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Comparative efficacy of an early intervention “parent and me” program for infants showing signs of autism: The Baby JASPER model

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Abstract

Despite important advancements into the early detection of autism, there are still few empirically supported interventions for children under the age of two years who are showing early signs. Caregiver-mediated interventions have gained in popularity as a method for delivering support to the child and family. The current study builds on current work by enrolling a comparatively large cohort of infants (ages 12–22 months of age) displaying early signs of autism into a randomized controlled intervention program. Infants and parents received a group-based program using a standard early childhood curriculum. In addition, all families were randomly assigned to receive parent training in the form of either parent-mediated Joint Attention Symbolic Play Engagement and Regulation (JASPER) training or psychoeducation. Infants in both classrooms made substantial gains in social-communication, play, and cognition during a brief, 8-week period. All infants gained over an average of 10 points in DQ and increased in standardized measures of social-communication and play, with these gains maintaining at a 2-month follow-up visit. The classroom that also received JASPER increased in child initiated joint engagement and play level during dyadic interactions with their parents, while the classroom that received psychoeducation increased in joint attention during a standardized assessment delivered by an independent assessor. Infant familial risk for autism (older sibling with autism) also moderated the effect of treatment on child initiated joint engagement where infants in the JASPER classroom without familial risk made the most gains from baseline to exit of the program. This study highlights the promise of intervening at the earliest stages to promote positive outcomes for children and families.

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CRediT authorship contribution statement

Connie Kasari: Writing – original draft, Methodology, Funding acquisition, Conceptualization. **Amanda Gulsrud:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Conceptualization. **Wendy Shih:** Formal analysis, Data curation. **Tanya Paparella:** Writing – review & editing, Methodology.

Keywords

Early signs of autism; Caregiver-mediated interventions; JASPER; Infants and toddlers at-risk for ASD

1. Introduction

Research into the detection of the earliest signs of autism has advanced considerably over the past decade, including identification of behavioral risk markers in infants in their first year of life (Chawarska et al., 2013; Jones and Klin, 2013; Shic et al., 2014) and the ability to reliably diagnose autism by 18 months of age (e.g. Guthrie et al., 2013). These findings, coupled with the promise that early behavioral intervention for children two to five years of age promotes positive social communication and cognitive outcomes (Brian et al., 2017; 2022; Dawson et al., 2010; Kasari et al., 2010, 2015; Schertz et al., 2018; Wetherby et al., 2014), has prompted the field to begin to study the efficacy of interventions for infants displaying early features of autism before the age of two years (Carter et al., 2011; Green et al., 2015; Rogers et al., 2012).

1.1. Why intervene even younger?

The first two years of life are marked by rapid brain changes and corresponding social, language, and cognitive capabilities (Botteron, 2019). Researchers hypothesize that if symptoms of autism are detected early and appropriate intervention commences, this may have the potential to alter brain development and the corresponding developmental trajectory of the child, resulting in more favorable outcomes (Webb et al., 2014). Thus, earlier detection of autism symptoms demands faster, feasible, and age-appropriate models of care. Parent mediated interventions have been the main source for delivering such models in young children with autism, with a growing body of evidence that parent-mediated interventions can be effective for children two to five years of age (Brian et al., 2017, 2022; Kasari et al., 2010, 2015; Schertz et al., 2018; Wetherby et al., 2014). This form of delivery may be particularly relevant as parents are highly invested in promoting positive outcomes for their children and dedicate the most time and attention during the early years.

Despite the promise of parent mediated interventions for children between the ages of two and five years, we have few examples in children under the age of two years. A recent review identified only seven randomized controlled trials (RCTs) of parent-mediated intervention with infants under the age of two (Law et al., 2022). This review identified that most of the studies were underpowered to detect differences among interventions and summarized that these early interventions did not appear to reduce the risk of autism in the future, with few differential child effects favoring the active treatment. Positive findings of the review largely centered on what researchers noted as improvement in parent interaction style. It is possible that improving parental responsiveness and sensitivity to their children may have downstream effects on child development, but studies rarely address this issue with long-term follow up.

Other challenges plaguing some parent mediated interventions include high rates of attrition and a focus on only parents who have the resources to attend sessions in clinics or access to research supported trials (Carr et al., 2016; Sterrett et al., 2022), although notable progress has been made using telehealth approaches and in communities with lower resources (Rahman et al., 2016; Sengupta et al., 2019; Brian, Solish et al., 2022). Recruitment is often difficult in this age range in part due to reluctance of parents to seek help for their infants, hoping characteristics they notice are just a developmental phase, or their feelings of stigma about bringing their child to therapy (Bradshaw et al., 2020).

In the present study, stigma was addressed by embedding 'therapy' into a common parent and child activity group setting. 'Mommy and me' (or parent and me) groups are regular early childhood events allowing parents the opportunity to better understand their child's developmental needs and to address these needs by learning particular parenting strategies while also connecting them with other parents who can be supportive.

1.2. The current study

The current study builds on previous work by enrolling a comparatively large cohort of infants (ages 12–22 months) displaying early signs of autism into a 'mommy and me' style classroom intervention. Parent-infant dyads were randomized to attend a 2 day, 3-hour per day infant classroom that embedded therapist and parent-mediated Joint Attention Social Play and Emotion Regulation (JASPER) (Kasari et al., 2021) into a program using a standard early childhood model based on the Assessment, Evaluation and Programming System (AEPS) Curriculum for Birth to Three Years (AEPS; Bricker & Waddell, 2002) or an infant classroom utilizing AEPS without embedded JASPER sessions. Both groups had a 60-minute rotation of parent training and education daily. The two different infant classrooms were each led by separate, non-overlapping interventionists and were in session at the same time each day of the week, but on alternate days to avoid potential classroom bleeding effects among parents.

2. Methods

Ethical approval was obtained through the University Institutional Review Board and the study was registered at Clinical Trials.gov (NCT01874327).

2.1. Participants

A total of 110 infants showing early signs of autism were referred to the research team and screened for eligibility (see Fig. 1 for Consort chart). Children were included in the study if they were between 12 and 21 months of age at entry into the study, displayed early concerns for autism as measured by elevated scores on the Autism Diagnostic Observation Schedule Toddler version (ADOS-T; Luyster et al., 2009), and a consistent parent was available for sessions two times per week. Children were excluded from the study if they had uncontrolled seizure activity or any known co-occurring syndromes or medical conditions (e.g. Tuberous sclerosis complex). Study recruitment took place on a rolling basis from January 2013 to September 2018. Eighty infants met the inclusion criteria and were randomized to one of two treatment conditions: a Baby JASPER Classroom or a

Standard Baby Classroom (description below). Randomized children were on average 18.21 months (SD=2.84) months at entry (see Table 1 for participant characteristics). Of the 80 randomized children, 21 children (26.25%) were infants with increased likelihood of autism (ILA), having at least one older sibling with a diagnosis of autism. This subset of infants was similar in baseline chronological age and early social communication skills, but had significantly higher Mullen Scales of Early Learning (MSEL) scores, including the Early Learning composite score, and receptive, expressive and visual receptive scores (See Table 2).

2.2. Procedures

2.2.1. Randomization and study design—Randomization took place using a random number generator by an independent statistician who maintained balance throughout the study period. Study personnel who conducted assessments (pre, post and follow up) and coded data were blind to children's allocation status. Adverse events were tracked with no serious adverse events reported during the study period. Six protocol deviations were documented (i.e., missed or shortened sessions, videotaping issue, and early exit due to parent's health issue).

2.2.2. Interventions—Both groups received a total of 6 h of early intervention per week (3-hour sessions, twice-weekly) for 8 weeks. Each infant classroom included 1-hour of specific parent instruction and training daily. The curriculum goals across the two conditions varied (see below), but both classrooms followed an early developmental model with group-based activities, circle-time, transitions, and daily living skills (e.g. diapering, snack time) embedded within the AEPS curriculum (Bricker & Waddell, 2002). An overarching goal of both classrooms was to provide a common mommy/daddy-and-me classroom structure for the parents and children. Parents were given opportunities to socialize, ask each other questions, and garner support from each other throughout.

2.2.3. Baby JASPER classroom—The Baby JASPER classroom embedded sessions based on the principles of the Joint Attention Symbolic Play Engagement and Regulation (*JASPER*; Kasari et al., 2021) intervention. JASPER is an empirically supported treatment that has been tested across a number of populations, including toddlers (Kasari et al., 2015; Shire et al., 2017), preschoolers (Chang and Locke, 2016; Kasari et al., 2014a) and school-aged children (Kasari et al., 2014b) with autism. JASPER focuses on sustaining periods of joint engagement to facilitate the development of social communication and play skills. The hour of parent instruction was split into two 30-minute sessions. One of the daily 30-minute sessions was parent-mediated, involving hands-on training with parents, while the other was interventionist-led with the parent observing.

2.2.4. Standard Baby classroom—In the Standard Baby classroom, the AEPS curriculum was used to select therapeutic goals in the domains of social-communication, motor, cognitive, and adaptive skills. Similar in structure to the Baby JASPER classroom, there were both parent and child-specific sessions delivered twice-weekly. In this condition the parent session took the form of a 1-hour group-based parent education session focused on behavior management, accessing services, and daily living skills (Brereton & Tonge, 2005). During the parent session, the children were working on pre-selected goals with trained interventionists.

2.2.5. Therapist supervision and treatment integrity—

Interventionists were trained to fidelity (greater than 90% adherence) on all aspects of the intervention prior to the study with at least two pilot infant/parent dyads. Additionally, 12.5% of sessions (or two out of 16 sessions) randomly selected across the 8 weeks in both the Baby JASPER and Standard Baby classroom were rated live by the senior investigators (AG and TP), across the classroom activities (e.g. circle time, snack time), individual and parent sessions. The average fidelity rating for the Standard Baby Classroom was 95.2% and 92.19% for the Baby JASPER classroom.

2.3. Measures

Examiners with clinical experience and trained to fidelity, who were also blind to treatment status, administered all pre-treatment, post-treatment, and follow-up assessments outside of the classroom setting, on different days and in different rooms. These assessments were then coded by an independent and blinded research team consisting of graduate students and research assistants, each trained to reliably code the measures described below. Videos were distributed at random with randomized numerical IDs so that coders were unaware of treatment condition and time point. Coders reached 80% reliability, measured using interclass correlation coefficients for each measure prior to coding any outcomes. All measures were collected at pre-treatment, post-treatment (8-weeks) and 2-month follow-up (16-weeks from baseline).

2.3.1. Caregiver child play interaction (CCX; Kasari et al., 2015)—

The CCX consisted of a 10-minute taping of the child and their caregiver. Caregivers were asked to engage in free play with their infant as they normally would at home using a standard set of toys (including dolls, dishes, balls, puzzles, trucks, shape sorters, and blocks). The blinded research assistants and graduate students coded the CCX for child social-communication, engagement, and play skills.

The CCX videos were coded for two types of communication: initiations of joint attention and initiations of behavioral regulation skills (requests). Discrete initiations of joint attention (IJA) behaviors included eye gaze, gestures, and language, consistent with the coding system applied in prior publications (see Kasari et al., 2014a; Kasari et al., 2015). The frequencies of IJA behaviors were summed to create a total IJA count. The behavior regulation outcome was a sum of the total number of eye gazes, gestures, and language initiated by the child (IBR), for the purpose of requesting.

The CCX videos were also coded for the duration of child-initiated joint engagement following the procedures of Kasari and colleagues (2015) and using an adapted coding system from Adamson and colleagues (2009). The coding combines the total duration of time the infant and parent were in states of child-initiated supported joint and coordinated joint engagement, with and without the use of symbols, into a single variable of child-initiated joint engagement. Supported joint engagement was coded if the child demonstrated awareness of the parent’s participation (e.g., takes turns with the same object, follows parent suggestion in play with the object), while coordinated joint engagement was coded when the child directly acknowledged the partner through triadic eye gaze, language, and/or gesture.

Play variables were also coded from the CCX. First, children's total diversity of play was coded, which is defined as the number of different types of play acts at each play level (Lifter et al., 1993). For example, putting a puzzle piece in a puzzle board and putting a shape in a shape sorter are two different types of presentation combination play. The second play outcome was the highest spontaneous play level demonstrated consistently during the interaction based on the play scale developed by Lifter and colleagues (1993).

2.3.2. Early social communication scales (ESCS; Seibert, Hogan & Mundy, 1982)—The ESCS is a videotaped, structured interaction designed to provide the child with the opportunity to communicate, including both to request and to share. The child and tester sit facing each other at a table with a set of toys in view, but out of the child's reach. Each toy is introduced one at a time. The ESCS was coded for children's spontaneous initiations of joint attention by summing the number of discrete joint attention initiations such as eye contact, gestures, early vocalizations, and language. Children's total number of spontaneous behavior regulation skills were also coded from the ESCS—a sum of eye contact, gestures, vocalizations, and language used for the purpose of requesting.

2.3.3. Structured play assessment-revised (SPA, Ungerer & Sigman, 1981; Kasari et al., 2010)—The SPA is a videotaped, semi-structured interaction designed to first observe the child's spontaneous play acts, and second to elicit the highest level of play from the child. The child is presented with 5 different play sets by the experimenter and the entire play interaction lasts between 15–20 min. The child's play behaviors are videotaped and later coded. The same variables of interest as the CCX were coded. One was the total diversity of child-initiated play acts, and the other was the highest play level achieved.

2.3.4. Mullen scales of early learning (MSEL; Mullen, 1995)—The MSEL is a measure of general cognitive ability appropriate for individuals from birth to 68 months. It yields age-equivalent scores for visual reception, gross motor skills, fine motor skills, and receptive and expressive language. Analyses included the child's age-equivalent scores for each of the subscales (fine motor, visual receptive, receptive language, and expressive language), as well as the combined Early Learning Composite (ELC) score.

2.3.5. Demographic form—Parents completed a demographic form at each study time point. This form included child, parent, and family-level information such as the parent's education, ethnicity, and child's treatment history, including interventions received prior to entering the study.

2.3.6. The autism diagnostic observation schedule- toddler version (ADOS-T; Luyster et al., 2009)—The ADOS-T is a semi-structured, standardized assessment of communication, social interaction, play, and imaginative use of materials. It is designed to assess for a clinical presentation of ASD or other pervasive developmental disorders in young infants and toddlers. Diagnostic algorithms can be used to calculate a total score, where higher scores indicate more autism symptoms. Cutoff scores are then applied to the total scores to indicate whether there is: 'little-to-no-concern', 'mild-to-moderate-concern', or 'moderate-to-severe-concern.' The ADOS-T was used to determine eligibility for the study with those scoring in the 'mild-to-moderate-concern' and 'moderate-to-severe-concern' included in the study. See Fig. 2 for Study Design and Data Collection Timepoints.

2.4. Statistical methods

Descriptive information for the primary and secondary outcomes and demographic information are presented as means and standard deviations for continuous variables and percentages in each group for categorical variables. Generalized linear mixed models were used to evaluate the longitudinal trajectories of all outcomes with subject-level random intercepts. For all outcomes except for the Mullen subscales and ELC, the models controlled for average baseline mental age (i.e. average of all subscales at baseline). The treatment effect of Baby JASPER vs. Standard Baby classrooms was defined as significant interaction between the treatment group and time (group by time interaction). Separate models were fit for each longitudinal outcome. Sibling status was also factored into the models and significant findings were reported.

The study was powered to detect a moderate difference of Cohen's $d = 0.66$ (based on prior data of SD = 111.89, Kasari et al., 2015) in joint engagement with 80% power at a significance level of $\alpha = 0.05$. An effect size of 0.66 corresponds to difference in joint engagement of 74 s (~1 min and 14 s).

3. Results

Demographic characteristics and cognitive measures were not statistically different between treatment groups (See Table 1). While the Mullen Early Learning Composite at baseline was higher for the Standard Baby classroom children compared to the Baby JASPER classroom children, the difference was not statistically significant ($p = 0.142$). In addition, compared to the Baby JASPER classroom, the Standard Baby classroom trended toward having more infants with an older autistic sibling (ILA; p = 0.06). Further analyses indicated that infants with ILA had significantly higher Mullen T-scores and Mullen age equivalency scores (visual receptive, receptive language, and expressive language) compared to children without an older autistic sibling (See Table 2). Hence, all models were adjusted for Mullen baseline mental age (average of all subscales).

3.1. Child initiated joint engagement (CCX)

There was a significant main effect of time with infants in both treatment groups making significant improvements in child-initiated joint engagement ($F(1112) = 7.15$, $p = 0.009$). There was also a significant treatment by time interaction with infants in the Baby JASPER classroom making significantly more gains compared to infants in the Standard Baby classroom from baseline to exit ($F(1, 112) = 4.86$, $p = 0.0295$). These differences diminished by the 2-month follow-up with no treatment by time differences in child-initiated JE between treatment groups ($F(1, 112) = 0.64$, $p = 0.524$) as children in the Standard Baby classroom increased in joint engagement by follow-up (Fig. 3).

3.2. Child initiated joint attention (CCX)

In interactions with parents, infants in both treatment groups improved in total spontaneous joint attention skills from baseline to exit ($F(1113) = 8.08$, $p = 0.005$) and from baseline to 2 month follow-up ($F(1113) = 20.11$, $p < 0.001$) with no significant difference in improvements between treatment groups ($F(1113) = 0.52$, $p = 0.474$) and ($F(1113) = 0.11$, $p = 0.738$, respectively).

Infants in both treatment groups remained stable in total requesting skills from baseline to exit ($F(1113) = 1.86$, $p = 0.175$), but improved significantly by the 2-month follow-up ($F(1113) = 6.57$, $p = 0.01$) with no significant difference in improvements between treatment groups ($F(1113) = 0.48$, $p = 0.489$ respectively).

3.3. Play (CCX)

Infants in both treatments made significant improvements in highest play level observed during the parent child interaction from baseline to exit ($F(1115) = 11.87$, $p < 0.001$), and from baseline to follow-up ($F(1115) = 16.88$, $p < 0.001$). There was no differential growth in play level from baseline to exit across the two groups ($F(1115) = 0.2$, $p = 0.885$), however the Baby JASPER group made significantly more progress in their play level from baseline to the 2-month follow-up ($F(1115) = 4.87$, $p = 0.0294$). The Baby JASPER classroom improved on average approximately 1.66 play levels more than the Standard Baby classroom at the time of follow-up.

From baseline to exit, all infants improved in their total play diversity ($F(1115) = 6.07$, $p = 0.015$) and there was no difference in the rate of improvement across the two treatment groups ($F(1115) = 1.11$, $p = 0.294$). There was also significant improvement in total play diversity from entry to the 2-month follow-up ($F(1115) = 4.67$, $p = 0.03$), but no difference in the rate of improvement across the two treatment groups ($F(1115) = 0.62$, $p = 0.431$).

3.4. Child initiated joint attention (ESCS)

Regarding total joint attention in the ESCS, there was a significant treatment by time interaction where infants in the Standard Baby classroom made more improvements in total joint attention skills compared to the Baby JASPER infants ($F(1118) = 4.65$, $p = 0.03$). Baby JASPER children remained stable in their total joint attention skills from baseline to exit ($F(1118) = 0.16$, $p = 0.687$) and from baseline to 2-month follow-up ($F(1118) = 0.15$, $p = 0.696$). Children in the Standard Baby classroom improved from baseline to exit ($F(1118) = 6.24$, $p = 0.0139$) and from baseline to 2-month follow-up ($F(1118) = 9.54$, $p = 0.003$).

Children in both treatment groups improved in requesting skills from baseline to exit ($F(1118) = 15.37$, $p < 0.001$) and from baseline to 2-month follow-up ($F(1118) = 25.85$, $p < 0.001$) with no significant difference in improvements between treatment groups from baseline to exit ($F(1118) = 0.01$, $p = 0.992$) or the 2-month follow-up ($F(1118) = 1.99$, $p = 0.161$).

3.5. Play (SPA)

There was significant growth in the highest level of play observed during the SPA from baseline to exit ($F(1118) = 8.57$ $p = 0.004$) and from baseline to the 2-month follow-up ($F(1118) = 31.44$, $p < 0.001$) across both the Baby JASPER and Standard Baby classrooms. There were no differences in the rate of improvement across the two groups from entry to exit ($F(1118) = 0.9$, $p = 0.368$) or entry to the 2-month follow-up ($F(1118) = 0.02$, $p = 0.879$).

Children in both treatment groups improved in total play diversity from baseline to exit ($F(1118) = 15.69$, $p < 0.001$) and from baseline to the 2-month follow-up ($F(1118) = 5.05$, $p < 0.001$). There was no difference in the rate of improvement across the two treatment groups from baseline to exit ($F(1118) = 0.09$, $p = 0.766$) or from baseline to the 2-month follow-up ($F(1118) = 0.46$, $p = 0.646$).

3.6. MSEL age equivalent scores

Children in both treatment groups improved in receptive language ($F(1,59) = 67.40$, $p < 0.001$), expressive language ($F(1,59) = 68.33$, $p < 0.001$), gross motor ($F(1,58) = 73.04$, $p < 0.001$), fine motor ($F(1,59) = 150.35$, $p < 0.001$), visual receptive ($F(1,59) = 82.13$, $p < 0.001$), and Early Learning Composite (ELC; $F(1,59) = 41.88$, $p < 0.001$) skills from baseline to exit. There were no significant differences in improvements in any age equivalency subscales and ELC between treatment groups (receptive: $F(1,59) = 0.89$, $p = 0.349$; expressive: $F(1,59) = 0.01$, $p = 0.937$; gross motor: $F(1,58) = 1.11$, $p = 0.297$; fine motor: $F(1,59) = 0.75$, $p = 0.389$; visual receptive: ($F(1,59) = 0.30$, $p = 0.584$; ELC: $F(1,59) = 1.80$, $p = 0.185$). On average, both groups made an 11-point increase in overall ELC, equivalent to developmental quotient (DQ) score, from entry to exit (a period of 8 weeks). Although not statistically significant, the Standard Baby classroom also started an average 7-points higher on ELC standard scores than the Baby JASPER group.

3.7. Moderators of treatment effects

We examined whether ILA moderated treatment effects since ILA status approached significance for differences between groups at baseline. Infant ILA status moderated the effect of treatment only on child-initiated joint engagement ($F(1108) = 11.56$, $p = 0.001$) where Baby JASPER infants without ILA made the most gains from baseline to exit ILA (Fig. 4).

In addition, ILA was also found to predict both expressive language ($F(1,59) = 6.5$, $p = 0.0134$) and DQ ($F(1,59) = 5.805$, $p = 0.0192$), such that infants with ILA had higher expressive language and DQ, but ILA did not moderated the treatment effect on expressive language and DQ.

4. Discussion

As the field rapidly expands its ability to detect early behavioral features of autism, there is an increasing need for effective interventions to reach even younger populations. Intervening in these early years requires careful consideration of the approach, intensity, and methods employed. Building on the knowledge gained from past trials, we utilized a mommy/ parent-and-me classroom model to bring families together with a focus on empowering parents with knowledge and strategies to facilitate interactions with their infants. This trial demonstrated promising, but mixed results. Infants in both classrooms made substantial gains in social-communication, play, and cognition during a brief, 8-week period. All infants gained over an average of 10 points in DQ and increased in standardized measures of social-communication and play, with these gains maintaining at a 2-month follow-up visit. The Baby JASPER classroom increased in child-initiated joint engagement and play level during dyadic interactions with their parent, while the Standard Baby classroom increased in joint attention during a standardized assessment delivered by an independent assessor.

This study utilized a universal classroom curriculum with active comparison of two different types of parent support interventions–one focused on psychoeducation, and the other on hands-on coaching with their infant. Infants in both classrooms made substantial gains over the course of the intervention and mostly maintained or continued to improve in these skills after the intervention ended. This is quite remarkable given the young age of the children, brevity of intervention delivered (8 weeks), and developmental period targeted, a time when autism behavioral symptomatology is often unfolding (across the second year of life). While difficult to determine the exact effect of this program given the absence of a no treatment control condition, several promising indicators were evident. First, all infants on average made 4 months gain across a 2-month intervention period, far out pacing what would be expected due to maturation alone. Second, and critical to these findings, is that the improvements were *child-initiated* and *unprompted* skills, many assessed by independent raters, suggesting these skills were being generalized from dyadic interactions with parents and truly independent. Findings regarding the positive effect of early intervention on cognition have been found in slightly older samples (Dawson et al., 2010), but to our knowledge it has not been replicated in a sample this young.

When parents were directly coached in JASPER strategies, this led to higher quality joint interactions between parent and infant in two areas, joint engagement, and play. This is consistent with previous findings and supports the growing evidence base for parent-mediated JASPER (Kasari et al., 2010 & 2015). In addition, infant sibling status moderated the effect of treatment on child-initiated joint engagement, such that Baby JASPER infants who did not have an older sibling with autism made the most gains. This finding was somewhat surprising and should be interpreted with caution given that infants with ILA in our sample had more advanced cognitive and language scores and also varied widely in baseline joint engagement across the two classrooms. This suggests that further work is needed to understand how individual characteristics in the child and parent shape these outcomes. Equally important to consider is that this model did not produce differential gains in social-communication or maintain greater gains in joint engagement past the immediate treatment period. This indicates that parent-mediated approaches may be best suited for specific dyadic gains and that booster sessions or continued coaching is needed for parents and infants to continue to make gains in these areas. In this trial, parent mediation was a light touch of only 1 h per week and may not have been sufficient to see lasting results. It is also possible that child initiated joint engagement has a ceiling effect and, in fact, infants in the Baby JASPER classroom reached age expectations earlier than infants in the Standard classroom, but this is difficult to ascertain without a normative comparison sample.

Infants randomized to the Standard Baby classroom made many similar and important gains as well. These infants displayed greater gains in joint attention during the standardized assessment (ESCS), but not in the CCX. This difference may be due to structural differences between the two classrooms. The Standard Baby classroom had roughly 1-hour more of structured, interventionist led, table-top activities for infants per day. While the parents were engaged in psychoeducation, novel adults were engaging with the infants, which may have led to better attention and emotion regulation during the independent assessment. During these sessions, the infant was expected to sit, wait for his/her turn, and attend to adult instruction, which may have bettered mirrored the testing environment of the ESCS, where children are asked to sit and attend to adult bids for social attention. Additionally, these children had more exposure to instruction from adults that were not their parents. Lastly, the universal curriculum, AEPS, had social-communication goals as well. It is possible that the increased structure in the Standard classroom was more conducive to learning joint attention and that these skills require more direct and structured instruction for very young children.

This study also highlights several considerations for future clinical and research endeavors. First, the goal of this study was to determine if parents could engage their children in ways to improve their outcomes in a short period of time. In 2 months and 16 sessions, children improved in social communication, play, and cognition. However, it is also clear (and not surprising) that parents and children would benefit from more sustained intervention and likely intervention more convenient to their home, as evidenced by families who did not complete the study lived furthest from the clinic (Sterrett et al., 2022). DQ gains were evident in both groups, recognizing the malleability of cognition in young children. Often, areas of core impairment in social communication (joint attention, joint engagement, play, imitation) are either not assessed in parent-mediated interventions or found invariable (Landa, 2018). In this study, children improved in both treatment groups with some differential changes by treatment model.

Future research studies should also be mindful of familial risk for autism, stratifying groups on this variable. Recent studies have found that infants with ILA due to having an older sibling with ASD often score higher on developmental assessments than community referred, non-infant sibling participants (Cohenour et al., under Review). This was also true in our sample, where infants had higher overall cognitive scores and expressive language, although unknown at the time of study initiation and not accounted for in the randomization.

In summary, this infant trial comparing two parent assisted models of early intervention shows promise as one vehicle to offer services to parents and their infants showing early signs of autism. Creating a supportive context for parents and their infants to gather and learn early developmental skills has high relevance and highlights the promise of intervening at the earliest moment to promote positive outcomes for children and families.

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Data Availability

Data will be made available on request.

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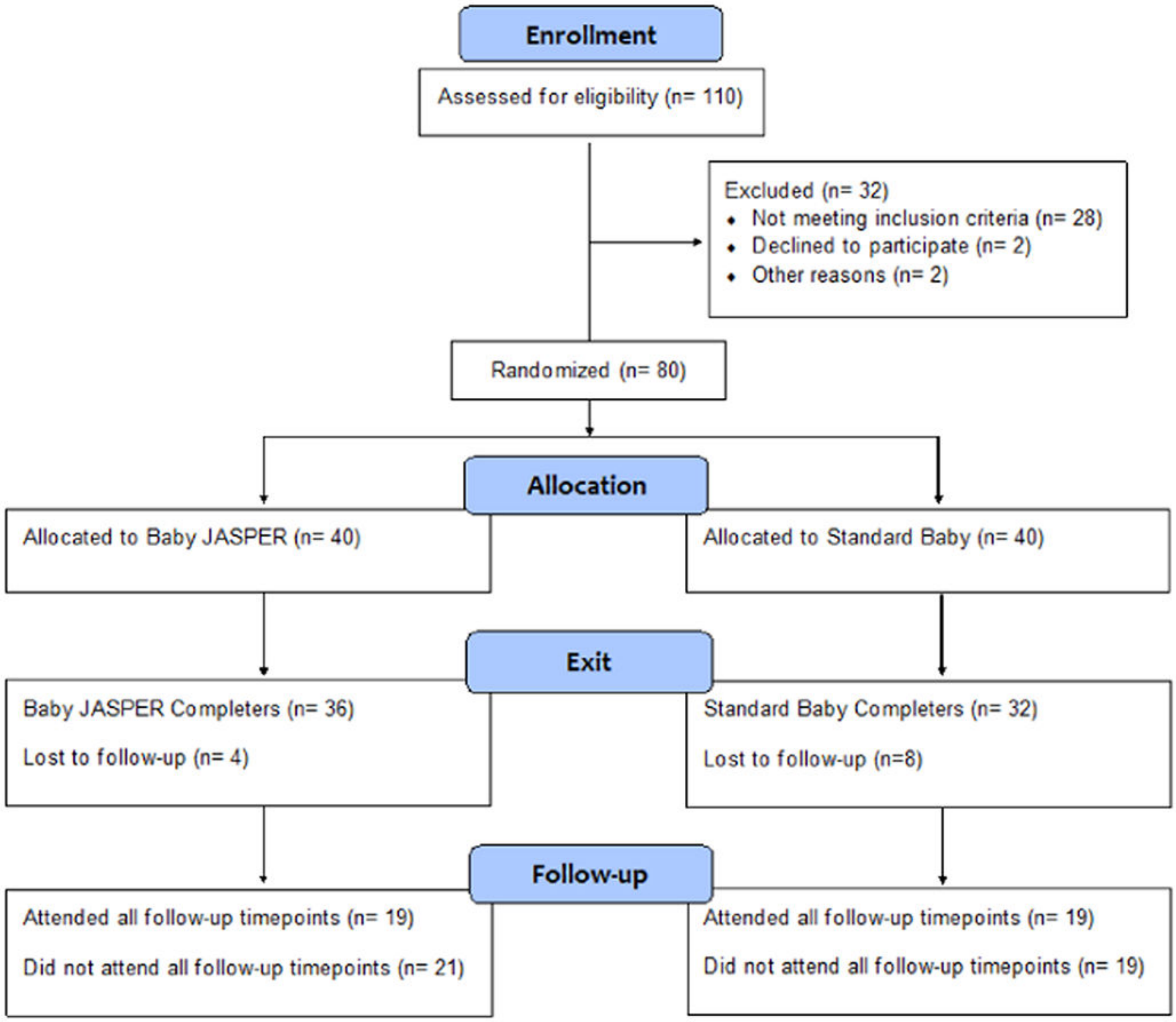

Fig. 1.
Consort Chart.

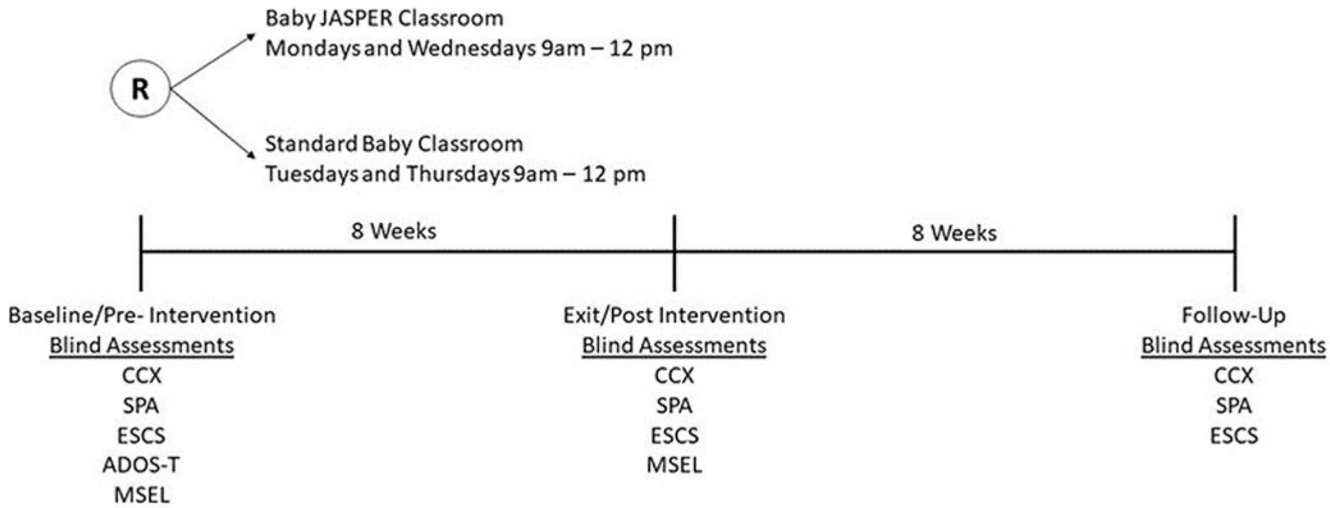

Fig. 2.
Study Design and Data Collection Timepoints.

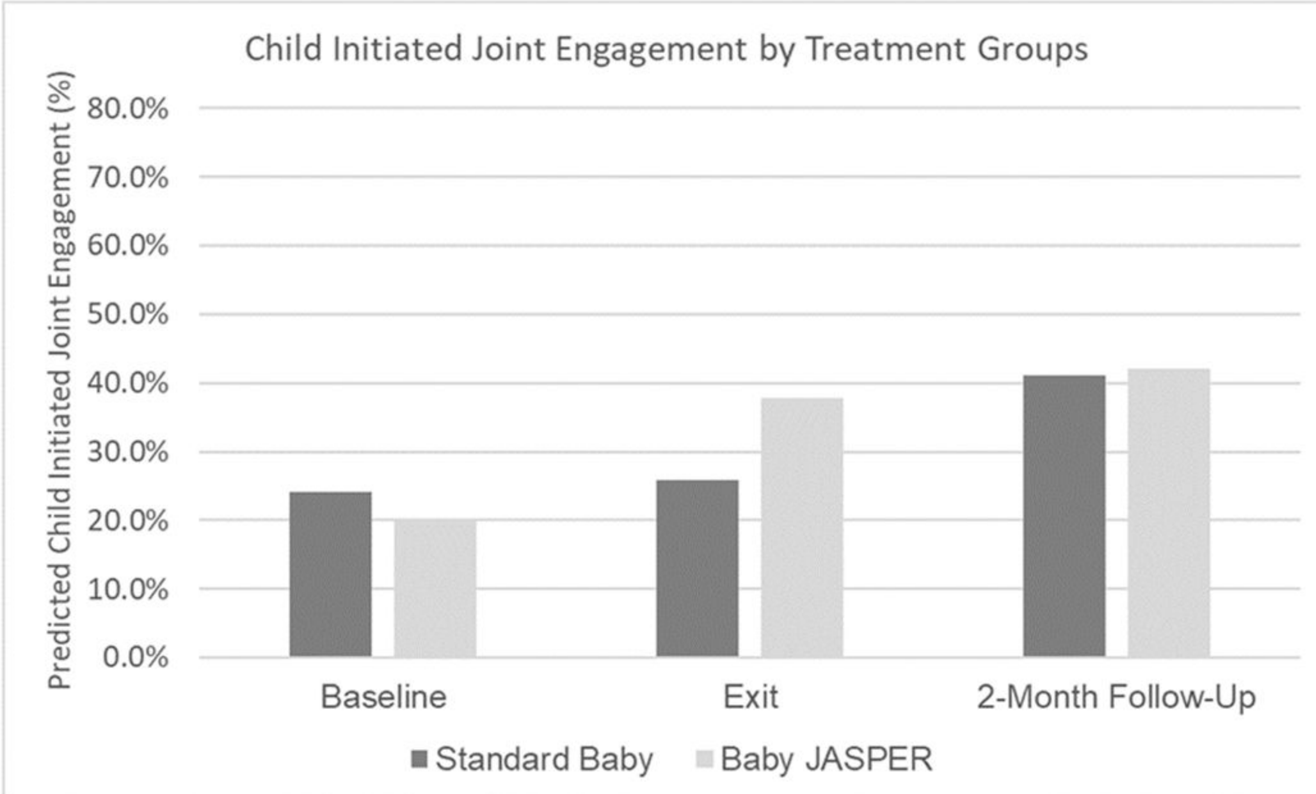

Fig. 3.
Child Initiated Joint Engagement By Groups.

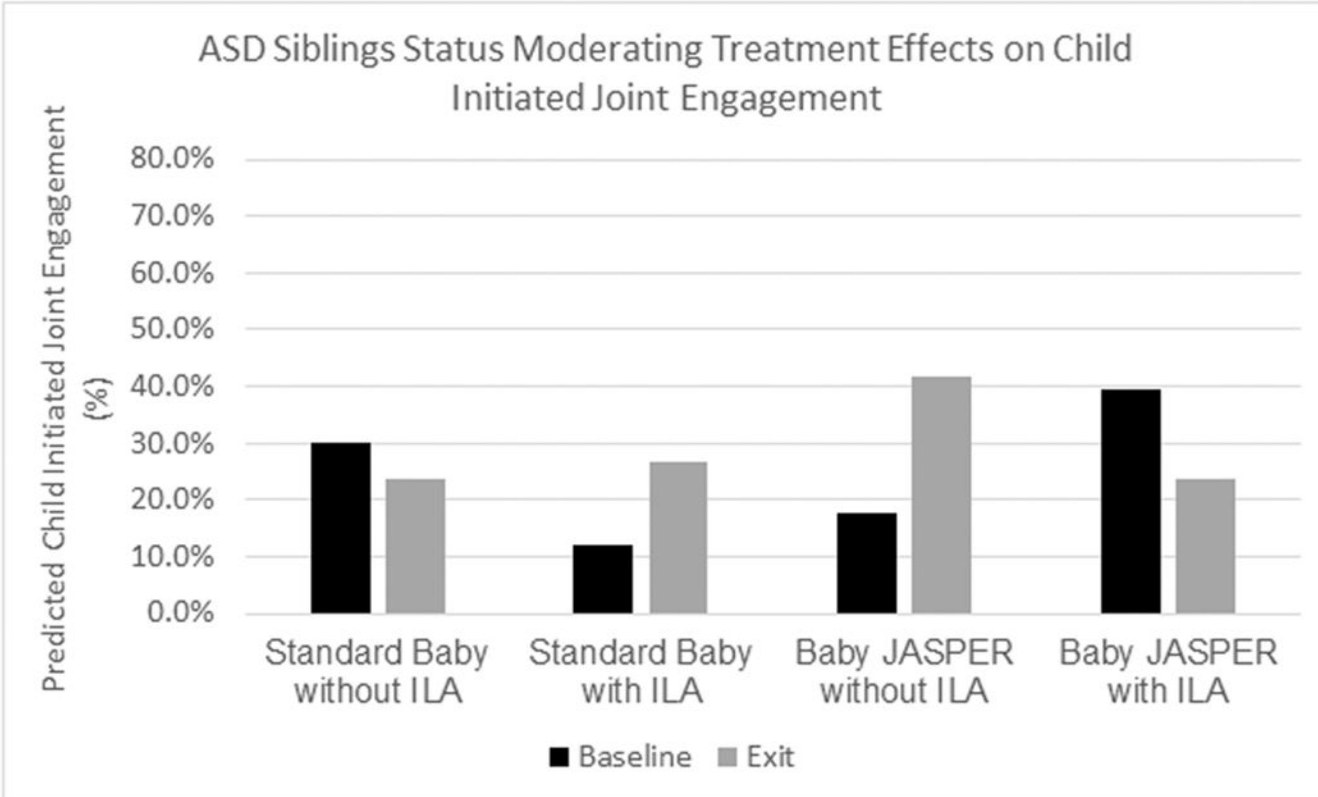

Fig. 4.
ASD sibling status moderating treatment effects on child initiated joint engagement.

Table 1

Descriptive Information of Full Sample (Mean, SD).

	Full Sample N = 80	Baby JASPER n = 40	Standard Baby n = 40	p-value
Chronological Age (Months)	18.21 (2.84)	18.12 (3.11)	18.3 (2.58)	0.999
Mullen ELC Standard Score	69.54 (14.95)	66.67 (12.86)	72.4 (16.45)	0.142
Number of Infant Sibs: n (%)	21 (26.25%)	6 (15%)	15 (37.5%)	0.060
Race/Ethnicity: n (%)				0.520
White	35 (43.75%)	20 (50.00%)	15 (37.50%)	
African American	4 (5.00%)	3 (7.50%)	1 (2.50%)	
Asian	7 (8.75%)	4 (10.00%)	3 (7.50%)	
Hispanic	10 (12.50%)	3 (7.50%)	7 (17.50%)	
Multiethnic	9 (11.25%)	3 (7.50%)	6 (15.00%)	
Other	14 (17.50%)	7 (17.50%)	7 (17.50%)	
Do Not Wish to Disclose	1 (1.25%)	(0%)	1 (2.50%)	
Child Gender: n (%)				0.780
Female	16 (20.00%)	9 (22.5%)	7 (17.5%)	
Male	64 (80%)	31 (77.5%)	33 (82.5%)	
ADOS Toddler Module Total score	17.72 (4.75)	18.43 (4.68)	17.00 (4.77)	0.267
Mother’s Employment: n (%)				0.654
Employed full-time	21 (26.25%)	10 (25%)	11 (27.5%)	
Employed full-time and second job		1 (2.5%)	1 (2.5%)	
Employed part-time	13 (16.25%)	9 (22.5%)	4 (10%)	
Not employed	28 (35%)	14 (35%)	14 (35%)	
Self-employed full-time	3 (3.75%)	1 (2.5%)	2 (5%)	
Self-employed part-time	10 (12.5%)	3 (7.5%)	7 (17.5%)	
Do Not Wish to Disclose	3 (3.75%)	2 (5%)	1 (2.5%)	

Table 2

Baseline Characteristics by Infant Sibling Status.

	Has Sibling with ASD		
Characteristics	**No (n = 57)**	**Yes (n = 21)**	**p-value**
Chronological Age (in months)	18.18 (2.79)	18.33 (3.04)	0.772
Gender			0.999
Female	11 (19.3%)	4 (19%)	
Male	46 (80.7%)	17 (81%)	
Mullen Early Scales of Learning			
Visual Receptive T Score	34.65 (11.21)	41.67 (12.99)	0.051
Fine Motor T Score	37.91 (11.65)	42.33 (8.45)	0.143
Receptive Language T Score	27.00 (12.93)	30.52 (9.14)	0.011
Expressive Language T Score	26.70 (8.73)	34.57 (11.14)	0.003
Visual Receptive Age Equivalent	13.86 (3.61)	16.19 (3.84)	0.021
Fine Motor Age Equivalent	15.91 (3.27)	16.86 (2.08)	0.174
Receptive Language Age Equivalency	9.96 (5.8)	12.38 (3.87)	0.002
Expressive Language Age Equivalency	9.37 (4.22)	12.71 (3.96)	0.002
Cognitive T Score	126.26 (34.31)	149.10 (32.65)	0.006
ELC Standard Score	66.89 (14.6)	76.33 (14.43)	0.007
Early Social Communication Scales			
Initiating Joint Attention	9.94 (10.01)	12.25 (8.85)	0.131
Initiating Behavior Requests	17.06 (12.53)	22.55 (12.7)	0.081
Responding Joint Attention	0.29 (0.22)	0.35 (0.29)	0.553
Structured Play Assessment			
Total Play Diversity	11.04 (7.82)	15.35 (12.26)	0.259
Play Mastery	4.46 (2.94)	6.15 (3.05)	0.027
Play Emerging	7.06 (3.21)	8.10 (3.24)	0.177