Schreibman, L. (1996). Collateral effects of parent training on family interactions. *Journal of Autism and Developmental Disorders, 26*(3), 347-359.

- Kroeger, K. & Sorensen, R. (2010). A parent training model for toilet training children with autism. *Journal of Intellectual Disability Research*, 54, 556–567.
- Kummerer, S.E. & Lopez-Reyna, N.A. (2006). The role of Mexican immigrant mothers' beliefs on parental involvement in speech–language therapy. *Communication Disorders Quarterly*, 27, 83–94.
- Landry, S.H., Smith, K.E., & Swank, P.R. (2006). Responsive parenting: Establishing early foundations for social, communication, and independent problem solving skills. *Developmental Psychology*, 42, 627-642.
- Ingersoll, B., Lewis, E., & Kroman, E. (2007). Teaching the imitation and spontaneous use of descriptive gestures in young children with ASD using a naturalistic behavioral intervention. *Journal of Autism and Developmental Disorders*, 37, 1446–1456.
- Itzchak, E.B. & Zachor, D.A. (2011). Who benefits from early intervention in autism spectrum disorders? *Research in Autism Spectrum Disorders*, 5, 345–350.
- Ledford, J.R. & Wolery, M. (2013). Procedural fidelity: An analysis of measurement and reporting practices. *Journal of Early Intervention*, 35, 173-193.
- LeVine, R. A. & New, R. S. (2008). Introduction. In R. A. Levine & R.S. New (Eds.). *Anthropology and Child Development: A Cross-cultural Reader* (pp.1-7). Malden, MA: Blackwell Publishing Ltd.
- Lieber, J., Butera, G., Hanson, M., Palmer, S., Horn, E., Czaja, C., Diamond, K., Goodman-Jansen, G., Daniels, J., Gutpa, S., & Odom, S. (2009). Factors that influence the implementation of a new preschool curriculum: Implications for professional development. *Early Education and Development*, 20, 456-481.
doi:[10.1080/10409280802506166](https://doi.org/10.1080/10409280802506166)
- Lieberman-Betz, R.G. (2015). A systematic review of fidelity of implementation in parent-mediated early communication intervention. *Topics in Early Childhood Special Education*, 35, 15–27.
- Lord, C., Risi, S., DiLavore, P.S., Shulman, C., Thurm, A., & Pickles, A. (2006). Autism from 2 to 9 years of age. *Archives of General Psychiatry*, 63, 694-701.

- Maccoby, E. E., & Martin, J. A. (1983). Socialization in the context of the family: Parent–child interaction. In P. H. Mussen & E. M. Hetherington (Eds.), *Handbook of Child Psychology: Vol. 4. Socialization, Personality, and Social Development* (4th ed., pp. 1-101). New York: John Wiley.
- Mahoney G. (1992). The Maternal Behavior Rating Scale-Revised. Cleveland, OH: Case Western Reserve University (available from the author).
- Mahoney, G. & Perales, F. (2003). Using relationship-focused intervention to enhance the social–emotional functioning of young children with autism spectrum disorders. *Topics in Early Childhood Special Education, 23*, 77-89.
- Mahoney, G., & Perales, F. (2005). Relationship-focused early intervention with children with pervasive developmental disorders and other disabilities: A comparative study. *Journal of Developmental and Behavioral Pediatrics, 26*(2), 77–85.
- Mahoney, G.J. & MacDonald, J. (2007). ASD and Developmental Delays in Young Children: The Responsive Teaching Curriculum for Parents and Professionals Manual. Austin: PRO-ED, Inc.
- Mahoney, G. & Wiggers, B. (2007). The role of parents in early intervention: Implications for social work. *Children & Schools, 29*, 7-15.
- Manz, P.H., Gernhart, A.L., Bracaliello, C.B., Pressimone, V.J., & Eisenberg, R.A. (2014). Preliminary development of the Parent Involvement in Early Learning Scale for low-income families enrolled in a child-development-focused home visiting program. *Journal of Early Intervention, 36*, 171–191. doi: 10.1177/1053815115573077
- Matson, J.L., Rieske, R.D., & Tureck, K. (2011). Additional considerations for the early detection and diagnosis of autism: Review of available instruments. *Research in Autism Spectrum Disorders, 5*, 1319-1326.
- McCollum, J. A. & Yates, T. J. (2001). Cross-cultural perspectives on approaches to parent–infant interaction intervention. Technical report. Early Childhood Research Institute on Culturally and Linguistically Appropriate Services.
<http://www.eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=ED479105>

- McConachie, H., Fletcher-Watson, S., & Working Group 4, COST Action 'Enhancing the Scientific Study of Early Autism,' (2014). Building capacities for rigorous controlled trials in autism: The importance of measuring treatment adherence. *Child: Care, Health and Development*. doi:10.1111/cch.12185
- Minjarez, M.B., Williams, S.E., Mercier, E.M., & Hardan, A.Y. (2011). Pivotal Response group treatment program for parents of children with ASD. *Journal of Autism and Developmental Disorders*, 41, 92-101.
- Moncher, F. J., & Prinz, R. J. (1991). Treatment fidelity in outcome studies. *Clinical Psychology Review*, 11, 247-266.
- Morawska, A., Ramadewi, M.D., & Sanders, M.R. (2014). Using epidemiological survey data to examine factors influencing participation in parent-training programmes. *Journal of Early Childhood Research*, 12, 264–278. doi: 10.1177/1476718X14536952
- Mullen, E. M. (1995). *Mullen Scales of Early Learning*: AGS edition. Circle Pines, MN: American Guidance Service.
- Nefdt, N., Koegel, R., Singer, G., & Gerber, M. (2010). The use of a self directed learning program to provide introductory training in pivotal response treatment to parents of children with autism. *Journal of Positive Behavior Interventions*, 12, 23–32.
- Nock, M.K., Ferriter, C., & Holmberg, E. (2007). Parent beliefs about treatment credibility and effectiveness: Assessment and relation to subsequent treatment participation. *Journal of Child and Family Studies*, 16, 27–38.
- Noe, S., Spencer, T.D., Kruse, L., & Goldstein, H. (2014). Effects of a tier 3 phonological awareness intervention on preschoolers' emergent literacy. *Topics in Early Childhood Special Education*, 34, 27-39.
- O'Donnell, C.L. (2008). Defining, conceptualizing, and measuring fidelity of implementation and its relationship to outcomes in K-12 curriculum intervention research. *Review of Educational Research*, 78, 33-84.

- Odom, S.L., Fleming, K., Diamond, K., Lieber, J., Hanson, M., Butera, G., Horn, E., Palmer, S., & Marquis, J. (2010). Examining different forms of implementation and in early childhood curriculum research. *Early Childhood Research Quarterly, 25*, 314-328.
- Ogden, T. & Fixsen, D.L. (2014). Implementation science: A brief overview and a look ahead. *Zeitschrift fur Psychologie, 222*, 4–11.
- Olson, S.L. & Lunkenheimer, E.S. (2009). Expanding concepts of self-regulation to social relationships: Transactional processes in the development of early behavioral adjustment. In A. Sameroff (Ed.), *The Transactional Model of Development: How Children and Contexts Shape Each Other* (pp.55-76). Washington, DC: American Psychological Association.
- Pajareya, K. & Nopmaneejumruslers, K. (2011). A pilot randomized controlled trial of DIR/Floortime™ parent training intervention for pre-school children with autistic spectrum disorders. *Autism, 15*, 563-577.
- Park, H. & Lau, A.S. (2016). Socioeconomic status and parenting priorities: Child independence and obedience around the world. *Journal of Marriage and Family, 78*, 43–59. doi:10.1111/jomf.12247
- Pence, K.M., Justice, A.L., & Wiggins, L.K. (2008). Preschool teachers' fidelity in implementing a comprehensive language-rich curriculum. *Language, Speech, and Hearing Services in Schools, 39*, 329–341.
- Pereira, A. I., Muris, P., Mendonca, D., Barros, L., Goes, A. R., & Marques, T. (2015). Parental involvement in cognitive-behavioral intervention for anxious children: Parents' in-session and out-session activities and their relationship with treatment outcome. *Child Psychiatry and Human Development*. doi:10.1007/s10578-015-0549-8.
- Peters, S., Calam, R., & Harrington, R. (2005). Maternal attributions and expressed emotion as predictors of attendance at parent management training. *Journal of Child Psychology and Psychiatry, 46*, 436–448.
- Pianta, R. C., La Paro, K., & Hamre, B. K. (2008). *Classroom assessment scoring system*. Baltimore: Brookes.

- Pierce, K., Carter, C., Weinfeld, M., Desmond, J., Hazin, R., Bjork, R., & Gallagher, N. (2011). Detecting, studying, and treating autism early: The one-year well-baby check-up approach. *Journal of Pediatrics*, *159*, 548-465.
- Powell, D.R. & Diamond, K.E. (2013). Implementation fidelity of a coaching-based professional development program for improving Head Start teachers' literacy and language instruction. *Journal of Early Intervention*, *35*, 102-128.
- Randolph, J.K., Stichter, J.P., Schmidt, C.T., & O'Connor, K.V. (2011). Fidelity and effectiveness of PRT implemented by caregivers without college degrees. *Focus on Autism and Other Developmental Disabilities*, *26*, 230-238.
- Reyno, S. M., & McGrath, P. J. (2006). Predictors of parent training efficacy for child externalizing behavior problems: A meta-analytic review. *Journal of Child Psychology and Psychiatry*, *47*, 99–111.
- Reznick, J. S., Baranek, G. T., Reavis, S., Watson, L. R. & Crais, E. R. (2007). A parent report instrument for identifying one-year-olds at risk for an eventual diagnosis of autism: The First Year Inventory. *Journal of Autism and Developmental Disorders*, *37*, 1691-1710.
- Richman, A.L., Miller, P.M., & LeVine, R.A. (1992). Cultural and educational variations in maternal responsiveness. *Developmental Psychology*, *28*, 614-621.
- Robins, D.L., Fein, D., Barton, M.L., & Green, J. A. (2001). The modified checklist for autism in toddlers: an initial study investigating the early detection of autism and pervasive developmental disorders. *Journal of Autism and Developmental Disorders*, *3*, 131–144.
- Rocha, M.L., Schreibman, L., & Stahmer, A.C. (2007). Effectiveness of training parents to teach joint attention in children with autism. *Journal of Early Intervention*, *29*, 154-172.
- Rogers, S.J., Estes, A., Lord, C., Vismara, L, Winter, J., Fitzpatrick, A., Guo, M., & Dawson, G. (2012). Effects of a brief Early Start Denver Model (ESDM)-based parent intervention on toddlers at risk for Autism Spectrum Disorders: A randomized controlled trial. *Journal of the American Academy of Child & Adolescent Psychiatry*, *51*, 1052-1065.

- Rogers, S.J., Vismara, L., Wagner, A.L., McCormick, C., Young, G., & Ozonoff, S. (2014). Autism treatment in the first year of life: A pilot study of Infant Start, a parent-implemented intervention for symptomatic infants. *Journal of Autism and Developmental Disorders*, *44*, 2981–2995. DOI 10.1007/s10803-014-2202-y
- Rollins, P.R., Campbell, M., Hoffman, R.T., & Self, K. (2016). A community-based early intervention program for toddlers with autism spectrum disorders. *Autism : The International Journal of Research and Practice*, *20*, 219-232.
- Salari, R. & Filus, A. (2017). Using the Health Belief Model to explain mothers' and fathers' intention to participate in universal parenting programs. *Prevention Science*, *18*, 83-94.
- Sameroff, A. (2010). A unified theory of development: A dialectic integration of nature and nurture. *Child Development*, *81*, 6–22.
- Sameroff, A. J. (1983). Developmental systems: Contexts and evolution. In W. Kessen (Series Ed.) & P. H. Mussen (Vol Ed.). *Handbook of Child Psychology: Vol. 1. History, Theories, and Methods*. (pp. 238–294). New York: Wiley.
- Sameroff, A. J. (1999). Ecological perspectives on developmental risk. In J. D. Osofsky & H. E. Fitzgerald (Eds.), *WAIMH Handbook of Infant Mental Health: Vol. 4. Infant Mental Health Groups at Risk* (pp. 223–248). New York: Wiley.
- Sameroff, A. J. (2006). Identifying risk and protective factors for healthy youth development. In A. Clarke-Stewart & J. Dunn (Eds.), *Families Count: Effects on Child and Adolescent Development* (pp. 53–76). Cambridge, UK: Cambridge University Press.
- Sameroff, A. J. (Ed.) (2009). *The Transactional Model of Development: How Children and Contexts Shape Each Other*. Washington, DC: American Psychological Association.
- Sameroff, A. J., & Emde, R. N. (Eds.) (1989). *Relationship Disturbances in Early Childhood: A Developmental Approach*. New York: Basic Books.
- Sameroff, A.J., & Fiese, B.H. (2000). Transactional regulation: The developmental ecology of early intervention. In J.P. Shonkoff & S.J. Meisels (Eds.), *Handbook of Early Childhood Intervention* (2nd edition, pp. 135-159). New York: Cambridge University Press.

- Sandall, S., Hemmeter, M.L., Smith, B.J., & McLean, M.E. (Eds.) (2005). *DEC Recommended Practices: A Comprehensive Guide for Practical Application in Early Intervention/Early Childhood Special Education*. Missoula, MT: Division for Early Childhood.
- Schertz, H. H., & Odom, S. L. (2007). Promoting joint attention in toddlers with autism: A parent-mediated developmental model. *Journal of Autism and Developmental Disorders*, *37*, 1562–1575.
- Schertz, H. H., Odom, S. L., Baggett, K.M., & Sideris, J.H. (2013). Effects of Joint Attention Mediated Learning for toddlers with autism spectrum disorders: An initial randomized controlled study. *Early Childhood Research Quarterly*, *28*(2), 249-258.
- Schulte, A., Easton, J. E., & Parker, J. (2009). Advantages in treatment integrity research: Multidisciplinary perspectives on the conceptualization, measurement, and enhancement of treatment integrity. *School Psychology Review*, *38*, 460-475.
- Snyder, P.A., Hemmeter, M.L., Fox, L., Bishop, C.C., & Miller, M.D. (2013). Developing and gathering psychometric evidence for a fidelity instrument: The Teaching Pyramid Observation Tool—pilot version. *Journal of Early Intervention*, *35*, 150-172.
- Solomon, R., Van Egeren, L.A., Mahoney, G., Huber, M.S.Q., & Zimmerman, P. (2014). PLAY project home consultation intervention program for young children with Autism Spectrum Disorders: A randomized controlled trial. *Journal of Developmental and Behavioral Pediatrics*, *35*, 475 - xxx
- Spoth, R.L., Redmond, C., Kahn, J.H., & Shin, C. (1997). A prospective validation study of inclination, belief, and context predictors of family-focused prevention involvement. *Family Proc*, *36*, 403-429.
- Stadnick, M.S., Stahmer, A., & Brookman-Frazee, L. (2015). Preliminary effectiveness of Project ImPACT: A parent-mediated intervention for children with autism spectrum disorder delivered in a community program. *Journal of Autism and Developmental Disorders*, *45*, 2092–2104.
- Stadnick, N., Haine-Schlagel, R., & Martinez, J.I. (2016). Using observational assessment to help identify factors associated with parent participation engagement in community-based child mental health services. *Child & Youth Care Forum*, *45*, 745-758.

- Steiner, A.M., Gengoux, G.W., Klin, A., & Chawarska, K. (2013). Pivotal Response Treatment for infants at-risk for Autism Spectrum Disorders: A pilot study. *Journal of Autism and Developmental Disorders, 43*, 91-102.
- Stone, W. L., Coonrod, E. E., & Ousley, O. Y. (2000). Screening tool for autism in two-year-olds (STAT): Development and preliminary data. *Journal of Autism and Developmental Disorders, 30*, 607–612.
- Strain, P.S. & Bovey II, E.H. (2011). Randomized, controlled trial of the leap model of early intervention for young children with autism spectrum disorders. *Topics in Early Childhood Special Education, 31*, 133-154.
- Strauss, K., Vicari, S., Valeri, G., D’Elia, L., Arima, S., & Fava, L. (2012). Parent inclusion in Early Intensive Behavioral Intervention: The influence of parental stress, parent treatment fidelity and parent-mediated generalization of behavior targets on child outcomes. *Research in Developmental Disabilities, 33*, 688-703.
- Sutherland, McLeod, Conroy, and Cox, (2013). Measuring implementation of evidence-based programs targeting young children at risk for emotional/behavioral disorders: Conceptual issues and recommendations. *Journal of Early Intervention, 35*, 129-149.
- Symes, M.D., Remington, B., Brown, T., & Hastings, R.P. (2006). Early Intensive Behavioral Intervention for children with ASD: Therapists’ perspectives on achieving procedural fidelity. *Research in Developmental Disabilities, 27*, 30-42.
- Tarbox, J., Schiff, A., & Najdowski, A.C. (2010). Parent-implemented procedural modification of escape extinction in the treatment of food selectivity in a young child with autism. *Education and Treatment of Children, 33*, 223-234.
- Taylor, W.D., Asgary-Eden, V., Lee, C.M., & LaRoche, K.J. (2015). Service providers’ adherence to an evidence-based parenting program: What are they missing and why? *Journal of Child and Family Studies, 24*, 50–56.
- Turner-Brown. L.M., Baranek, G. B., Reznick, J.S., Watson, L.R., Crais, E. (2012). The First Year Inventory: A longitudinal follow-up of 12-month-old to 3-year-old children. *Autism*. Advance online publication. doi: 10.1177/1362361312439633

- Venker, C.E., McDuffie, A., Weismer, S.E., & Abbeduto, L. (2012). Increasing verbal responsiveness in parents of children with autism: A pilot study. *Autism, 16*, 568-585.
- Wakeford, L. & Odom, S.L. (2011). *Describing parents as participants in intervention studies: Literature review and implications*. Unpublished manuscript, University of North Carolina at Chapel Hill.
- Wakeford, L. (2012). Chapter 12: Sensory processing in children with autism: Implications for music therapy. In P. Kern & M. Humpal (Eds.). *Music Therapy for Young Children with Autism and Their Families: Learning Through Music in Everyday Life*. London: Jessica Kingsley.
- Wakeford, L. (2008). *Assessment of maternal responsiveness and parent-child interactions: The need for a more culturally competent approach in early childhood intervention*. Unpublished manuscript, University of North Carolina at Chapel Hill.
- Wakeford, L., Baranek, G.T., Crais, E.R., Watson, L.R., & Turner-Brown, L. (2012). *Adapted Responsive Teaching intervention for young children at risk for autism: A case example*. Manuscript in preparation.
- Wakeford, L., Boyd, L., Little, L., Tashjian, C., Baranek, G.T., Crais, E.R., Reznick, S., & Watson, L.R. (2009). The Family Routines Exploration & Description-Revised. Unpublished tool. University of North Carolina at Chapel Hill.
- Walker, J.M.T. (2016). Realizing the American Dream: A parent education program designed to increase Latino family engagement in children's education. *Journal of Latinos and Education, 15*, 344-357. DOI: 10.1080/15348431.2015.1134536
- Wallace, K.S. & Rogers, S.J. (2010). Intervening in infancy: Implications for Autism Spectrum Disorders. *Journal of Child Psychology and Psychiatry, 51*, 1300-1320.
- Webster-Stratton, C. H., Reid, M.J., & Marsenich, L. (2014). Improving therapist fidelity during implementation of evidence-based practices: Incredible Years program. *Psychiatric Services (Washington, D.C.)*, 65, 789-795.

- Wehby, J.H., Maggin, D.M., Partin, T.C.M., & Robertson, R. (2012). The impact of working alliance, social validity, and teacher burnout on implementation fidelity of the Good Behavior Game. *School Mental Health, 4*, 22-33.
- Wetherby, A.M. & Prizant, B.M. (2002). *Communication and Symbolic Behavior Scales: Developmental Profile*. Baltimore, MD: Paul H Brookes Publishing
- Wetherby, A.M. & Woods, J.J. (2006). Early social interaction project for children with autism spectrum disorders beginning in the second year of life: A preliminary study. *Topics in Early Childhood Special Education, 26* (2), 67-82.
- Wolery, M. (2011). Intervention research: The importance of fidelity measurement. *Topics in Early Childhood Special Education, 31*, 155- 157.
- Wong, V.C.N. & Kwan, Q.K. (2010). Randomized controlled trial for early intervention for autism: A pilot study of the Autism 1-2-3 Project. *Journal of Autism and Developmental Disorders, 40*, 677-688.
- Woolfolk, T.N. & Unger, D.G. (2009). Relationships between low-income African American mothers and their home visitors: A Parents as Teachers program. *Family Relations, 58*, 188-200.
- Zaghlawan, H.Y., & Ostrosky, M.M. (2016). A parent-implemented intervention to improve imitation skills by children with autism: A pilot study. *Early Childhood Education Journal, 44*, 671–680.
- Zilberstein, K. (2016). Soapbox: Class matters in parenting interventions. *Clinical Child Psychology and Psychiatry, 21*, 359–367. doi: 10.1177/1359104516630774