CHARACTERIZING PREDICTORS AND MODERATORS OF PARENT PARTICIPATION ENGAGEMENT IN EARLY AUTISM INTERVENTION

By

Hannah C. Tokish

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ABSTRACT

Parent engagement in early intervention supports child and family outcomes but is currently lacking in community service settings. The current study examined parent and provider factors that influence parent participation engagement (PPE), defined as active, independent, and responsive contribution to treatment, in early autism intervention in the Part C Early Intervention (EI) system, which provides publicly funded services for developmentally delayed children under three and emphasizes the use of parent coaching. While most studies have examined influences on proxies of PPE (e.g., attendance, retention, homework completion), the current study utilized objective observational assessment to examine parent and provider factors that predict PPE. Multilevel modeling was used to analyze PPE across 215 EI session recordings that involved 113 independent parents and 61 independent providers. Results suggested that a) single parents face greater barriers to PPE, b) provider quality of parent coaching may promote higher PPE, c) provider quality of parent coaching may not moderate the influence of single parent status on PPE, and d) the quality of specific parent coaching strategies influences PPE. Provider use of high-quality Reflection & Problem Solving (i.e., eliciting parent concerns and working through barriers to at-home intervention strategy use) predicted significantly higher PPE while provider use of high-quality Demonstration (i.e., explaining and demonstrating intervention techniques to parents) predicted lower PPE. Implications for increased provider training in particular parent coaching domains to promote PPE in early autism intervention are discussed.

ACKNOWLEDGEMENTS

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INTRODUCTION

Parent Participation Engagement

Autism is a neurodevelopmental disorder characterized by difficulties with social communication and interaction as well as restricted and repetitive behaviors, interests, and activities (American Psychological Association, 2022). Early and intensive intervention (i.e., targeting fundamental developmental skills in the first three years of life) is key to supporting developmental outcomes and quality of life for children with autism (Althoff et al., 2019; Eunice Kennedy Shriver National Institute of Child Health and Human Development, 2019). Increasingly, best practice guidelines for early intervention are focused on parent[i] engagement to support child outcomes and family well-being (Casagrande & Ingersoll, 2017).

Parent participation engagement (PPE) is defined as a caregiver's active, independent, and responsive contribution to treatment (Haine-Schlagel & Walsh, 2015). PPE is characterized by both in-session behaviors, such as asking questions, sharing perspectives, and participating in therapy activities, and between-session behaviors that involve following through on provider recommendations (Haine-Schlagel & Walsh, 2015; Guan et al., 2019). Meta-analyses suggest that parent engagement in intervention sessions is related to improvements in both parent and child outcomes as well as long-term retention of families in treatment (Dowell & Ogles, 2010, Guan et al., 2019). In child treatment, PPE is particularly important given the role that parents play in seeking treatment, facilitating attendance, following through with provider recommendations at home, and supporting efforts to adjust child behavior (Haine-Schlagel & Walsh, 2015). However, parent engagement is currently lacking in community service settings,

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[i] In this proposal, parent refers to the wide variety of caregiving roles such as biological parent, stepparent, adoptive parent, grandparent, foster parent, and other guardians.

including the state-funded early intervention (EI) system which provides care for toddlers on the autism spectrum (Haine-Schlagel & Walsh, 2015).

Notably, much of the current research literature on parent engagement has focused on session attendance, homework completion, and therapist and parent-reported engagement rather than in-session PPE. A recent review of treatment engagement interventions found that attendance was the most common indicator of treatment engagement and was measured in over 90% of studies (Lakind et al., 2021). Research suggests that these measures are not truly equivalent to active engagement, which remains relatively understudied and not well-understood, particularly in autism populations (Becker et al., 2015). Few studies have examined PPE using more objective methods, such as observational coding schemes of parent engagement behaviors during sessions. To our knowledge, only one study has examined PPE in autism-specific intervention (Guan et al., 2019). Thus, observational assessment of PPE is needed to inform methods of promoting in-session engagement to improve outcomes for children on the autism spectrum and their families.

Parent Characteristics and Parent Engagement

The majority of research on predictors of parent engagement has focused on how child, parent, and family factors affect proxies including attendance, homework completion, and self-reported participation in child psychotherapy more broadly (Haine-Schlagel & Walsh, 2015). For example, single parent status has consistently been associated with reduced parent attendance (Haine-Schlagel & Walsh, 2015). In addition, parents with high stress levels, low sense of self-efficacy, and low motivation to participate in treatment often demonstrate lower attendance and participation (King et al., 2014; Kurzrok et al., 2021; Stadnick et al., 2016; Solish & Perry, 2008; Nock & Kazdin, 2005; Haine-Schlagel & Walsh, 2015). Two studies have utilized observational coding schemes to examine how parent motivation to participate in therapy influences PPE with

mixed findings (Stadnick et al., 2016; Haine-Schlagel et al., 2019). While both studies found that parent motivation as measured by the Parent Motivation Inventory (PMI) did not significantly predict PPE, Stadnick et al. (2016) found that the PMI ability to change subscale, which measures parent beliefs that they can adjust their parenting behaviors in treatment, was significantly associated with increased PPE.

Furthermore, parents of minoritized and/or low socioeconomic status (SES) backgrounds often exhibit lower levels of attendance and reported participation than non-Latine White and high SES families due to factors including obstacles to healthcare access, lack of resources, cultural stigma, and language barriers (Haine-Schlagel & Walsh, 2015; Haine-Schlagel et al., 2022; Holly et al., 2019; Stadnick et al., 2016; Dickson et al., 2017; Guan et al., 2019; Tomczuk et al., 2022; Miller et al., 2008; Fawley-King et al., 2013; Garland et al., 2012; Pereira et al., 2016; Hansen & Warner, 1994). To our knowledge, three articles have reported ethnic disparities in PPE using the Parent Participation Engagement in Child Psychotherapy: Observational Coding Manual, in which coders rate videos of psychotherapy or intervention sessions according to the quality of specific behaviors indicating PPE. These articles found reduced levels of PPE for Hispanic/Latine parents compared to their non-Hispanic/Latine counterparts (Dickson et al., 2017; Guan et al., 2019; Stadnick et al., 2016). Guan et al. (2019) examined PPE in the context of a randomized controlled trial (RCT) of An Individualized Mental Health Intervention for Children with Autism Spectrum Disorder (AIM HI), a parent-mediated intervention for children between 5 and 13 years of age with autism and challenging behaviors, in publicly funded outpatient and school-based mental health programs in Southern California. In a sample of 39 parents randomly assigned to the intervention condition (51% English-speaking non-Latine White, 31% English-speaking Latine, and 18% Spanish-speaking Latine), the authors found

reduced PPE (defined by a composite score of asking questions, participating in session activities, and showing commitment to therapy) for Spanish-speaking Latine parents and parents with lower household income (Guan et al., 2019). The other two articles examined PPE in the context of a randomized pilot study of the Parent and Caregiver Active Participation Toolkit (PACT), a set of strategies designed to promote PPE, in Southern California community-based child psychotherapy services for children between the ages of 4 and 13 years with disruptive behavior problems. Using a mean PPE score of 5 engagement behaviors (e.g., sharing general perspectives, sharing home action perspectives, showing enthusiasm about home actions, asking questions, and demonstrating commitment to therapy), Stadnick et al. (2016) found reduced PPE for a sample of 8 Hispanic parents compared to their non-Hispanic White counterparts. In item-level analyses using the same sample, Dickson et al. (2017) reported that the Hispanic parents exhibited reduced general perspective sharing, home action perspective sharing, and enthusiasm about home actions specifically, finding no differences in question asking or commitment to therapy in Hispanic versus non-Hispanic parents. These findings suggest that decreased engagement (i.e., greater barriers to active engagement) may exacerbate existing disparities in access to quality intervention services for underserved families (Haine-Schlagel et al., 2022; Dickson et al., 2017). Thus, there is a need to increase understanding of the family and sociodemographic factors that influence PPE using objective observational coding schemes of parent engagement behaviors within early autism intervention sessions.

Part C Early Intervention, Parent Coaching, and Parent Engagement

Given the general lack of parent engagement observed in community service settings, where many children receive care, it is important to understand how to promote parent engagement in these types of settings (Haine-Schlagel & Walsh, 2015). The current study uniquely occurs within the context of the Part C Early Intervention (EI) System, which serves

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children under age three with or at increased likelihood of developmental delays or disabilities, including autism and related social communication delays. The Part C EI system is publicly funded, available in all states, and serves approximately 3.7% of all children under three years old (Michigan Department of Health and Human Services, 2023; U.S. Department of Education, 2023). Part C serves a diverse population of children, and it is currently estimated that approximately 50% of children receiving services are of a racially and/or ethnically minoritized background (U.S. Department of Education, 2023). Within Part C, it is currently considered best practice to emphasize parent consultation and/or parent coaching, in which providers teach parents intervention techniques to use at home with their child and provide feedback on parent strategy use, to empower parents to support their children's development (Kuhn et al., 2023; Michigan Department of Health and Human Services, 2023; Casagrande & Ingersoll, 2017; Ingersoll & Wainer, 2013). In addition, Part C emphasizes the provision of family-centered services, which are described as practices that treat families with dignity and respect, involve families in choices to strengthen functioning, and are individualized, flexible, and responsive to each family's unique needs. Part C emphasizes creating parent-provider collaboration, building family knowledge and skills to enhance parenting self-efficacy, and providing services in the home and community to the extent possible (Division for Early Childhood, 2014). Generally, parents tend to report high satisfaction with Part C EI and perceive it to be family-centered, which may promote greater engagement given previously established associations between treatment satisfaction and engagement (Noyes-Grosser et al., 2018; Bailey et al., 2004; Hebbeler et al., 2007; Fawley-King et al., 2013; Haine-Schlagel & Walsh, 2015). Since Part C is a unique service system, it is vital to examine factors that may influence PPE in order to understand who

is at increased likelihood for reduced engagement and to enhance the effectiveness of Part C EI for children on the autism spectrum.

Little research has focused on how provider characteristics or behaviors during intervention sessions may influence parent engagement (Garland et al., 2012). Some studies suggest that provider-reported training in parent-mediated interventions (PMIs) and greater use of evidence-based practices are associated with higher parent attendance at treatment sessions (Dickson et al., 2017; Garland et al., 2012; Stevens et al, 2006). One study found that parents whose providers received training in the Parent and Caregiver Active Participation Toolkit (PACT), which incorporates therapist training in increasing parent engagement opportunities, exhibited higher PPE than parents whose providers were in the treatment as usual group (TAU; Haine-Schlagel et al., 2018). Further analyses from this study found that provider-reported training in PMIs prior to the study was also associated with increased PPE as measured by the same behavioral coding scheme (Stadnick et al., 2016). Thus, there is evidence that provider training in PMIs and engagement techniques, as well as adherence to evidence-based practices, may be related to parent engagement.

Furthermore, specific techniques used by providers during intervention sessions may influence parent engagement. Studies indicate that supportive and facilitative communication increased parental compliance with the provider while lack of directive skill-building strategies and limited involvement in shared decision-making were associated with lower parent-reported participation (Patterson & Forgatch, 2001; Baker-Ericzén et al., 2013). One study that utilized an observational coding scheme of PPE indicated that therapist use of engagement strategies including Collaboration (e.g., offering suggestions, seeking and incorporating parent input,

involving parent in therapeutic activities, working with the parent on parent-focused homework plans), Empowerment (e.g., recognizing strengths and efforts, addressing barriers to parent participation), and Psychoeducation (e.g., providing information about child problems and treatments) increased parent perspective sharing about strategy use at home while Alliance (e.g., active listening, conveying parent-therapist partnership, communicating positive regard) did not (Martinez & Haine-Schlagel, 2018). These findings warrant an increased focus on the nature and quality of provider intervention techniques (i.e., parent coaching strategies) to promote PPE.

While the Part C EI system emphasizes parent coaching, which may increase PPE, research suggests that EI providers in Part C spend little time actively coaching parents during sessions and that "working with the child without explanation" is common (Sawyer & Campbell, 2017; Peterson et al., 2007; Romano & Schnurr, 2020). A recent study by Pellecchia et al. (2023) examined the use of parent coaching in Part C and found overall low use of coaching techniques and significant variability in the quality of coaching across providers. The authors also found that when providers used parent coaching, they tended to only use a few strategies (e.g., collaboration and in-vivo feedback). As parent coaching may promote greater parent engagement through the incorporation of explicit opportunities for engagement, it is vital to understand how provider parent coaching within Part C influences PPE to inform provider training and strategies in order to increase PPE in EI, thereby strengthening the quality of care for children on the autism spectrum.

Present Study

Since certain family and sociodemographic characteristics may reduce parent engagement in treatment while provider training in parent coaching may increase engagement, it is possible that the quality of provider coaching of parents moderates the influence of parent personal and sociodemographic characteristics on parent engagement. Higher quality parent

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coaching by providers may encourage higher levels of engagement for families who might otherwise demonstrate lower engagement related to high stress, low self-efficacy, and low motivation as well as barriers associated with single parenthood, low SES background, and minoritized racial/ethnic identity. Further research is needed to examine how providers' coaching of parents in PMIs may reduce barriers to engagement for underserved families in particular.

As early intervention is key to supporting outcomes for children on the autism spectrum and parent engagement is vital for intervention efficacy, the proposed study will also examine how the quality of provider coaching of parents may broadly increase parent engagement in autism-specific intervention. This study addresses existing gaps in the literature (i.e., use of proxies of engagement as outcome measures, little research on engagement in autism-specific intervention, and lack of understanding of how provider behaviors influence engagement) by applying an objective observational coding scheme of parent engagement, the Parent Participation Engagement (PPE) in Child Psychotherapy Observational Coding Manual (Haine-Schlagel & Martinez, 2014), to recordings of early autism intervention sessions (Haine-Schlagel & Walsh, 2015; Stadnick et al., 2016; Garland et al., 2012). By increasing understanding of factors that predict active parent engagement and reduce barriers to engagement for underserved families, the findings of this study will inform improved provider training and bolster the quality of autism intervention, thereby improving outcomes for children on the autism spectrum.

The first aim of the current study was to examine whether parent characteristics predict PPE in Part C early autism intervention. Based on previous research, we hypothesized that parents with single marital status, minoritized racial and/or ethnic identity, low SES background, high stress, low-self-efficacy, and low motivation will demonstrate reduced PPE (King et al., 2014; Kurzrok et al., 2021; Stadnick et al., 2016; Nock & Kazdin, 2005; Haine-Schlagel &

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Walsh, 2015; Haine-Schlagel et al., 2022; Miller et al., 2008; Holly et al., 2019; Dickson et al., 2017; Guan et al., 2019; Tomczuk et al., 2022; Fawley-King et al., 2013; Garland et al., 2012, Pereira et al., 2016; Hansen & Warner, 1994).

The second aim of the current study was twofold. First, we planned to investigate how overall provider quality of parent coaching influences PPE and we expected that higher provider coaching quality will be associated with increased PPE. If parent characteristics and overall provider quality of parent coaching predicted PPE as expected, we then planned to examine whether provider quality of parent coaching moderates the effect of parent characteristics on PPE in Part C early autism intervention. We hypothesized that higher quality parent coaching by providers would reduce the association of parent characteristics with PPE such that parents with single marital status, minoritized racial and/or ethnic identity, low SES background, high stress, low-self-efficacy, and low motivation would demonstrate *higher levels of parent participation engagement*.

The third aim of the current study was to explore how the quality of specific provider parent coaching strategies influences parent engagement in Part C early autism intervention. We hypothesized that high quality Collaboration (i.e., working together with the parent during the session and co-creating goals) and In-Vivo feedback (i.e., giving feedback as the parent practices intervention techniques during sessions) would be related to *higher parent participation engagement* based on literature suggesting that collaboration, supportive and facilitative communication, shared decision-making, and directive skill-building strategies are associated with greater participation in child mental health treatment sessions (Martinez & Haine-Schlagel, 2018; Patterson & Forgatch, 2001; Baker-Ericzén et al., 2013).

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Study Design

The current study recruited participants from the ongoing Reciprocal Imitation and Social Engagement (RISE) Study, a National Institute of Mental Health (NIMH)-funded multi-site randomized controlled trial (RCT) across four states (Michigan, Massachusetts, Washington, and Illinois). The RISE study is examining the effectiveness of caregiver-implemented Reciprocal Imitation Teaching (CI-RIT), an evidence-based naturalistic developmental behavioral intervention (NDBI) for young children with social communication delays, in the Part EI System.

EI providers are recruited and randomly assigned to undergo comprehensive training in delivering CI-RIT or to join the waitlist control group, in which providers receive CI-RIT training after the conclusion of their study participation. Families on their caseload whose children are 18-30 months and show early signs of autism, including social communication delays, are recruited to participate. Both English and Spanish-speaking families are recruited. Families are assessed at 3 timepoints: intake (T1), post-intervention (4 months after intake; T2), and follow-up (9 months after intake; T3). Each provider-parent dyad is required to have weekly intervention sessions during the duration of their 4-month active study participation between T1 and T2, and EI sessions can occur either in-person in the family's home, in-person in a community space, or via telehealth. An EI session is video recorded approximately every four weeks between T1 and T2 and up to three EI session recordings are collected for each family as part of the study.

Participants

Participants in the current study included 61 community providers and 113 parents that participated in the larger RISE study. Each provider-parent dyad that completed at least one in-

person intervention session recording were included. Telehealth sessions were excluded for the purpose of the current analyses, as little research has examined potential differences in provider parent coaching methods administered in-person versus via telehealth. Both English and Spanish-speaking families were included if their EI sessions were conducted in English. 7 EI session recordings were conducted in Spanish and were excluded from the current analyses due to a lack of Spanish-speaking coders.

Measures

Table 1. Description of Study Measures

Measure	Time-point	Informant	Construct
Family Demographic Information Form (FDIF)	Intake	Parent	Parent and child demographics
Provider Practices Survey (PPS)	Intake	Provider	Provider demographics
Parent Motivation Inventory (PMI) Readiness to Change Subscale	Intake	Parent	Parent motivation to change parenting behavior
Parenting Stress Index-4 Short Form (PSI-4 SF)	Intake	Parent	Parenting stress
Parenting Efficacy Survey (PES)	Intake	Parent	Parenting efficacy
Parent Empowerment and Coaching in Early Intervention (PEACE) Caregiver Coaching Fidelity Tool	T1-T2	Observational Coding	Quality of provider parent coaching strategies
Parent Participation Engagement (PPE) in Child Psychotherapy: Observational Coding Manual	T1-T2	Observational Coding	Parent participation engagement in EI sessions

Family and Provider Demographic Questionnaires

Family and provider demographics were collected at intake via questionnaires about child and parent characteristics (i.e., age, sex, race, ethnicity, marital status, education level) as well as

provider characteristics and professional experience (i.e., sex, race, ethnicity, type of degree, professional background, years in profession, caseload).

The Parenting Stress Index-4 Short Form

The Parenting Stress Index-4 Short Form (PSI-4 SF; Abidin 1990) was administered at intake to measure stress specifically related to parenting, including personal distress, dissatisfaction regarding parent-child interactions, and perceptions of child self-regulatory skills. Parents rated 36 items (e.g., "I often have the feeling that I cannot handle things very well", "My child's behavior is more of a problem than I expected", etc.) on a scale of 1 (Strongly Disagree) to 5 (Strongly Agree), with higher scores indicating higher parenting stress. The PSI-4 SF includes 3 subscales (Parental Distress, Parent-Child Dysfunctional Interaction, Difficult Child), which are summed to produce a Total Stress score (score range: 36-180).

To account for missing items, a prorated Total Stress score was calculated and used in all analyses. The prorated Total Stress score for each participant was calculated as the Total Stress sum score multiplied by the total number of items (36), divided by the total number of items (36) minus the number of missing items. In the current sample, the internal consistency of the Total Stress scale was found to be excellent according to published guidelines (36 items; $\alpha = .93$; Cicchetti 1994).

The Parent Motivation Inventory

The Parent Motivation Inventory (PMI) was administered to parents at intake as a measure of parent motivation to participate in intervention (Nock & Photos, 2006). The PMI includes 25 items rated by parents on a 1 (strongly disagree) to 5 (strongly agree) scale incorporating three aspects of motivation including 1. Desire for child change, 2. Readiness to change parenting behavior and 3. Perceived ability to change parenting behaviors. This study used only the "Readiness to Change" subscale of 14 items (e.g., "I am willing to change my

current parenting techniques and try new ones", "I am motivated to practice the techniques I will learn in session at home with my child") as a measure of parent motivation.

Items are summed to create a Parent Readiness to Change score (score range: 14-70), with higher scores indicating greater readiness to change parenting behavior in the intervention process. To account for missing items, a prorated Parent Readiness to Change score was calculated and used in the current analyses. The prorated score for each participant was calculated as the Parent Readiness to Change sum score multiplied by the total number of items (14), divided by the total number of items (14) minus the number of missing items. In the current sample, the internal consistency of the PMI Readiness to Change subscale was found to be excellent (14 items; α = .94; Cicchetti 1994)).

The Parenting Efficacy Survey

The Parenting Efficacy Survey (PES) was administered at intake. The PES is a 10-item parent-report survey that asks parents to assess their parenting abilities and quality as a parent (e.g., "When your child is upset, fussy, or crying, how good are you at soothing him or her?", "In general, how good a parent do you feel you are?"; Teti & Gelfand, 1991). The PES items are scored on scale from 1 (Not Good at All) to 4 (Very Good) and the items are summed to get a Total Efficacy score (score range: 10-40), with a higher score indicating a greater sense of parenting self-efficacy. To account for missing items, a prorated Total Efficacy score was calculated and used in all analyses. The prorated score for each participant was the Total Efficacy sum score multiplied by the total number of items (10), divided by the total number of items (10) minus the number of missing items. In the current sample, internal consistency of the PES was found to be fair based on published guidelines (10 items; α = .77; Cicchetti 1994).

The Parent Participation Engagement in Child Psychotherapy: Observational Coding Manual

The Parent Participation Engagement in Child Psychotherapy: Observational Coding Manual was used to measure active parent engagement during recorded EI session videos (Haine-Schlagel & Martinez, 2014; Appendix A). The PPE observational coding manual was adapted from the PRAC Therapy Process Observational Coding System for Child Psychotherapy- Strategies (PRAC TPOCS-S) and "An Individualized Mental Health Intervention for ASD" (AIM HI) observational coding manual as a behavioral coding scheme to score parents' participation engagement observed in recordings of psychotherapy sessions for children with disruptive behavior and autism, respectively (Garland, Brookman-Frazee, & Mcleod, 2008; Brookman-Frazee & Chlebowski, 2013; Haine-Schlagel & Martinez, 2014). It is also applicable to early intervention and has been previously used in a study of a parent-mediated autism intervention (Guan et al., 2019).

Coders rated parents on the frequency and thoroughness of six behaviors indicating active engagement. Items included 1. general perspective sharing (e.g., sharing perspectives about child skills/progress, the intervention in general, etc.), 2. perspective sharing about home actions (i.e., sharing perspectives about practicing strategies at home outside of intervention sessions), 3. expressing agreement with or enthusiasm about home actions, 4. asking questions (e.g., administrative or clinically relevant questions), 5. participating in therapy activities (e.g., participating in in-session practice of strategies with the provider present), and 6. demonstrating commitment to therapy. Items were rated on a 1 (absent) to 5 (present and high quality) scale. If no perspectives about home actions were shared, the two home action items were rated as not applicable (N/A). If there was no opportunity to participate in a therapy activity in session, the therapy activity participation quality was rated as not applicable (N/A). All scored items were averaged for an overall PPE score, with higher scores indicating higher PPE. In the current

sample, internal consistency of the PPE coding scheme was found to be relatively low (6 items; α = .67).

Undergraduate research assistants (RAs) were trained to reliability (>80%) prior to independently coding sessions and remained blind to condition. One EI session recording from each provider-parent dyad was randomly selected and prioritized for coding. Once all parent-provider dyads had one session coded, further EI session recordings were randomly selected for coding. All RAs participated in monthly consensus coding meetings to prevent drift. Approximately 20% of the 215 total videos (n=46) were coded by two independent observers. Inter-rater reliability was assessed with intraclass correlations and their 95% confidence intervals based on an average measures one-way random effects model (n = 46, ICC = .79, 95% CI [.61, .88]). Inter-rater reliability was assessed to be excellent according to published guidelines (Cicchetti 1994).

The Parent Empowerment and Coaching in Early Intervention (PEACE) Caregiver Coaching Fidelity Observational Coding Scheme

The Parent Empowerment and Coaching in Early Intervention (PEACE) Caregiver Coaching Fidelity tool was used to measure providers' quality of parent coaching during the same recorded EI sessions (Pellecchia et al., 2022; Appendix B). The PEACE Caregiver Coaching Fidelity tool evaluates parent coaching fidelity/quality in five domains linked to adult learning theory and best practice in caregiver coaching. Adapted from the Triadic Intervention and Evaluation Scale (TIERS) and the Project ImPACT Fidelity of Implementation for Coaching Form, this intervention-agnostic behavioral coding scheme focuses on provider behaviors that indicate the quality of their parent coaching strategies. It was designed for use with any PMI and

has been used to evaluate provider coaching quality within the Part C EI system (Basu et al., 2010; Ingersoll & Dvortcsak, 2010; Pellecchia et al., 2022; Pellecchia et al., 2023).

Coders rated the quality of 21 provider coaching behaviors on a scale from 1 (Never) to 5 (Almost Always) regarding whether the provider used that strategy when given the opportunity (e.g., "Let caregivers make some decisions and lead parts of the intervention session", "Observe ongoing interactions and comment on specific strategies that are working well", etc.). Of the 215 total videos coded with the PPE coding scheme, 181 were also coded by the PEACE coding scheme (i.e., approximately 84% of the videos were coded with both coding schemes). In the current sample, internal consistency of the PEACE coding scheme was found to be fair according to published guidelines (21 items; $\alpha = .78$; Cicchetti 1994).

This measure includes an overall provider quality of parent coaching score, which is the average of all 21 items, with higher scores indicating higher quality of coaching (score range: 1-5). The measure also includes subscale scores for each of the five domains of parent coaching strategies. The General domain involves organizing aspects of intervention session structure (e.g., "Set the plan for today's session with caregiver", "Arrange aspects of the environment to promote parent-child interaction"; 5 items; $\alpha = .23$). The Collaboration domain involves working with the parent and co-creating goals (e.g., "Let caregivers make some decisions and lead parts of the intervention session", "The coach and caregiver collaboratively set goals for the child"; 4 items; $\alpha = .53$). The Demonstration domain incorporates explaining and demonstrating techniques for the parent (e.g., "Explicitly teach a strategy to the caregiver", "Demonstrate/model techniques that promote caregiver-child interaction"; 3 items; $\alpha = .83$), while the In-Vivo Feedback domain focuses on giving feedback as the parent practices techniques (e.g., "Allow sufficient time for the caregiver to practice strategies during session",

"Observe ongoing interactions and comment on specific strategies that are working well [positive feedback]"; 3 items; α = .76). Finally, the Reflection and Problem-Solving domain centers on helping the parent work through obstacles to using intervention strategies at home (e.g., "The coach asks the caregiver about possible barriers to practice and discusses solutions", "Helps the caregiver work through any obstacles in the implementation of the techniques using reflective strategies"; 6 items; α = .27). Items in each domain are averaged for domain-specific quality scores, with higher scores indicating higher quality of the coaching strategy (score range: 1-5).

Undergraduate research assistants (RAs) were trained to reliability (>80%) prior to independently coding sessions and remained blind to condition. All RAs participated in monthly consensus coding meetings to prevent drift. Approximately 20% of the 181 videos were coded by two independent observers (n=34). Inter-rater reliability of the total score and each subscale score was assessed by calculating intraclass correlations and their 95% confidence intervals based on average measures one-way random effects models. According to published guidelines, (Cicchetti 1994), inter-rater reliability was assessed to be excellent for the total score (ICC=.92, 95% CI [.84, .96]). Inter-rater reliability was found to be good to excellent for all domains/coaching strategies: General (ICC=.73, 95% CI [.47, .87]), Collaboration (ICC=.68, 95% CI [.37, .84]), Demonstration (ICC=.93, 95% CI [.85, .96]), In-Vivo Feedback (ICC=.77, 95% CI [.54, .88]), Reflection & Problem Solving (ICC=.82, 95% CI [.64, .91]).

Table 2. Internal Consistency and Interrater Reliability of Study Measures

	No. of Items	α	ICC	ICC 95% CI
Parenting Stress Index (PSI)	36	.93	-	-
Parental Distress (PD) Subscale	12	.89	-	-
Parent-Child Dysfunctional Interaction (PCDI) Subscale	12	.79	-	-
Difficult Child (DC) Subscale	12	.85	-	-
Parenting Efficacy Survey (PES)	10	.77	-	-
Parent Motivation Inventory Readiness to Change Subscale	14	.94	-	-
Parent Participation Engagement (PPE) Observational Coding Mean	6	.67	.79	.61-.88
1. General Perspective Sharing	1	-	.62	.32-.79
2a. Any Home Action Perspectives? (Yes/No)	1	-	.62	.31-.79
2b. Home Action Perspective Sharing	1	-	.62	.31-.79
2c. Enthusiasm about Home Actions	1	-	.62	.31-.79
3. Question Asking	1	-	.85	.74-.92
4a. Any Therapy Activities? (Yes/No)	1	-	.88	.79-.93
4b. Therapy Activity Participation	1	-	.88	.79-.93
5. Overall Commitment	1	-	.67	.41-.82
Parent Empowerment and Coaching in Early Intervention (PEACE) Observational Coding	21	.78	.92	.84-.96
General Domain	5	.23	.73	.47-.87
Collaboration Domain	4	.53	.68	.37-.84
Demonstration Domain	3	.83	.93	.85-.96
In-Vivo Feedback Domain	3	.76	.77	.54-.88
Reflection & Problem-Solving Domain	6	.27	.82	.64-.91

Statistical Analysis

Due to the repeated and nested nature of the EI session recordings, intraclass correlations were calculated through fitting the null model to inform the appropriate number of levels to include in multilevel models. ICCs indicated that 35.1% of the variance in PPE in the current sample was due to provider-level differences at Level 3, 29.8% of the variance was explained by parent-level differences at Level 2, and 35.1% of the variance was attributable to the EI session recording timepoint at Level 1. Thus, 3-level multilevel models were run with EI session recording timepoint (Level 1) nested within parents (Level 2), nested within providers (Level 3).

Descriptive statistics were run in SPSS and all multilevel analyses were run using the nlme package in R (IBM Corp., 2021; Pinheiro et al., 2023).

EI session recording timepoint did not significantly predict PPE and was therefore not included as a fixed effect (t(100)= -1.47, p = .15). Since data were drawn from an ongoing RCT, intervention condition (CI-RIT versus waitlist-control) was included as a covariate in all analyses, as in previous intervention studies (Stanick et al., 2016; Dickson et al., 2017). Mean PPE was included as the outcome variable in all analyses and the residuals were approximately normally distributed. Correlational analyses indicated that the vast majority of correlations between predictor variables were less than .50 and examination of variance inflation factors (VIFs) indicated that multicollinearity was not a concern, as all VIF values were below 5. Pearson product-moment correlation matrices for all aims are presented in Tables 3 and 4.

Table 3. Correlation Matrix of Aim 1 and Aim 2 Predictor and Outcome Variables

	Parent Marital Status	Parent Minoritized Status	Parent Education	Parenting Stress	Parenting Efficacy	Parent Motivation	Provider PC Quality	PPE
Parent Marital Status	1							
Parent Minoritized Status	**-.38***	1						
Parent Education	**.34***	-.08	1					
Parenting Stress	.12	-.08	-.09	1				
Parenting Efficacy	-.12	.07	-.07	**-.52***	1			
Parent Motivation	.05	-.15	.13	-.01	.05	1		
Provider PC Quality								
EI Recording 1	-.04	-.08	-.19	**.25***	**-.24***	-.07	1	
EI Recording 2	.04	-.16	**-.35***	.24	-.16	-.24		
EI Recording 3	.02	-.06	-.12	.22	-.03	.05		
PPE								
EI Recording 1	**.30***	-.20	.05	.06	-.14	.19	**.36***	1
EI Recording 2	**.28***	-.22	.01	**.26***	**-.32***	-.02	**.49***	
EI Recording 3	.11	**-.27***	.02	.11	-.12	.08	**.41***	

*p < .05; PC = Parent Coaching; PPE = Parent Participation Engagement

Table 4. Correlation Matrix of Aim 3 Predictor and Outcome Variables

	Collaboration	Demonstration	In-Vivo Feedback	Reflection & Problem-Solving	Parent Participation Engagement
Collaboration Quality	1				
Demonstration Quality	.46*	1			
In-Vivo Feedback Quality	.50*	.51*	1		
Reflection & Problem-Solving Quality	.34*	.46*	.38*	1	
Parent Participation Engagement	.29*	.27*	.25*	.46*	1

*p < .05

Continuous parent-level predictors were grand mean centered prior to analysis (e.g., parenting stress, parenting efficacy, parent motivation). Continuous provider-level variables, including provider overall quality of parent coaching in addition to quality of individual coaching domains (Collaboration, Demonstration, In-Vivo Feedback, and Reflection & Problem-Solving), were also grand mean centered. Parent marital status, parent minoritized status, and parent education level were dichotomously coded prior to analysis. Marital status was coded 0 for single parents and 1 for parents living with a spouse or partner. Minoritized status was coded 0 for White, Non-Hispanic/Latine parents and 1 for parents of a racial and/or ethnic minoritized background. Education level was coded 0 for parents who completed education below a 4-year college degree and 1 for parents who completed a 4-year college degree or above. Neither parent age ($t(52) = 1.03$, $p = .31$) nor parent gender ($t(52) = -1.01$, $p = .32$) significantly predicted PPE and thus were not included as covariates.

RESULTS

The current sample included 215 observations of EI session recordings at Level 1, 113 parents at Level 2, and 61 providers at Level 3. Observations/participants at each level were approximately evenly split between the intervention and TAU conditions.

The EI session recordings were approximately evenly split across recording timepoints 1, 2, and 3 with slightly more recordings at timepoint 1. The average session recording length was around 48 minutes (SD = 11 minutes, 9 seconds). Full descriptive statistics for EI session recordings are presented in Table 5.

Table 5. Early Intervention Session Recording Characterization (n = 215)

	n (%) or Mean (SD)
Study Condition	
RIT-Now	109 (50.7%)
RIT-Later	106 (49.3%)
EI Session Recording Timepoint	
Timepoint 1	84 (39.1%)
Timepoint 2	70 (32.6%)
Timepoint 3	61 (28.4%)
Video Length (mm:ss)	47:45 (11:09)
Observational Coding Scheme Applied	
Parent Participation Engagement (PPE)	215 (100.0%)
Parent Empowerment and Coaching in Early Intervention (PEACE)	181 (84.2%)

Parents were predominantly mothers living with a spouse or partner and were between 22 and 55 years of age (Mean = 34.15, SD = 6.12). Their children were predominantly males between the ages of 16 and 34 months (Mean = 26.71, SD = 3.56). Most parents identified as White, non-Hispanic/Latine, and English-speaking; however, when race and ethnicity were combined into minoritized status, approximately 60% of the parent sample were of a minoritized racial and/or ethnic background. There was considerable variability in education level and slightly over half the sample reported having received below a 4-year college degree. Parent and

child demographics are presented in Table 6 and full descriptive statistics for the parent measures

are listed in Table 7.

Table 6. Parent and Child Demographics (n = 113)

	Parent: n (%)	Child: n (%)
Study Condition		
RIT-Now	60 (53.1%)	60 (53.1%)
RIT-Later	53 (46.9%)	53 (46.9%)
Age: *Mean (SD)*	34.15 (6.12) years	26.71 (3.56) months
Gender		
Male	13 (11.5%)	77 (68.1%)
Female	100 (88.5%)	36 (31.9%)
Parent Relationship to Child		
Mother	99 (87.6%)	-
Father	12 (10.6%)	-
Foster Mother	1 (0.9%)	-
Grandmother	1 (0.9%)	-
Parent Marital Status		
Lives with spouse/partner	82 (72.6%)	-
Does not live with spouse/partner	31 (27.4%)	-
Race		
Asian	11 (9.7%)	8 (7.1%)
Black/African American	25 (22.1%)	22 (19.5%)
Indigenous/Native Alaskan	1 (0.9%)	1 (0.9%)
Native Hawaiian/Other Pacific Islander	2 (1.8%)	0 (0.0%)
White	55 (48.7%)	53 (46.9%)
More than one race	8 (7.1%)	18 (15.9%)
Other/Not listed	3 (2.7%)	3 (2.7)
Prefer not to answer	8 (7.1%)	8 (7.1%)
Ethnicity		
Hispanic/Latine	33 (29.2%)	36 (31.9%)
Not Hispanic/Latine	76 (67.3%)	74 (65.5%)
Prefer not to answer	4 (3.5%)	3 (2.7%)
Parent Preferred Language		
English	110 (97.3%)	-
Spanish	3 (2.7%)	-
Parent Minoritized Status		
Minoritized	71 (62.8%)	-
Non-Hispanic/Latine White	38 (33.6%)	-
Unknown	4 (3.5%)	-

Table 6 (cont'd)

Parent Highest Education
   9th-11th grade — 6 (5.3%) -
   High school diploma/GED — 19 (16.8%) -
   Trade/vocational school — 8 (7.1%) -
   Associate's degree/2-year degree — 12 (10.6%) -
   Courses toward college — 17 (15.0%) -
   Bachelor's degree/4-year degree — 31 (27.4%) -
   Master's degree — 16 (14.2%) -
   Professional degree (MD, PhD, JD) — 3 (2.7%) -
   Prefer not to answer — 1 (0.9%) -

Parent College Degree
   College degree or above — 50 (44.2%) -
   Below college degree — 62 (54.9%) -
   Unknown — 1 (0.9%) -

Table 7. Parent Characterization

	Mean (SD)
Parenting Stress Index (PSI) Total Stress Raw Score	81.10 (21.05)
Parenting Efficacy Scale (PES) Total Efficacy Score	31.07 (4.22)
Parent Motivation Inventory Readiness to Change Score	64.07 (7.54)
Parent Participation Engagement (PPE) Score	3.02 (0.91)
Parent Participation Engagement (PPE) Items	
1. Perspective Sharing in General	3.41 (1.07)
2a. Were any home actions discussed?: n (%)	-
Yes	163 (75.8%)
No	52 (24.2%)
2b. Perspective Sharing about Home Actions	3.37 (1.12)
2c. Agreeement with/Enthusism about Home Actions	3.12 (1.17)
3. Asking Questions	2.07 (1.17)
4a. Did any therapy activities take place?: n (%)	-
Yes	114 (53.0%)
No	101 (47.0%)
4b. Participation in Therapy Activities	3.96 (0.92)
5. Demonstrating Commitment	3.21 (1.17)

EI providers were predominantly female, White, non-Hispanic Latine, and English-speaking and reported ages between 26 and 64 years (Mean = 40.24, SD = 9.88). The majority of providers received a master's degree and reported a professional background as a speech

language pathologist, occupational therapist, or developmental therapist. Providers had a an average of approximately 12 years of professional experience (Mean = 12.59, SD = 10.63) and about half had worked at their Part C agency for over 5 years. The average total caseload reported by providers in the past month was approximately 20 (SD = 8.80), with an average of about 7 children with social communication delays (SD = 5.45). Complete provider demographics are presented in Table 8. Descriptive statistics of the average overall quality of parent coaching and of each parent coaching strategy are listed in Table 9 and reveal relatively lower quality of Collaboration in comparison to the other parent coaching domains/strategies (Mean = 1.97, SD = 0.76).

Table 8. Early Intervention Provider Demographics (n = 61)

	n (%)
Study Condition	61
RIT-Now	34 (55.7%)
RIT-Later	27 (44.3%)
Age (years): *Mean (SD)*	40.24 (9.88)
Gender	
Male	4 (6.6%)
Female	56 (91.8%)
Missing	1 (1.6%)
Race	
Asian	4 (6.6%)
Black/African American	3 (4.9%)
Indigenous/Native Alaskan	0 (0.0%)
Native Hawaiian/Other Pacific Islander	0 (0.0%)
White	47 (77.0%)
More than one race	3 (4.9%)
Other/Not listed	2 (3.3%)
Prefer not to answer	1 (1.6%)
Missing	1 (1.6%)
Ethnicity	
Hispanic/Latine	1 (1.6%)
Not Hispanic/Latine	57 (93.4%)
Prefer not to answer	2 (3.3%)
Missing	1 (1.6%)

Table 8 (cont'd)

Fluent Languages	
English	61 (100.0%)
Spanish	1 (1.6%)
Highest Degree Earned	
Bachelor's Degree	6 (9.8%)
Master's Degree	52 (85.2%)
Doctoral Degree	2 (3.3%)
Other	1 (1.6%)
Years of Professional Experience: *Mean (SD)*	
Total Years	12.59 (10.63)
Years with Autism/Social Communication Delays	12.22 (8.96)
Caseload in Past Month: *Mean (SD)*	
Total Number of Children	19.43 (8.80)
Number of Children with Autism Diagnosis	2.03 (3.56)
Number of Children with Social Communication Delay	7.03 (5.45)
Number of Children with Suspected Autism	3.64 (2.03)
Professional Background	
Speech Language Pathologist (SLP)	19 (31.1%)
Occupational Therapist	11 (18.0%)
Physical Therapist	1 (1.6%)
Early Childhood Educator	2 (3.3%)
Special Educator	8 (13.1%)
Developmental Therapist	15 (24.6%)
Social Worker	3 (4.9%)
Other	2 (3.3%)
Amount of Time at Part C Agency	
0-3 months	3 (4.9%)
3-6 months	3 (4.9%)
6-12 months	6 (9.8%)
1-3 years	12 (19.7%)
3-5 years	9 (14.8%)
5+ years	28 (45.9%)

Table 9. Provider Quality of Parent Coaching Characterization

	Mean (SD)
PEACE Overall Quality of Parent Coaching	2.76 (0.68)
PEACE Quality of Individual Parent Coaching Strategies	
General	3.12 (0.76)
Collaboration	1.97 (0.76)
Demonstration	2.43 (1.33)
In-Vivo Feedback	2.47 (1.26)
Reflection & Problem-Solving	3.40 (0.80)

Aim 1: The Influence of Parent Characteristics on PPE

Initially, separate 3-level random intercept models were run to examine the independent effect of each predictor on PPE. Not controlling for any other parent factors, marital status significantly predicted PPE (t(52) = 2.89, SE = .15, p = .006, b = .44) and parent minoritized status approached significance (t(50) = -1.81, SE = .15, p = .077, b = -0.27). Parent education, parenting stress, parenting efficacy, and parent motivation did not significantly predict PPE in separate models. Provider quality of coaching marginally significantly predicted PPE without controlling for any parent factors (t(72) = 1.90, SE = .19, p = .06, b = .24).[ii]

For Aim 1, a 3-level random intercepts model with only parent-level predictors (e.g., parent marital status, parent minoritized status, parent education level, parenting stress, parenting efficacy, and parent motivation) was run (Table 8). Parent marital status significantly predicted PPE when controlling for other parent characteristics (t(42)=3.04, SE = .17, p = .004, b = .52), indicating that parents living with a spouse or partner demonstrated higher PPE than single parents. The model did not indicate statistically significant effects of any other parent characteristics on PPE.[iii]

[ii] In 3-level models with all parent characteristics included, Level 2 slopes were also individually modeled as random for each parent-level characteristic separately. While the variance of most random slopes ranged from 3.70e-06 to 0.003, the variance of the random slope for minoritized status was 0.29. The inclusion of minoritized status as a random effect versus a fixed effect did not significantly influence results, so all parent characteristics were modeled as fixed effects in final analyses to run the most parsimonious models.

[iii] Given prior research suggesting that Hispanic/Latine parents exhibit reduced PPE compared to their non-Hispanic/Latine counterparts, we also examined the influence of ethnicity (coded 1 for Hispanic/Latine and 0 for non-Hispanic/Latine) on PPE without controlling for other parent characteristics. Hispanic/Latine ethnicity marginally predicted reduced PPE (t(49)=-1.84, b=-.30, p=.07). The full Aim 1 model was also run with parent ethnicity as a fixed effect rather than parent minoritized status, controlling for other parent characteristics (Stadnick et al., 2016; Dickson et al., 2017; Guan et al., 2019). Findings were virtually unchanged (Hispanic/Latine: t(41)=-.61, b=-.10, p=.55), so minoritized status was used instead of ethnicity in all models moving forward.

Table 10. Aim 1 Multilevel Model: The Influence of Parent Characteristics on Parent Participation Engagement in Early Autism Intervention

	Parent Participation Engagement			
Fixed Effects	*Unstandardized Coefficients*	*95% CI*	*Standard Error*	*P-Value*
Intercept	2.39	1.98-2.80	0.21	.00
Parent Lives with Spouse/Partner	0.52	0.18-0.85	0.17	**.004**
Parent Minoritized Status	-0.07	-0.37-0.22	0.15	.63
Parent College or Higher	-0.06	-0.35-0.23	0.15	.68
Parent Stress	0.00	-0.01-0.01	0.00	.99
Parent Self-Efficacy	-0.02	-0.05-0.02	0.02	.32
Parent Motivation	0.01	-0.01-0.03	0.01	.21
Random Effects	*Variance*	*95% CI of Variance*	*Standard Deviation*	
Level 3 (Provider) Intercept	0.14*	0.05-0.36	0.37	
Level 2 (Parent) Intercept	0.17*	0.07-0.42	0.41	
Residual	0.29*	0.21-0.40	0.54	

*Significance demonstrated with 95% confidence intervals

Aim 2: The Influence of Provider Quality of Parent Coaching on PPE

For Aim 2, a 3-level random intercepts model was first run with all parent characteristics plus the added fixed effect of provider quality of parent coaching (Table 9). Parent marital status remained a significant predictor of PPE when controlling for provider quality of parent coaching ($t(38) = 2.92$, SE = .17, p = .006, b = .51). Provider quality of coaching was a marginally significant predictor of PPE ($t(67) = 1.93$, SE = .13, p = .058, b = .25), indicating that higher provider quality of parent coaching may be related to higher PPE. A log-likelihood ratio test was used to compare the fit of this model compared to the Aim 1 model and revealed that the current model including provider quality of coaching was a significantly better-fitting model than the Aim 1 model with only parent characteristics ($\chi^2(1)= 54.94$, p < .0001).

Table 11. Aim 2 Multilevel Model 1: The Influence of Provider Quality of Coaching and Parent Characteristics on Parent Participation Engagement in Early Autism Intervention

	Parent Participation Engagement			
Fixed Effects	*Unstandardized Coefficients*	*95% CI*	*Standard Error*	*P-Value*
Intercept	2.49	2.06-2.92	0.22	.00
Parent Lives with Spouse/Partner	0.51	0.17-0.85	0.17	**.006**
Parent Minoritized Status	-0.04	-0.35-0.28	0.16	.82
Parent College or Higher	-0.05	-0.35-0.26	0.15	.76
Parent Stress	-0.00	-0.01-0.01	0.00	.76
Parent Self-Efficacy	-0.03	-0.06-0.01	0.02	.17
Parent Motivation	0.01	-0.01-0.03	0.01	.18
Provider PC Quality	0.25	-0.00-0.50	0.13	**.058**
Random Effects	*Variance*	*95% CI for Variance*	*Standard Deviation*	
Level 3 (Provider) Intercept	0.13*	0.05-0.37	0.36	
Level 2 (Parent) Intercept	0.12*	0.03-0.53	0.35	
Residual	0.34*	0.24-0.49	0.58	

*Significance demonstrated with 95% confidence intervals; PC = Parent Coaching

A final 3-level random-intercepts model was run for Aim 2 with an added interaction term between parent marital status and provider quality of parent coaching (Table 10)[iv]. The model did not demonstrate a significant interaction (t(66) = 1.48, SE = .23, p = .14, b = .33). According to a log-likelihood ratio test, it was not a significantly better-fitting model compared to the previous model that included only the main effects of parent characteristics and provider quality of coaching ($\chi^2(1)$= 2.26, p = .13).

[iv] Another random-intercepts model was run including only parent marital status, provider quality of parent coaching and their interaction (provider quality*parent marital status). This was a significantly poorer-fitting model than the Aim 2 interaction model reported in the main text that included all parent characteristics ($\chi^2(5)$= 29.78, p < .0001). This was also a significantly poorer-fitting model compared to the first Aim 2 model that included only parent characteristics and provider parent coaching quality without an interaction term ($\chi^2(4)$= 27.52, p < .0001).

Table 12. Aim 2 Multilevel Model 2: The Influence of Provider Quality of Parent Coaching on the Relationship Between Parent Marital Status and Parent Participation Engagement in Early Autism Intervention

	Parent Participation Engagement			
Fixed Effects	*Unstandardized Coefficients*	*95% CI*	*Standard Error*	*P-Value*
Intercept	2.45	2.02-2.88	0.22	0.00
Parent Lives with Spouse/Partner	0.51	0.17-0.85	0.17	**0.005**
Parent Minority Status	-0.01	-0.33-0.31	0.16	0.95
Parent College or Higher	-0.02	-0.32-0.29	0.16	0.92
Parent Stress	-0.00	-0.01-0.01	0.00	0.61
Parent Self-Efficacy	-0.03	-0.07-0.01	0.02	0.14
Parent Motivation	0.01	-0.01-0.03	0.01	0.18
Provider PC Quality	0.02	-0.36-0.41	0.20	0.90
Provider Quality*Parent Spouse	0.33	-0.10-0.77	0.23	0.14
Random Effects	*Variance*	*95% CI for Variance*	*Standard Deviation*	
Level 3 (Provider) Intercept	0.12*	0.04-0.36	0.34	
Level 2 (Parent) Intercept	0.13*	0.03-0.52	0.36	
Residual	0.34*	0.24-0.48	0.58	

*Significance demonstrated with 95% confidence intervals; PC = Parent Coaching

Aim 3: The Influence of Provider Parent Coaching Strategies on PPE

For Aim 3, one 3-level random intercepts model including provider quality of Collaboration, Demonstration, In-Vivo Feedback, and Reflection & Problem-Solving as predictors was run (Table 11). The model indicated a significant effect of Reflection & Problem Solving on PPE ($t(69) = 4.00$, SE = .08, $p = .0002$, b = .33), such that higher quality Reflection & Problem Solving predicted higher PPE by an average of .33. Demonstration also significantly predicted PPE ($t(69) = -2.20$, SE = .06, $p = .03$, b = -.13) such that higher quality Demonstration predicted slightly lower PPE by an average of .13. Quality of Collaboration approached significance ($t(69) = 1.74$, SE = .08, $p = .087$, b = .15), with higher quality Collaboration trending towards predicting higher PPE. In-Vivo Feedback did not significantly predict PPE ($t(69) = -.11$, SE = .05, $p = .91$, b = -.006).

Table 13. Aim 3 Multilevel Model: The Influence of the Quality of Provider Parent Coaching Strategies on Parent Participation Engagement in Early Autism Intervention

	Parent Participation Engagement			
Fixed Effects	*Unstandardized Coefficients*	*95% CI*	*Standard Error*	*P-Value*
Intercept	2.68	2.43-2.92	0.12	.00
Quality of Collaboration	0.15	-0.02-0.31	0.08	.09
Quality of Demonstration	-0.13	-0.24-0.01	0.06	**.03**
Quality of In-Vivo Feedback	-0.01	-0.11-0.10	0.05	.91
Quality of Reflection & PS	0.33	0.17-0.50	0.08	**.0002**
Random Effects	*Variance*	*95% CI for Variance*	*Standard Deviation*	
Level 3 (Provider) Intercept	0.12*	0.04-0.34	0.34	
Level 2 (Parent) Intercept	0.16*	0.06-0.45	0.40	
Residual	0.31*	0.22-0.45	0.56	

*Significance demonstrated with 95% confidence intervals; PS = Problem-Solving

DISCUSSION

The current study examined the influence of parent characteristics and provider parent coaching behaviors on parent participation engagement (PPE) in early autism intervention in the Part C Early Intervention (EI) system using an observational coding scheme of PPE.

The Influence of Parent Characteristics on PPE

Examination of parent characteristics including marital status, minoritized status, education, parenting stress, parenting efficacy, and motivation to change parenting behaviors through intervention indicated that only parent marital status significantly predicted PPE. This suggests that single parents face greater barriers to active, in-session PPE. This finding is consistent with previous research indicating that single parents demonstrate lower attendance and participation more broadly (Haine-Schlagel & Walsh, 2015). Contrary to our hypotheses, no other parent characteristics significantly predicted PPE.

There are a number of possible explanations for the lack of replication of previous research suggesting that parents with minoritized racial/ethnic identities, low SES backgrounds, high stress, low self-efficacy, and low motivation exhibit reduced parent engagement in child treatment. First, the differences in findings may be related to measurement characteristics. For example, the current study used the Parenting Stress Index-4 Short Form as a proxy for parent stress, but it may be the case that parenting stress does not impact parent engagement in the same way as broader life stressors. Interestingly, another study examining parent involvement in Intensive Behavioral Intervention for autism did not find a relationship between parent scores on the PSI and either parent-reported or therapist-reported involvement in their child's intervention (Solish & Perry, 2008). Furthermore, the current analyses utilized the Parent Readiness to Change subscale of the Parent Motivation Inventory (PMI), while other studies have used the

total PMI sum score and/or different subscales to measure parent motivation in treatment (Stadnick et al., 2016; Haine-Schlagel et al., 2019).

PPE may also be qualitatively different for parents involved in Part C EI. Given the family-centered focus of Part C and the emphasis on provider use of parent coaching, parents may naturally exhibit higher PPE regardless of sociodemographics and/or stress, self-efficacy, and motivation than in previously studied community- and school-based child mental health services without the same emphasis on parent and family priorities. In addition, while previous studies have been predominantly conducted in populations of older children with disruptive behavior disorders and attention-deficit/hyperactivity disorder (ADHD), the current study examined PPE in a population of young children under three years old with early signs of autism for whom intervention may naturally require greater parent involvement due to age and diagnosis. Indeed, studies suggest that parents are more likely to receive psychotherapy incorporating parent involvement for younger children and that parents of children on the autism spectrum are similarly more likely to be involved in EI for younger versus older children (Dowell & Ogles, 2010; Solish & Perry, 2008). Moreover, because most Part C EI providers administer services in families' homes, this aspect of the Part C system may allow greater PPE during sessions for parents who would otherwise face increased barriers to attending clinic-based sessions or transferring clinic-based strategies to the home context. Thus, aspects of the Part C EI context and young ASD population may lead to different levels of PPE during EI sessions as well as different influences of parent characteristics on PPE levels.

It may also be the case that parent characteristics influence different aspects of parent engagement differently. While parent characteristics seem to influence session attendance, homework completion, and parent-reported participation, they may not influence in-session

active PPE in the same way. When comparing the current findings to previous studies that have utilized the same PPE Observational Coding Scheme, it is worth highlighting a few notable differences. The three articles that examined the effect of Hispanic/Latine ethnicity on PPE were conducted with two samples from Southern California, while the current study's Hispanic/Latine population was recruited from multiple regions of the United States (e.g., Michigan, Illinois, Washington, and Massachusetts; Stadnick et al., 2016; Dickson et al., 2017; Guan et al., 2019). It is likely that the Hispanic/Latine sample in the current study is more heterogeneous than the Southern California Hispanic/Latine parents included in other studies. In addition, Hispanic/Latine parents in the current sample were predominantly English-speaking while Dickson et al. (2017) and Stadnick et al. (2016) included predominantly Spanish-speaking Hispanic/Latine parents. Guan et al. (2019) also only found reduced PPE for Spanish-speaking Hispanic/Latine parents compared to non-Hispanic Latine White and English-speaking Hispanic/Latine parents. Since the current study excluded EI sessions conducted in Spanish, there are notable differences in the population of parents in the current study compared to previous publications.

Furthermore, while the outcome variable included in the current analyses was the PPE score averaged across all individual PPE behaviors, other studies have used scores derived differently from the PPE coding scheme. For example, the composite PPE score used by Guan et al. (2019) only included three of the PPE items (e.g., asking questions, participating in session activities, showing commitment to therapy) and Dickson et al. (2017) examined the effect of ethnicity on each PPE behavior individually rather than an average score. It is important to note that the current study focused primarily on minoritized status, finding a marginal effect of minoritized status on PPE when not controlling for other parent characteristics. Exploratory

analyses similarly found a marginal effect of parent ethnicity on PPE when not controlling for other parent characteristics. In the current sample, both parent minoritized status and ethnicity were correlated with marital status and education, which may explain why minoritized status and ethnicity did not significantly predict PPE when controlling for other parent characteristics. It is also possible that we would be more likely to find relationships between these parent characteristics and PPE in a larger sample.

The Influence of Provider Quality of Parent Coaching on PPE

The addition of provider quality of parent coaching to the model indicated that higher quality parent coaching by providers may promote greater PPE even after controlling for parent characteristics, but this finding was only marginally significant. Marital status remained a significant predictor even after controlling for provider coaching behavior. However, provider quality of coaching did not moderate the association of single parent status with reduced PPE, suggesting that increasing the quality of parent coaching may not allow single parents to overcome barriers to PPE. This suggests provider quality of parent coaching may increase PPE broadly for families, but that that further strategies are needed to reduce barriers to PPE for single-parent families.

The Influence of Provider Parent Coaching Strategies on PPE

Aim 3 analyses indicated that the quality of providers' Reflection & Problem Solving with families may have the greatest impact on PPE compared to other provider parent coaching strategies (e.g., Collaboration, Demonstration, In-Vivo Feedback). Interestingly, the current study found that greater quality of provider Demonstration predicted *decreased* PPE, potentially indicating that greater use of Demonstration provides fewer opportunities for parents to engage. When providers are modeling and explaining techniques to the parent, they are typically working directly with the child rather than the parent and may provide less opportunity for parents to

actively participate in those parts of the session. However, Demonstration may still be an important coaching strategy to encourage parent learning and ultimate fidelity to the intervention strategies. These findings suggest that in order to promote PPE in early autism intervention, providers should engage in reflection about family experiences of barriers to practicing and using intervention strategies at home as well as help parents to problem solve methods of overcoming any barriers faced. It may also be beneficial during EI sessions to balance the amount of Demonstration of techniques with other strategies that may more effectively engage parents. Given that Pellecchia et al. (2022) found that most EI providers tended to only use Collaboration and In-Vivo Feedback, we echo their call for targeted training for providers in specific parent coaching strategies, particularly Reflection & Problem-Solving, to increase PPE and support child and family outcomes in early autism intervention. Reflection & Problem-Solving may be a particularly important and helpful strategy for families facing increased barriers to active in-session PPE, such as single parent families.

Limitations and Future Directions

It is possible that the current analyses were underpowered to find small effects of parent characteristics on PPE. While we are unaware of a simulation study that perfectly matches the current study's data structure, a similar simulation study indicates that the current analyses may be underpowered. In a psychotherapy simulation study utilizing a 3-level multilevel model with measurement occasion (Level 1) nested within patient (Level 2), nested within therapist (Level 3), the authors found that the necessary sample size to obtain sufficient power (i.e., a power of 0.80) with 5 measurements per patient included 85 therapists with two patients each (i.e., 170 total patients; de Jong et al., 2010). This study only examined 5, 11, or 21 measurements per patient, which does not correspond to the approximately 2 EI session recordings per parent in the current study (de Jong et al., 2010). However, research suggests that while increasing sample

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size at Level 2 and Level 3 increases power, increasing the number of measurements does not substantially influence power, suggesting that this study accurately approximates the sample size needed in the current study for a power of 0.80 despite differences in the number of measurement occasions (Lee & Hong, 2021). Notably, simulation studies also suggest that a sample size of at least 30-50 of the highest cluster (i.e., providers in the current study) is sufficient for unbiased fixed effect estimates, which suggests that the current regression coefficients and standard errors are likely stable despite slightly reduced power (Maas & Hox 2004, Maas & Hox, 2005, Lee & Hong, 2021; Clark and Wheaton, 2007). Behavioral research (e.g., psychotherapy and educational research) simulation studies have found reliable estimates even with smaller Level 3 (e.g., therapist and school) samples, with one psychotherapy study suggesting at least 10 therapists were necessary for unbiased standard error estimates (e.g., therapists and schools; Magnusson et al., 2018; Falkenström et al., 2020; McNeish & Wentzel, 2017).

It is also unlikely that we were powered to detect moderation, as power for a moderator effect is typically lower than for a main effect, particularly for a Level 3 moderator (Dong et al., 2018). Given the potential for Type II error, the lack of significant findings do not necessarily mean that parent characteristics do not meaningfully influence PPE and that provider overall quality of coaching does not moderate the effect of parent marital status on PPE. Thus, there may be effects of parent sociodemographic characteristics, stress, self-efficacy, and motivation that we could not detect in the current sample due to power constraints. Coding of EI sessions with both the PPE and PEACE observational coding schemes is ongoing to increase power in future analyses.

While all analyses controlled for study intervention condition, the RISE RCT is ongoing and has not yet released the intervention condition data for publication. In future analyses, it seems theoretically likely that provider training in CI-RIT may increase provider quality of parent coaching compared to providers in the waitlist-control condition. If future analyses confirm this hypothesis, we plan to conduct mediational models to examine whether CI-RIT training influences PPE through improved provider quality of parent coaching.

Although the demographics of our sample are representative of the general demographics of families receiving services in Part C, current findings should be interpreted with caution when generalizing to families in EI. Given studies indicating that parents who choose to participate in research studies often demonstrate higher motivation and engagement than families in standard care settings, (Haine-Schlagel & Walsh, 2015), our sample likely included parents with higher levels of motivation and PPE, which may have influenced the observed relationships of parent characteristics, provider behaviors, and parent engagement. In addition, the current study excluded EI sessions conducted in Spanish due to a lack of Spanish-speaking coders. Since only 7 sessions were excluded for this reason, it is unlikely that results were biased but the current findings are nonetheless based on an English-speaking sample. As observational coding of parent engagement continues, Spanish-speaking research assistants will be recruited to code Spanish EI sessions for future analyses. The current findings may also not apply to parent coaching conducted via telehealth since the study sample was limited to in-person EI session recordings. Next steps include adapting the PPE Observational Coding Scheme for telehealth EI sessions to better understand how different service delivery modalities may influence PPE.

Another limitation to consider in the current study is that parent engagement occurs in the context of a bidirectional relationship between the parent and provider, which makes it difficult

to parse out which individual is driving the level of engagement observed. For example, it is possible that a parent who demonstrates lower engagement may lead a provider to provide fewer opportunities for the parent to engage in the session, which may further reduce parent engagement. On the other hand, a provider who asks many questions and invites parent perspectives will likely lead to the parent to naturally demonstrate higher engagement as there are more opportunities to engage. To parse apart the bidirectional influences on parent engagement, future research will utilize lag-sequential analysis methods to ensure greater understanding of how parent engagement is influenced sequentially by both parent and provider in-session behaviors.

Multidimensionality of Parent Engagement

While a unique strength of the current study is its use of an observational coding scheme to objectively measure in-session PPE, this was the only measure of parent engagement included and it is unclear how it relates to other more commonly examined behavioral measures of engagement (e.g., attendance, retention, and homework completion). Conceptual models suggest that parent engagement is multidimensional and have highlighted different aspects of engagement including social (e.g., therapeutic alliance), cognitive (e.g., beliefs about treatment outcomes), affective (e.g., emotions experienced related to treatment), and behavioral (e.g., attendance and participation; Chorpita & Becker, 2022). Despite conceptual models and emerging empirical evidence suggesting that parent engagement is multidimensional, individual studies have tended to only focus on one aspect of engagement (Chorpita & Becker, 2022). A recent review of 52 randomized controlled trials of treatment engagement interventions found that 61.5% of studies measured only one engagement domain and 26.9% measured two domains (Lakind et al., 2021). Given this research suggesting the multidimensionality of parent engagement, future analyses will investigate how parent characteristics and provider coaching

strategies influence other aspects of parent engagement to promote broader understanding of multiple engagement measures.

Provider Perceptions of Parent Engagement

Recent qualitative work suggests that provider perceptions of parent engagement impact provider beliefs and decisions about the fit of parent coaching for individual families (Tomczuk et al., 2021). For example, providers reported that families with a low SES background and competing priorities (i.e., busy work schedules, life stressors), were not a good fit for parent coaching because parents did not have sufficient resources at home and demonstrated low energy during sessions (Tomczuk et al., 2021). Providers also referenced multigenerational or single-parent families, language barriers, and cultural stigma as factors that reduced engagement and made parent-mediated interventions a poor fit. However, providers interpreted competing life stressors as lack of motivation and engagement, using terminology such as "lazy" and "checked out" to describe parents, suggesting that provider biases influence perceptions of parent engagement. Another study by Straiton et al. (2023) similarly indicated that provider perceptions of parent readiness for parent coaching influence providers' decisions about whether to offer parent training. Providers often perceived parent "readiness" for parent coaching through overt behavioral indicators, such as regular session attendance without missing sessions, independently choosing to closely observe sessions, giving their undivided attention during sessions, following provider recommendations, and asking providers for advice and information. Thus, providers' perceptions of parent engagement and related intervention fit may be perpetuating ongoing disparities in access to quality evidence-based interventions. Since provider perceptions of engagement and commitment often influence the type of intervention families ultimately receive, it is vital to further understand how providers interpret parent engagement and how they perceive barriers to engagement to address disparities in service access and quality. In addition, increasing

provider training in parent coaching and encouraging its use with diverse families may reduce the effect of provider perceptions of engagement on the perceived fit of parent coaching for marginalized families. If providers are encouraged to use parent coaching with all families regardless of initial behavioral engagement indicators, parents may ultimately exhibit increased engagement during sessions in response to provider parent coaching strategies. Increased parent engagement may then encourage continued use of parent coaching by providers and alter their perceptions of the fit of parent coaching for marginalized families, potentially reducing disparities in access to this evidence-based intervention method.

Additional research suggests that providers often attribute low treatment engagement to the client rather than the provider or service agency and that many providers overestimate the strength of client engagement (Gearing et al., 2012; O'Keeffe et al., 2019). Moreover, providers tend to mainly observe behavior when assessing client engagement, but the method of assessment was found to differ according to the level of engagement in a recent study (Becker et al., 2021). The majority of providers reported observing attendance when engagement was perceived to be low, but the majority of providers considered in-session participation or homework completion when engagement was perceived to be high. The authors also reported that it was uncommon for providers to report considering therapeutic relationship, client beliefs about treatment, or client understanding of the treatment approach when thinking about engagement (Becker et al., 2021). Given that the findings of the current study suggest the value of provider behaviors to promote parent engagement, future research should investigate provider perspectives on parent engagement through qualitative interviews to better understand how providers are interpreting and reacting to parent engagement to improve provider training and use of engagement strategies.

CONCLUSION

The current study suggests that while many parent sociodemographic and personal characteristics may not influence active parent participation engagement (PPE) in early autism intervention sessions in the Part C Early Intervention (EI) system, single parents face greater barriers to demonstrating PPE in this context. Though high-quality provider parent coaching in Part C may promote PPE, it does not seem to differentially increase PPE for single parents versus parents living with a spouse or partner. However, provider use of high-quality reflection and problem-solving parent coaching strategies is related to increased PPE. Findings suggest that provider training should incorporate emphasis on the quality of particular parent coaching strategies to promote PPE in early autism intervention and increase the quality of Part C EI services for diverse families.

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