

UCLA

UCLA Electronic Theses and Dissertations

Title

Parents' Intervention Fidelity and Children's Joint Engagement: Dyads Including Children with Autism Spectrum Disorder who are Minimally Verbal

Permalink

<https://escholarship.org/uc/item/7sf3177x>

Author

Patterson, Stephanie Y.

Publication Date

2013

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA

Los Angeles

Parents' Intervention Fidelity and Children's Joint Engagement: Dyads Including Children with
Autism Spectrum Disorder who are Minimally Verbal

A thesis submitted in partial satisfaction of the requirements for the degree of Master of Arts in
Education

by

Stephanie Yoshiko Patterson

2013

ABSTRACT OF THE THESIS

Parents' Intervention Fidelity and Children's Joint Engagement: Dyads Including Children with Autism Spectrum Disorder who are Minimally Verbal

by

Stephanie Yoshiko Patterson

Master of Arts in Education

University of California, Los Angeles, 2013

Professor Connie Kasari, Chair

Approximately 25% of children with autism spectrum disorder (ASD) are minimally verbal (i.e. less than 20 functional words) at school entry (Anderson et al., 2007). Yet, literature examining social communication interventions for school-age children with ASD who are minimally verbal is limited (Lord et al., 2005). Twenty-two children with ASD age 5-8 with less than 20 words received a six-month social communication intervention including three-months of parent-training. Monthly 10-minute play interactions were coded for parents' implementation fidelity and children's time jointly engaged (Adamson et al., 2009). Parents mastered an average of 70% of the strategies with greatest gains in the first month. Critical gains in children's joint engagement were associated with parents' fidelity across time demonstrating parents' learning was relevant to children's gains.

The thesis of Stephanie Yoshiko Patterson is approved.

Sandra Graham

Jeffrey Wood

Connie Kasari, Committee Chair

University of California, Los Angeles

2013

Table of Contents

1. Introduction	pp. 1-6
2. Methods	pp. 6-10
3. Results	pp. 10-12
4. Discussion	pp. 12-18
5. Conclusions	pp. 18
6. References	pp. 23-27

List of Tables and Figures

1. Table XX Parent Workshops: Description of Content pp. 19
2. Table XX Engagement States: Descriptions pp. 20
3. Table XX Mean Values and Standard Deviation for Child
Engagement and Parents' Fidelity at Study Entry and Exit pp.21
4. Figure XX Parents' Total Fidelity Over Time pp. 22

Acknowledgements

This study is one component of a larger study entitled Characterizing Cognition in Nonverbal Individuals with Autism (CCNIA- PI- Kasari). We thank Autism Speaks for their support of the CCNIA study (Grant number: 5666) as well as their support of the work reported in this manuscript through the Dennis Weatherstone Predoctoral Fellowship (Grant number: 7036). Further thanks to the Canadian Institutes for Health Research for support through the Doctoral Foreign Study Award and Autism Research Training Program. I would also like to acknowledge the dedicated efforts of all members of the CCNIA study team including Kelly Goods, Jilly Chang, Kathryne Krueger, and Charlotte Mucchetti. Finally, thank you to all of the children and families who participated in the intervention.

Many children with autism spectrum disorders (ASDs) demonstrate severe delays in communication, such that 25% of children with ASD are minimally verbal (i.e., less than 20 functional spoken or augmented words) at school entry (Anderson et al., 2007). Little is known about the development of social communication in school-age children with ASD who have minimal verbal language however, one predictor of language development in typically and atypically developing children is time spent jointly engaged (e.g., Kasari, Paparella, Freeman, & Jahromi, 2008). Yet, children with ASD spend limited time jointly engaged compared to typically developing peers (Adamson, Bakeman, Deckner, & Ronski, 2009). Children have a number of fundamental interaction partners including teachers, peers, as well as parents. Parents' ability to maintain a synchronized shared state of engagement is also linked to children's language growth (Siller & Sigman, 2002). In order to support parents' ability to foster joint engagement, parent-mediated interventions demonstrating positive effects on children's joint engagement and early social communication have been developed for young children with ASD (e.g., Kasari, Gulsrud, Wong, Kwong, & Locke, 2010). Yet, intervention literature specific to school-age children with ASD who have minimal expressive language is very limited (Lord et al., 2005). The current study examines parents' ability to learn and implement a blended intervention comprised of two evidence-based interventions (Kasari et al., 2010; Kaiser & Hancock, 2003) and the association between their learning and the time spent jointly engaged by their school-aged children with ASD who are minimally verbal.

Importance of Parent-Child Interaction: Implications for Development

A social pragmatic view of development emphasizes the significance of social exchanges between the child and caregiver as the central context for learning (Tomasello, 2001). For example, how parents engage their children in daily social interactions can influence

communicative development for both typically and atypically developing children (e.g., Siller & Sigman, 2002). It is well established that children with ASD demonstrate early deficits in joint attention and other social communication skills that impact the child's awareness of others and their ability to coordinate attention between a partner and a shared referent (Mundy, Sigman, & Kasari, 1990). Related to these delays are the tendencies for children with ASD to make fewer social initiations (Mundy et al., 1990) and to reject more of their parents' bids for interaction (Adamson et al., 2001) than typically developing children. It is this constellation of factors that may make entering into and maintaining a joint engaged state difficult for a parent, influencing both the amount and quality of children's learning opportunities (Luyster & Lord, 2009). The potential cumulative effects of this impoverished learning environment on the development of a child who is experiencing significant communication challenges are ominous but not well understood (Warren et al., 2009). Thus, it is necessary to explore how parents may learn to better facilitate shared interactions with their children with ASD who are minimally verbal.

Joint Engagement, Language and Communication in ASD

Engagement in children with ASD. Compared to typically developing children of matched chronological age and children with developmental delays other than ASD of matched language level, young children with ASD have been found to spend 20-30% less time jointly engaged with their caregivers (Adamson et al., 2009). Rather, research suggests that children with ASD are spending more time focused solely on objects to the exclusion of people (Adamson et al., 2009). This state of object engagement is in opposition to joint engagement where both the child and social partner actively attend to a shared activity (Adamson et al., 2009). Object engagement has not been linked to children's later communicative abilities while associations between time jointly engaged with concurrent and later language have been

demonstrated repeatedly (e.g., Kasari et al., 2008). Therefore, targeted joint engagement interventions represent a natural first step to explore communicative development within the population of school-age children with ASD who are minimally verbal.

Language development in the school years for children with ASD. The extant literature includes very limited examination of the communication development of school-age children with ASD who are minimally verbal. For example, Pickett, Pullara, O’Grady, and Gordon (2009) describe 167 individuals with ASD who developed speech between the ages of 5 and 15 years. Emerging literature utilizing single subject experimental designs has also demonstrated that children with ASD can develop symbol systems through the use of augmentative and alternative communication (AAC; Ganz et al., 2011; Olive, Lang, & Davis, 2008). AAC systems include communication systems other than spoken language spanning a number of modalities including speech generating devices (e.g., SGDS: dynavox, iPad), picture/graphic systems, and manual sign (Mirenda & Iacono, 2009). However, little information is available to describe the factors contributing to language development in school-age children who are minimally verbal. The literature does demonstrate that a joint engaged state is a predictor of language development in young children with ASD (Adamson et al., 2009). Joint engagement provides a unique context for learning whereby a parent may scaffold a child’s emerging skills within a shared attentional focus (Kasari et al., 2008). Research has demonstrated that joint engagement can be increased through the delivery of targeted interventions focusing on both spoken (Kasari et al., 2010) and augmentative communication (Adamsom, Ronski, Bakeman, & Sevcik, 2011). Overall, a joint engaged state provides a pivotal venue for communicative development and is therefore, a key intervention target for children who are minimally verbal.

Parent Education and Training Programs

Training parents to use intervention strategies is an essential component of intervention programming for children with ASD in order to provide consistent, daily support (National Research Council, 2001). Recent reviews suggest parents of children with ASD can become effective language facilitators through parent-training (e.g., Patterson, Smith, & Mirenda, 2012). In addition, this learning can positively impact parents' behaviour (e.g., reduce depression, enhance communication style, knowledge of ASD) as well as children's language development (e.g., increased vocabulary, vocalizations, AAC usage) (Matson, Mahan, & Matson, 2009; McConachie & Diggle, 2007; Thurnberg, Sandberg, & Ahlsen, 2009). Specifically, programs targeting parents' ability to foster a state of joint engagement have demonstrated positive effects on children's early social communication skills (e.g., Kasari et al., 2010) and language development (e.g., Kaiser & Hancock, 2003). However, less is known about the degree to which parents are learning to accurately deliver these interventions during training and over time, specifically with school age-children with ASD who are minimally verbal.

Importance of Fidelity of Intervention Implementation

Documenting fidelity of implementation is a necessary but under-reported component of methodological quality (Lord et al., 2005; Smith et al., 2007). Fidelity measures provide information regarding implementation accuracy and protocol adherence (Smith et al., 2007). Conclusions regarding intervention efficacy based on studies which lack measures of fidelity can be erroneous due to the inability to determine which components were delivered or the quality of their delivery. Meta-analysis of service programming indicates that implementation impacts program outcomes (Durlack & DuPre, 2008), yet, only a handful of studies primarily utilizing single subject research designs have evaluated parents' mastery of the skills presented in parent-

training programs for families of children with ASD (Patterson et al., 2012). Across studies, mixed gains were found in parents' implementation across a range of intervention varying in practices and dosage. Therefore, detailed examination of parents' fidelity in randomized intervention trials and examination of parents' learning with children's outcomes is necessary.

The Current Study

Overall, the existing body of literature on parent-training programs includes limited detailed examination of parents' learning, their ability to accurately and flexibly deliver high quality intervention over time, and the relationship between parents' increasing skills and children's outcomes. Further, children with ASD who are minimally verbal are underrepresented in the parent-training literature. Due to the limited literature examining this specific subgroup of children with ASD, the trajectories and outcomes of these children are often masked by group effects when included in studies with children with a range of language skills. The goal of the current study is to examine the degree to which parents of school-age children who are minimally verbal master a targeted social communication intervention over time. We hypothesize that parents may demonstrate a small increase in fidelity over the course of the first three months of intervention (stage 1) where they are only observing the clinician work with their child. We then expect greater gains in parents' fidelity as they receive training for the later three months of the intervention (stage 2). We also anticipate that parents of children in the AAC condition who need to learn how to navigate the speech generating device in addition to the intervention may demonstrate lower fidelity than those in the spoken language condition who only learn the intervention strategies. In addition, a second aim of this study is to examine the association between parents' fidelity of intervention implementation and children's joint

engagement over the course of the intervention. We hypothesize that parents' increased fidelity over time will be associated with children's total time jointly engaged.

Methods

Participants

Children. This study includes 22 children enrolled in a multisite intervention study. Only families enrolled through one of three sites were included due to the increased frequency of documentation of caregiver-child play interactions at this site. Included children were: (a) between 5 and 8 years of age, (b) diagnosed with an autism spectrum disorder (confirmed using the Autism Diagnostic Observation Schedule: ADOS Lord et al., 1999) but no other sensory or genetic disorder (e.g., seizure disorder), (c) demonstrated minimal verbal language (less than 20 functional expressive words), (d) had engaged in at least two years of early intervention, and (e) demonstrated a nonverbal developmental age of at least 24 months. Included children ranged in age from 5.2 to 7.8 years (*mean*= 6.6 years) and developmental level with a mean nonverbal age equivalent score of 4.26 years (*SD*= 1.13 years) on the Leiter International Performance Scale Revised (Leiter-R: Roid & Miller, 1997). Children also varied in language skills with an age equivalent expressive language mean of 22 months (*SD*=5.76 months) as measured by the Test of Early Language Development-3 (TELD-3: Hresko et al., 1981). In addition, children obtained age equivalent receptive language scores of 33.9 months (*SD*= 8.72 months) on the Peabody Picture Vocabulary Test- 4 (PPVT-4: Dunn & Dunn, 1997) and 22.5 months (*SD*=9.14 months) on the TELD-3. Children were all males who caregivers identified as Caucasian (*n*=12), Asian (*n*=5), African American (*n*=2), Hispanic (*n*=2), and multiracial (*n*=1). Parents reported that children had received two to three years of intervention typically including speech therapy and interventions based in applied behavioural analysis. Two children failed to complete intervention

dropping out after three of six months. Both families withdrew for reasons unrelated to the intervention (e.g., moved away, job demands). Families returned at study six month exit and follow up for assessments. Data from both families are included in the analyses. At three month follow up 17 families returned for assessment.

Caregivers. Families selected one caregiver to act as the target caregiver for this study (i.e., participate in coaching). Additional caregivers were welcomed to observe sessions and workshops but they did not receive coaching to ensure that each family's target caregiver received the same coaching dosage. Descriptive information is provided for target caregivers ($n=22$) including 18 mothers and 4 fathers ranging in age from 32 to 45 years (mean= 39.23 years, $SD=3.89$ years). All primary caregivers had completed at least some college where seven entered college but did not obtain a degree, nine completed a college degree, and six obtained graduate degrees.

Procedures

Measure. Families completed a 10-minute caregiver-child interaction (CCX) with a standard set of toys (including a ball, blocks, vehicles, dinosaurs, dishes with food, dolls and furniture, drum with sticks, a puzzle and a shape sorter) at monthly intervals from entry through exit and at three month follow up (total of eight interactions). Parents were instructed to play with their child as they usually would.

Intervention. Families participated in a six-month long novel intervention blending two evidence-based approaches: Joint Attention, Symbolic Play, Engagement, and Regulation (JASPER: Kasari et al., 2010) and Enhanced Milieu Teaching (EMT: Kaiser & Hancock, 2003). This intervention targets joint engagement, early social communication, and language in the context of developmentally appropriate play in order to create opportunities for learning.

Language modeling, expansions, and environmental supports are provided to support language development. In addition, language facilitation strategies including time delay procedures and milieu episodes (see Hancock & Kaiser, 2006) are also incorporated.

Intervention sequence. Participants were randomized to one of two conditions which differed by the mode of communicative output targeted either: (a) spoken or (b) spoken and augmented output via a speech generating device (spoken and AAC). The intervention was divided into two stages. Stage one consisted of three months of clinician-child intervention. At the end of stage 1, children's communicative development was assessed across intervention sessions and structured assessments. The data were evaluated against a set of criteria to determine whether the child was considered a responder or non-responder to treatment. Further information about responder status criteria can be obtained from the author. Responders continued with the same treatment condition from stage 1 while non-responders were re-randomized to either: (a) Spoken and AAC (if in Spoken in stage 1) or (b) increased intensity (one additional session per week). Re-randomization to the Spoken condition was not available to non-responders in the Spoken and AAC condition as this would constitute removal of the AAC device. Rather, non-responders were provided increased intensity Spoken and AAC. Only two children were considered non-responders, one re-randomized to each arm (increased intensity, Spoken and AAC). Due to the limited number of non-responders ($n=2$), the analyses for the current study will be conducted based on the child's initial randomization to Spoken or Spoken and AAC.

Parent coaching. Parent coaching began at stage 2, half way into intervention. Parent education included: (a) six content workshops, (b) passive parent coaching, and (c) active parent coaching. Workshops were delivered every fourth session where all other intervention sessions

were dedicated to coaching (see Table 1 for workshop description). Passive parent coaching occurred for two-thirds of each session where the interventionist would verbally highlight information for the parent as she conducted the intervention with the child while the final third of the session included active parent coaching whereby the parent would interact with the child while the interventionist supported the parents' implementation of the intervention as necessary.

Primary Outcome Measures

Caregiver fidelity of implementation. The videotaped CCX were taken monthly from entry through follow up (total of eight videos) and coded for parents' fidelity of implementation. The fidelity protocol includes seven sections, one for each of the six workshops as well as AAC use (if in AAC). Items represented the key components of the intervention generally mirroring interventionists' clinical fidelity. Items were rated using a five point Likert scale where a 1 represented inaccurate or lack of use a strategy while a 5 represented high quality, developmentally appropriate use of the strategy for least 80% of the time, the standard which clinicians were required to meet in order to deliver the intervention. Two trained independent raters blind to study time point scored the videos. Coding discrepancies were resolved through consensus discussion. Twenty percent of the videos were coded for inter-rater reliability. Interclass correlations (ICC) indicate high reliability across workshops (ICC= 0.997).

Child engagement. The CCX was also coded for children's engagement. An engagement state was defined as three or more consecutive seconds, characterized as one of the seven mutually exclusive states reflecting a hierarchy of attention to objects and the parent (Adamson et al., 2009) from unengaged through joint engagement (see Table 2 for description of states). The study analysis includes a composite variable "joint engagement" (JE) including the four joint states: supported joint (SJ), symbol infused supported joint (SJS), coordinated joint (CJ),

and symbol infused coordinated joint (CJS) (see Table 2 for descriptions and coding anchors). In addition time spent unengaged (UN) and object engaged (OB) will be reported. Reliability was established across independent raters where Intra-Class Correlations (ICCs) ranged from 0.84-0.99.

Results

Descriptive statistics were conducted to ensure that statistical assumptions were met for linear mixed models. Children's total joint engagement was not normally distributed at all time points. Therefore, a log transformation was performed to satisfy this assumption. Mean values at entry and exit demonstrate an increase in parents' total fidelity, AAC fidelity, and children's time JE. In addition, mean values for both unengaged and object focused states decreased over time. See Table 3 for mean values for parent and child variables at study entry (time 1) and study exit (time 7).

Treatment Group Assignment. The data were also examined for differences in parents' fidelity and children's time JE between intervention conditions (Spoken vs. Spoken and AAC). Mixed ANOVA models demonstrated that there was no significant interaction between time and treatment condition for either time JE or parent fidelity scores. As such, treatment condition was not included as a parameter in the model to follow.

Linear Models: Parent Fidelity and Children's Joint Engagement

A longitudinal mixed model was used to examine the association between parents' fidelity of implementation and the total duration of time children spent in a joint engaged state (log transformed: \ln time JE). A model was constructed with parents' fidelity score (percentage) as the outcome:
$$\text{Fidelity}_{ij} = \alpha_0 + \alpha_1 \text{time1-4}_{ij} + \alpha_2 \text{time4-5}_{ij} + \alpha_3 \text{time5-7}_{ij} + \alpha_4 \text{time7-8}_{ij} + \alpha_5 \ln \text{JE}_{ij} + \beta_i + \epsilon_{ij}$$

The model allows for random intercepts. Residual error terms are independent and identically distributed with variance σ^2 . Within this repeated measures model, children's total time in seconds spent joint engaged (Intime JE) was included as a time varying predictor to examine the association of children's changing joint engagement with parents' changing fidelity over time. The model demonstrated that parents' rate of growth in total intervention fidelity was significantly associated with the duration of children's JE at all time points ($f(1,111)=6.65$, $p<0.011$).

In addition, time was included as four separate parameters in the model. The first parameter included time points 1 through 4 representing the first half of treatment where parents only observed a clinician. The second parameter included time 4-5 representing the first month of parent training while parameter three included time 5-7, the last two months of parent training. Finally, parameter four included time 7-8 to capture the three-month follow up period. Figure 1 depicts parent fidelity across the four time segments.

Altogether, four distinct trends in parents' learning were found where first, on average from time 1-4 parents demonstrated a small but significant increase in their understanding and application of the intervention ($f(1,111)=19.20$, $p<.001$). Second, the steepest increase in parents' learning occurred in the first month of coaching from time 4-5 ($f(1,111)= 17.28$, $p<.01$) while fidelity then remained relatively stable and on average did not change significantly from time 5-7 ($f(1,111)=.01$, $p<.05$). Last, fidelity decreased slightly but significantly from treatment exit to follow up ($f(1,111)=8.80$, $p<.004$). Overall, this model demonstrates that the rate at which parents learned to accurately and appropriately implement the intervention strategies varied based on the type of training (observation vs. coaching). Parents did learn from observation alone but the greatest gains occurred in the first month of coaching with increases tapering off over the

last two months. Parents achieved an average of 70% mastery by study exit with maintenance of a large number of skills at follow up.

Discussion

Overall, parents demonstrated increased understanding and appropriate implementation of intervention strategies to support their children with ASD who are minimally verbal. Parents' total fidelity score was significantly associated with increases in the duration of time that children spent jointly engaged at all time points. This finding will be discussed relative to several factors including parents' learning, children's profile of engagement, and time related trends.

Parents' Overall Intervention Implementation Fidelity

Overall, parents made significant gains in their understanding and appropriate implementation of the intervention strategies achieving an average of just over 70% fidelity, 10% under the standard required of clinicians implementing the intervention. Parents entered the study with a range of knowledge and a variety of strategies to engage their children in play, with some having more success than others. The criteria used to assess parents' fidelity in this study was stringent, holding parents to the same standard that trained interventionists are required to meet in order to deliver the intervention. Within this framework and the scale of ratings from 0-5, a midrange score of 3 indicates that parents' were frequently trying the strategy but with the following concerns: 1) they may have failed to use a strategy when necessary and/or 2) they implemented the strategy incorrectly some of the time. Many parents received a higher rating of 4, indicating developmentally appropriate and accurate strategy implementation 60-80% of the time. Accurate and appropriate implementation was required over 80% of the time to obtain a score of 5. Therefore, parents who exited the study with 60-80% accuracy demonstrated that they learned the intervention techniques but, could still use some support in identifying moments

where they failed to use a strategy or demonstrated mixed quality implementation in order to increase the consistency and density of intervention they provide.

Intervention Condition

It was hypothesized that parents of children in the spoken and AAC condition may demonstrate lower overall intervention fidelity than those in the spoken language condition due to the demand to learn to navigate the SGD in addition to the intervention. This hypothesis was not confirmed as preliminary analyses indicated that there were no significant differences in parents' JASPER-EMT fidelity or children's time JE between the spoken and spoken plus augmented language conditions. However, examination of descriptive statistics indicate that on average, parents within the spoken plus AAC group did not learn to proficiently use the SGD (mean AAC score at exit= 0.74%, *SD*= 13.02%). To achieve over 80% fidelity, parents were required to keep the SGD in reach and use the SGD when modeling language (at least 25% of the time), expanding children's language (at least 50% of the time), and responding to their child's augmented communication (at least 80% of the time). The purpose of this type of responding was to provide augmented input in the form of language models and expansions to supplement spoken language without demanding output from the child (Ronski et al., 2011). However, parents tended to model and expand their children's language using purely spoken responses rather than respond with both spoken and augmented communication. In addition, parents tended to respond to their children's augmented communication with spoken language only. This lack of use of the device when modeling language and responding to children's spoken and augmented language led to low fidelity scores on the AAC items. However, it is notable that the two caregivers with the highest fidelity scores for AAC use (at 40% and 75% respectively) had children who frequently used the SGD functionally to communicate within the interaction while

caregivers within the remaining dyads demonstrated near zero use of the SGD (*mean*=11.3%).

This preliminary data may indicate that children's initiations of augmented communication elicit greater use of the SGD by their caregiver.

Profile of Engagement

First, on average this sample of children with ASD who are minimally verbal present with profile of engagement consisting primarily of time spent either unengaged (e.g., wandering, self stimulatory behaviour) or focused exclusively on objects to the exclusion of interactions partners (average sum of time unengaged and object focused at entry= 391.73 seconds). These children spent an average of approximately two minutes of the interaction jointly engaged at entry. This limited period of shared attention when compared to preschool age typically developing children who have been found to spend an average of 75% of much longer interactions (30 minute) jointly engaged (e.g., Adamson et al., 2009), has concerning implications for development when considering that multiple studies have demonstrated concurrent and predictive association between joint engagement and children's language development (e.g., Kasari et al., 2008). Findings from the current study indicate that an intervention targeting joint engagement and early social communication can lead to increases in children's shared attention. Further, even small changes in parents' strategy use are associated with increases in joint engagement. Therefore, even when children demonstrate an overwhelmingly lack of engagement or time spent alone with objects, parents are able to learn and implement intervention strategies to capture their children's attention and facilitate increases in joint engagement.

Parents' Learning and Children's Joint Engagement: Time Trends

It is notable, parents made some gains in their understanding of the intervention from only observing an interventionist implement the strategies with their child (mean difference from time 1 to time 4= 11.26%). However, parents' rate of learning increased dramatically with the onset of coaching and content workshops with the greatest increase occurring in the first month of instruction. Within the first month of coaching, parents are introduced the bulk of the primary intervention strategies and content knowledge (see table XX). Parents learn about the hierarchy of engagement states from unengaged through joint engagement, as well as the development stages of play (see Lifter, Sulzer-Azaroff, Anderson, & Cowdery, 1993). Parents are taught to notice their child's play level in order to select developmentally appropriate activities that will provide the context for them to enter a joint engaged state with their child. Parents are also asked to focus on allowing the child to initiate communication and play acts by following the child's lead, arranging materials in the environment, and imitating children's play and language. This information is included in workshops 1 and 2 and then targeted during subsequent coaching sessions. Overall, parents demonstrated high fidelity at study exit on material covered in these two workshops (workshop 1 average= 78%, workshop 2 average= 75%).

Between time 5 and 7 parents are introduced to more complex strategies. Parents were first asked to modify their language to match their child's developmental level by matching the length of their child's utterance (typically 1 or 2 words). Parents were also asked to comment on their child's play, thereby modeling language that is related to the child's attentional focus rather than ask questions or direct the child's attention. In addition, parents were introduced to the concept of play routines and strategies to establish repeatable routines with developmentally appropriate toys. Both language strategies as well as the concept of play routines were often introduced within the first month of training and then formally reviewed through workshops and

coaching in month two. This is because parents who mastered the basic strategies were naturally moving into play routines. Thus, it was necessary and natural next step to introduce these concepts. Next, parents were taught to expand their children's play routines and language. Appropriate expansion of children's play was a difficult strategy for many parents. A play expansion is meant to provide the child with one additional play act that the child may incorporate into their existing play routine. Expansions are designed to increase play diversity and flexibility, provide opportunities to model new vocabulary, and to extend the duration of the child's engagement in play. Parents were asked to model a new developmentally appropriate step to a play routine if the child was not yet able to initiate the next step independently. For example, the child may be putting dolls to sleep, by putting pillows, dolls and blankets on the bed and then pretending to sleep. An expansion of this routine could include the dolls waking up after they have gone to sleep. However, parents often expanded play too quickly, disrupting the play routine and breaking the state of joint engagement. Expansions are a necessary strategy in order to prolong the routine that is providing the basis for the joint engaged state as well as support the elaboration of children's play repertoires. However, due to the dynamic nature of play and engagement, expansions that are appropriate and well timed such that they facilitate rather than hinder engagement and play can be difficult to introduce. In order to increase parents' success with this complex but necessary strategy, parents may benefit from increased practice time with immediate feedback from a clinician. Shifting the balance of passive and active coaching to allow for more time in active coaching during months two and three of intervention may help support parents' implementation of complex strategies.

Strengths and Limitations

A strength of the current study is the focus on a population that is not often reported in the literature, families with school age children with ASD who are minimally verbal. The literature exploring parent-mediated programming and parent training primarily includes families with toddlers and preschool age children with ASD. Further, the explicit focus on children with ASD who have yet to develop functional expressive language skills adds to the unique contribution of this study.

Future Directions

In regard to parents' learning, the findings suggest that the rate at which parents learn the intervention strategies and implement them appropriately with their children influences the amount of time that their children spend in a joint engaged state. Seeing as parents within this sample made their greatest gains within the first month of parent training, exploration of further supports for more complex strategies are required. Such supports may include increasing time in active rather than passive coaching to allow parents to obtain more time practicing complex strategies while receiving in vivo feedback as well as video feedback to allow further opportunities to discuss, reflect upon, and troubleshoot implementation may help facilitate mastery of these strategies. Further, parents entered this study using a variety of strategies to try to engage their child in play.

In addition, children enrolled in this study had engaged in at least two years of early intervention programming during which time parents may have been exposed to a variety of intervention models, some incorporating parent training. Parents entered this study with range of strategies, some experiencing more success in engaging their child than others. Based on practices utilized in medical education for adult learners (Newman, 2002), future studies may explore how parent-training protocols may be individualized to build upon parents' existing

knowledge (e.g., individualize the order introduction of the content based on the needs of the parent) as well as incorporate their personal training goals to help facilitate parents' learning.

Conclusion

Overall, parents were able to successfully learn JASPER-EMT intervention strategies to support their children's joint engagement during play. Children with ASD who are minimally verbal who are spending a large portion of their time unengaged or engaged only with objects can make gains in the amount of time they spend jointly engaged with their parent. Further, parents' ability to accurately implement intervention strategies with their child does influence the amount of time that children spend jointly engaged, a state that has important implications for children's learning and development.

Table 1
 Parent Workshops: Description of Content

Workshop	Description
1: Introduction to the Intervention	<ul style="list-style-type: none"> •Information regarding purpose and key components of the intervention •Introduction to children’s engagement states
2: Mirroring and Mapping	<ul style="list-style-type: none"> •Focus on imitation and modeling language •Focus on imitation and modeling appropriate play actions
3: Establishing Play Routines	<ul style="list-style-type: none"> •Introduction to play routines •Focus on strategies to develop play routines •Highlight child’s language targets and appropriate language for play routines
4: Expanding Language and Play Routines	<ul style="list-style-type: none"> •Define appropriate play and language expansions for the child’s play and language level •Strategies for expanding play routines
5: Joint Attention and Time Delay Strategies	<ul style="list-style-type: none"> •Focus on joint attention gestures- modeling and strategies to facilitate children’s use of joint attention gestures •Introduction to time delay strategies including waiting within routines, assistance, providing choices and inadequate portions
6: Milieu Episodes	<ul style="list-style-type: none"> •Focus on the prompting procedure for a milieu episode to prompt the child’s communication •Determining appropriate opportunities to use milieu episodes

Table 2

Engagement State Descriptions (Adapted from Adamson et al., 2009)

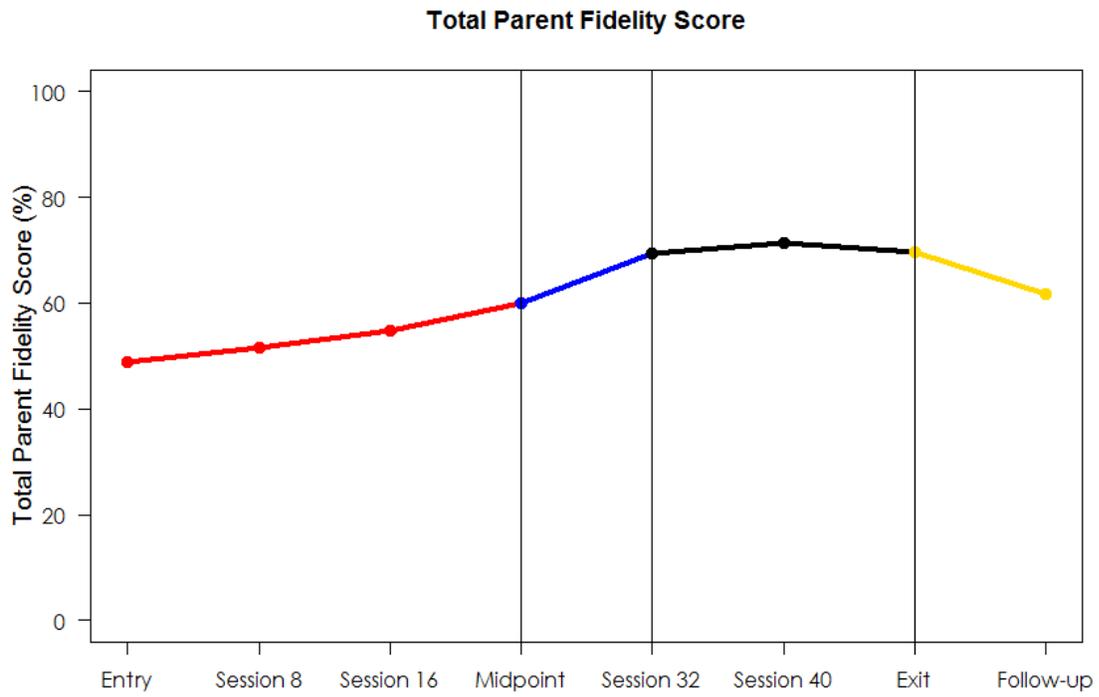
Engagement State	Definition
Supported Joint (SJ)	Child and parent are actively engaged in a shared referent. The child is aware of the parent’s participation (e.g., notices parent’s actions on object and child joins in the play; child and parent are actively taking turns on an object) but does repeatedly and overtly acknowledge the parents’ participation via eye contact.
Supported Joint with Symbols (SJS)	Child and parent are actively engaged in a shared referent and the child demonstrates an awareness of the parent’s participation. Additionally, the child acknowledges the parent’s use of symbols (e.g., child follows parent suggestion about how to act on an object) or the child uses symbols in reference to the shared activity (e.g., child and parent are rolling a ball back and forth and the child talks about the activity (e.g., “roll ball”) without making eye contact with the parent).
Coordinated Joint (CJ)	Child actively and repeatedly acknowledges both the shared activity and the interaction partner through eye contact and gestures (e.g., pointing, showing or giving objects)
Coordinated Joint with Symbols (CJS)	Child actively and repeatedly acknowledges both the shared activity and the interaction partner through eye contact and gestures (e.g. pointing, showing or giving objects). Additionally, the child responds to or uses language in reference to the shared activity.

Table 3

Mean Values and Standard Deviation for Child Engagement and Parent Fidelity

Variable	Entry Mean	Exit Mean
<i>Parent Variables</i>		
Total Fidelity Score	44.62% (<i>SD</i> =8.04%)	71.05% (<i>SD</i> =13.51%)
<i>Child Engagement Variables</i>		
Duration UN	112.68s (<i>SD</i> =112.68)	92.09s (<i>SD</i> =67.17)
Duration OB	279.05s (<i>SD</i> =126.24)	239.64s (<i>SD</i> =122.61)
Duration JE	123.27s (<i>SD</i> =73.98)	155.52s (<i>SD</i> =106.62)

Figure 1
Parents' Fidelity Score Over Time with Time Segmented Into Four Components



References

- Adamson, L.B., Bakeman, R., Deckner, F. & Ronski, M. (2009). Joint engagement and the emergence of language in children with autism and down syndrome. *Journal of Autism and Developmental Disorders, 39*, 84-96.
- Adamson, L., McArthur, D., Markov, Y., Dunbar, B., & Bakeman, R. (2001). Autism and joint attention: Young children's responses to maternal bids. *Applied Developmental Psychology, 22*, 439-453.
- Adamson, L.B., Ronski, M., Bakeman, R., & Sevcik, R.A. (2011). Augmented language intervention and the emergence of symbol infused joint engagement. *Journal of Speech, Language, and Hearing Research, 53*, 1769-1773.
- Anderson, D.K., Lord, C., Risi, S., DiLavore, S., Shulman, C., Thurm, A., ... Pickles, A. (2007). Patterns of growth in verbal abilities among children with autism spectrum disorder. *Journal of Consulting and Clinical Psychology, 75*, 594-604.
- Dunn, L.M., & Dunn, L.M. (1997). *Peabody picture vocabulary test- fourth edition*. Circle Pines, MN: American Guidance Service.
- Durlack, J.A., & DuPre, E.P. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American Journal of Community Psychology, 41*, 327-350.
- Ganz, J.B., Earles-Vollrath, T.L., Heath, A.K., Parker, R.I., Rispoli, M.J., & Duran, J.B. (2011). A meta-analysis of single case research on aided augmentative and alternative communication systems with individuals with autism spectrum disorders. *Journal of Autism and Developmental Disorders*. doi: 10.1007/s10803-011-1212-2.

- Hresko, W.P., Reid, D., K., & Hamill, D.D. (1981). *Test of early language development*. Los Angeles, CA: Western Psychological Services.
- Kaiser, A.P., & Hancock, T.B. (2003). Teaching parent new skills to support their young children's development. *Infants and Young Children, 16*, 9-21.
- Kasari, C., Freeman, S., & Paparella, T. (2006). Joint attention and symbolic play in young children with autism: A randomized controlled intervention study. *Journal of Child Psychology and Psychiatry, 47*, 6, 611-620.
- Kasari, C., Gulsrud, A.C., Wong, C., Kwon, S., & Locke, J. (2010). A randomized controlled caregiver mediated joint engagement intervention for toddlers with autism. *Journal of Autism and Developmental Disorders, 40*, 1045-1056.
- Lifter et al., 1993
- Lord, C., Rutter, M. L., DiLavore, P., & Risi, S. (1999). *Autism diagnostic observation schedule*. Los Angeles, CA: Western Psychological Services.
- Lord, C., Wagner, A., Rogers, S., Szatmari, P., Aman, M., Charman, T., ... Yoder, P. (2005). Challenges in evaluating psychosocial intervention for autism spectrum disorders. *Journal of Autism and Developmental Disabilities, 35*, 695-708.
- Luyster, R., & Lord, C. (2009). Word learning in children with autism spectrum disorders. *Developmental Psychology, 45*, 1774-1786.
- Matson, M.L., Mahan, S., & Matson, J.L. (2009). Parent training: A review of methods for children with autism spectrum disorders. *Research in Autism Spectrum Disorders, 3*, 868-875.

- McConachie, H., & Diggle, T. (2007). Parent implemented early intervention for young children with autism spectrum disorder: A systematic review. *Journal of Evaluation in Clinical Practice, 13*, 120-129.
- McDuffie, A.S., Yoder, P.J., & Stone, W.L. (2006). Labels increase attention to novel objects in children with autism and comprehension-matched children with typical development. *Autism, 10*, 288-301.
- Mirenda, P., & Iacono, T. (2009). *Autism Spectrum Disorders and AAC*. London: Paul H Brookes Publishing Company.
- Mundy, P., & Crowson, M. (1997). Joint attention and early social communication: Implications for research on intervention with autism. *Journal of Autism and Developmental Disabilities, 27*, 653-676.
- Mundy, P., Sigman, M., & Kasari, C. (1990). A longitudinal study of joint attention and language development in autistic children. *Journal of Autism and Developmental Disorders, 20*, 115-128.
- National Research Council (2001). *Educating children with autism*. Washington, DC: National Academy Press.
- Newman, P. (2002). Valuing learners' experience and supporting further growth: Educational models to help experienced adult learners in medicine. *British Medical Journal, 325*, 200-202.
- Olive, M.L., Lang, R.B., & Davis, T.N. (2008). An analysis of the effects of functional communication and a Voice Output Communication Aid for a child with autism spectrum disorder. *Research in Autism Spectrum Disorders, 2*, 223-236.

- Patterson, S.Y., Smith, V., & Mirenda, P. (2012). Parent training programs for families of children with autism: A systematic review of single case contributions. *Autism: International Journal of Research and Practice, 16*, 498-522.
- Pickett, E., Pullara, O., O'Grady, J., & Gordon, B. (2009). Speech acquisition in older nonverbal individuals with autism: A review of features, methods and prognosis. *Cognitive Behavioural Neurology, 22*, 1-21.
- Roid, G., & Miller, L. (1997). *Leiter international performance scale-revised*. Wood Dale, IL: Stoelting.
- Siller, M., & Sigman, M. (2002). The behaviors of parents of children with autism predict the subsequent development of their children's communication. *Journal of Autism and Developmental Disorders, 32*, 77-89.
- Smith, T., Scahill, L., Dawson, G., Guthrie, D., Lord, C., Odom, S., ... Wagner, A. (2007) Designing research studies on psychosocial interventions in autism. *Journal of Autism and Developmental Disorders 37*: 354–66.
- Thurnberg, G., Dahlgren Sandberg, A., & Ahlsen, E. (2009). Speech-generating devices used at home by children with autism spectrum disorders: A preliminary assessment. *Focus on Autism and Other Developmental Disabilities, 24*, 104-114.
- Tomasello, M. (2001). Perceiving intention and learning words in the second year of life. In M. Bowerman & S. Levinson (eds). *Language Acquisition and Conceptual Development*, 133-158. New York: Cambridge University Press.
- Warren, S.F., Gilkerson, J., Richards, J.A., Oller, D.K., Xu, D., Yapanel, U., et al. (2009). What automated vocal analysis reveal about the vocal production and language learning

environment of young children with autism. *Journal of Autism and Developmental Disorders*, 40, 555-569.