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Maintenance of Parent Strategies is Associated with Pre-Treatment Parent Fidelity, Treatment Assignment, and Post Treatment Community Services

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Maintenance of Parent Strategies is Associated with  
Pre-Treatment Parent Fidelity, Treatment  
Assignment, and Post Treatment Community  
Services

A dissertation proposal submitted in partial  
satisfaction of the requirements for the degree Doctor  
of Philosophy in Education

by

Amy Fuller

2014



## ABSTRACT OF THE DISSERTATION

Maintenance of Parent Strategies is Associated with  
Pre-Treatment Parent Fidelity, Treatment  
Assignment, and Post Treatment Community  
Services

by

Amy Fuller

Doctor of Philosophy in Education

University of California, Los Angeles, 2014

Professor Connie Kasari, Chair

A concerning outcome of many early interventions is that skills gained over the course of treatment are not maintained after the intervention support ends. Particularly for parents who are the target of early interventions, maintenance of taught strategies may be related to a number of factors, including both parent characteristics and subsequent intervention involvement. This study explored parents' use of three specific categories of strategies taught in an early intervention program (communication strategies, engagement strategies, and time spent in dyadic joint engagement) while interacting with their children with autism over time. Participants included 86 dyads who were randomized to either a parent-mediated joint attention intervention (JASPER) in which the specific strategies were taught, or a comparison parent education intervention (PE). Maintenance of strategies learned in the intervention was examined as a function of parents' level of naturally occurring JASPER fidelity pre-treatment. For parents

who were randomized to the JASPER condition, parents who displayed high levels of pre-treatment JASPER skills showed better maintenance of communication fidelity and time spent in dyadic joint engagement with their children from exit to follow-up than parents who displayed low levels of pre-treatment strategies. However, parents' level of pre-treatment JASPER strategies was not related to maintenance of communication strategies, engagement strategies, or time in joint engagement for the parent education condition. Second, for the entire sample, maintenance of parent communication fidelity, engagement fidelity, and time in dyadic joint engagement were examined in relation to participation in adult-directed behavioral interventions after program end. Participation in behavioral interventions after exit from the study was associated with more decrease in time spent in dyadic joint engagement during play from exit to follow-up. Findings highlight the importance of a match between intervention models and existing parent skills.

The dissertation of Amy Fuller is approved.

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2014

## Table of Contents

List of Tables

List of Figures

Introduction

    The Importance of Parent-Mediated Treatment

    Parent-Mediated Treatment Models

    Parent-Mediated Joint Attention/Joint Engagement Treatments

    Maintenance of Skills

    Features of the Intervention

    Naturally Occurring Strategies

    Examination of Factors Related to Change in Skills

    The Current Study

        Research Question 1

        Research Question 2

Method

    Participants

    Measures

        Autism Diagnostic Observation Schedule (ADOS)

        Mullen Scales of Early Learning

        Demographic Survey

        Parent–Child Interaction

Procedure

    Entry

    Calculation of Parent Strategy Scores

    High and Low Pre-Treatment Fidelity Subgroups

    Joint Engagement Treatment

    Parent Education Treatment

    Procedure at the Conclusion of Treatment

Results

    Preliminary Findings

    Main Findings

Discussion

Appendix I

Appendix II

References

## List of Tables

- Table 1. Pre-Treatment Child and Parent Characteristics
- Table 2. Domains Coded for Parent Strategy Use
- Table 3. Pre-Treatment Child and Parent Characteristics by Subgroup
- Table 4. Means by Treatment Group at Exit and Follow-up
- Table 5. Means by Subgroup at Exit and Follow-up
- Table 6. Differences in Communication Means by Subgroup
- Table 7. Changes in Parent Communication Strategies From Exit to Follow-up
- Table 8. Differences in Engagement Means by Subgroup
- Table 9. Changes in Parent Engagement Strategies From Exit to Follow-up
- Table 10. Differences in Time in Dyadic Joint Engagement by Subgroup
- Table 11. Changes in Time in Dyadic Joint Engagement From Exit to Follow-up
- Table 12. Participation in Behavioral Interventions at Follow-up
- Table 13. Correlations Between Changes in Parent Strategies/Time Spent in Joint Engagement and Time Spent in Behavioral Treatments



## List of Figures

Figure 1. Communication Fidelity Over Time for High and Low Pre-Treatment Performers

Figure 2. Engagement Fidelity Over Time for High and Low Pre-Treatment Performers

Figure 3. Seconds in Joint Engagement Over Time for High and Low Pre-Treatment Performers

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## **The Importance of Parent-Mediated Treatment**

The inclusion of parents as intervention agents is a key component in the early intervention of children with ASD (National Research Council, 2001). Interventions utilizing parent-mediated models have documented positive outcomes for both parents and children. Parents who serve as direct treatment providers for their children with ASD have reported lower stress levels (Brookman-Frazee, 2004) and greater optimism with regard to their competence in influencing their child's development (Koegel et al., 1982). Additionally, this type of model is less expensive and resource intensive (Matson, Mahan, & Matson, 2009) and may have a beneficial effect on the generalization and maintenance of child gains made in treatment (Koegel et al., 1982). Parents may also begin to serve as mentors to other families as they gain knowledge about evidence based interventions (Meadan, Ostrosky, & Zaghlawan, & Yu, 2009). As it has been suggested that parent involvement is critical to intervention effectiveness (Mahoney et al., 1999), parent mediated models show promise in the treatment of children with ASD.

### **Parent-Mediated Treatment Models**

A variety of treatments for children with ASD have utilized parent-mediated models. Pivotal response treatment (PRT), which targets a range of deficits and employs strategies such as natural reinforcement and child choice, has been implemented using parents as intervention agents (e.g. Schreibman & Koegel, 2005; Minjarez, Williams, Mercier, & Hardan, 2011; Symon, 2005). Parents have improved their children's communication skills, (Stahmer & Gist, 2001; Coolican, Smith, & Bryson, 2010) among other targets, by effectively learning PRT treatment strategies.

Other treatments, such as the early start Denver model (ESDM), have also demonstrated some success in employing parent-mediated models. The Denver model

(ESDM) combines developmental, relationship, and behavioral methods into a comprehensive treatment for infants and toddlers with ASD (Vismara, Colombi, & Rogers, 2009). Vismara et al. (2009) showed that parents learned to incorporate strategies from the Denver model into their daily routines and play activities. Frequencies of their children's spontaneous verbal utterances showed the largest increases when the parents implemented the intervention at fidelity (Vismara et al., 2009). However, a recent randomized controlled trial comparing a parent delivered ESDM condition to a community sample showed no differences in either parent ESDM fidelity or child outcomes after 12 weeks (Rogers et al., 2012).

Discrete trial teaching (DTT) is a very structured, adult directed intervention that has also shown promise in utilizing parents as intervention agents. DTT consists of "an instructor delivering a command to begin a trial, providing an appropriate consequence for the child's response (or lack of response), and then interposing an intertrial interval to separate the consequence of one trial from the command of the next (Crockett, Fleming, Doepke & Stevens, 2007). Parents have been able to learn DTT procedures and extend their skills across similar and dissimilar child skills (Crockett et al., 2007). Moes and Frea (2002) examined the effects of parent-delivered functional communication training (FCT) and contextualized FCT, both including DTT, on child communication and challenging behavior. Parents acquired strategies such as providing prompts and reinforcement. Additionally, their children's problem behavior decreased and functional communication increased when FCT was introduced (Moes & Frea, 2002).

However, many of these parent-mediated treatment studies were single subject designs with few participants or displayed methodological weaknesses, such as not

employing a control group. Moreover, parent-implemented randomized controlled trials for young children with autism have not demonstrated the large effects seen in intensive-treatment studies to date (Rogers et al., 2012).

### **Parent-Mediated Joint Attention/Joint Engagement Treatments**

A number of researchers have also been successful in teaching parents specific strategies through parent-mediated joint attention interventions. Rocha, Schreibman, and Stahmer (2007) were able to train parents to use intervention techniques such as initiating more joint attention bids. Schertz and Odom (2007) also used a parent-mediated framework to teach parents strategies related to turn taking, responding to joint attention, and initiating joint attention. Intervention strategies such as these have enabled children to increase their joint attention initiations and responsiveness to joint attention (Kasari et al., 2010; Rocha et al., 2007) and their development of play skills and engagement with others (Kasari et al., 2010).

Of particular importance, Kasari et al. (2010) have developed a systematic, layered intervention approach (JASPER) in which parents are taught to implement strategies in order to maintain longer and higher quality episodes of joint engagement around their child's object interests and developmental play level. This layered intervention approach attempts to teach parents to utilize multiple strategies simultaneously in order to increase time spent jointly engaged with their children.

### **Gaps in the Literature on Parent Training Interventions**

#### **Maintenance of Skills**

Previous literature has reported that parents are able to accurately implement these intervention strategies that they have been taught over the short term (Stahmer & Gist, 2001). It has been suggested, however, that a lifelong treatment model may be

beneficial for children with ASD and thus, that parents should continue to receive booster sessions for maintenance of child skills over time (Matson et al. 2009). Parents will likely need continued support and training in order to maintain these skills as their child develops (Patterson, Smith, & Mirenda, 2011).

To date, most recent parent-training studies have been short term with no follow up to examine the maintenance of parent skills (McConachie & Diggie, 2007). Furthermore, the majority of studies that do measure maintenance have shown that many parents have difficulty maintaining their skills at follow-up time points (e.g. Rocha et al., 2007). Thus, future research is needed to examine how parent's skills maintain or change when support from trained professionals is removed. More importantly, as maintenance of parent intervention strategies has proven to be difficult, determining ways to combat this loss of skill is paramount.

### **Features of the Intervention**

Additionally, examining which specific components of interventions that parents are not able to maintain over time is an area for continued research. Patterson et al. (2011) suggest that component analysis would be useful to reveal which strategies parents will need more assistance in maintaining when external support is removed. This information could inform future parent mediated studies as researchers gain more knowledge about what parents have difficulty implementing over the long term. If certain strategies are difficult for all parents or for specific parents, then professionals could potentially maximize their time providing booster training on these strategies alone.

### **Naturally Occurring Strategies**

On the other hand, some parents are able to utilize certain fundamental skills without the need for direct teaching. For example, Randolph et al. (2011) included

natural rates of parent PRT behaviors at baseline, which ranged up to 52% correct. Parents are also able to implement a minimal amount of DTT procedures without direct teaching. For example, Crockett, Fleming, and Doepke (2003) reported that parents implemented DTT procedures up to 18% correct at baseline.

Thus, it may be important to examine how strategies that parents are able to implement without direct teaching change over time. Perhaps the strategies of parents who appear to use these skills more “naturally” will have a different trajectory or relationship with child outcomes than strategies of parents who were directly taught these skills within a targeted intervention. Indeed, Gallimore, Goldenberg, and Weisner (1993) suggest that ecocultural theory be used as an approach to working with families of children with disabilities. A guiding principle of this theory is that it is more effective to design interventions that capitalize on existing characteristics of the family, rather than insisting that families make changes that are too discrepant from what is already naturally occurring (Gallimore, Goldenberg, & Weisner, 1993). Within a school consultation model, Rilley-Tillman and Chafouleas (2003) are also proponents of this general notion. They suggest that large changes to the system already in place are more likely to be rejected than smaller changes that utilize existing practices (Rilley-Tillman & Chafouleas, 2003). Thus, it is conceivable that parents will be more likely to adopt and maintain an intervention if it aligns with their existing practices and strategies.

### **Examination of Factors Related to Change in Skills**

Finally, no previous studies have examined *why* parent strategy use may change over time after the support of professionals is removed. If researchers can begin to understand specific variables that are associated with strategy maintenance or loss, then we can be better prepared to assist parents over time. In addition to the effect that

the removal of professionals can have on parent strategies, it would be beneficial to determine if there are other variables that make maintenance or loss of certain parent skills more likely.

**Other services received.** There has been limited previous research on what is taking place after treatment from a broader perspective that may be affecting parent strategy use. Limited information is known about the larger context of both parents' and children's behavior, such as the family's access to and use of external sources of ideas and assistance (Helm & Kozloff, 1986). This is a gap in knowledge that makes conclusions about how behavior maintains and what variables predict the extent of change difficult to make (Helm & Kozloff, 1986).

One broad area to examine that may shed light on whether parents maintain particular strategies is gathering information on interventions and services children and their families are receiving in addition to the target treatment. For example, Drew et al. (2002) report that while participating in their study, particular families elected to begin home-based behavioral interventions. This reflects the clinical situation in the real world in which many families participate in multiple interventions simultaneously (Drew et al., 2002). If the target parent strategies are aligned with subsequent treatments the family enrolls in, then parents may be likely to retain these skills over time. However, there are a multitude of interventions for children with ASD with a variety of different approaches, so consistency may be difficult to achieve.

**Core deficits.** One area of disagreement is centered upon whether interventions should focus directly on overcoming social communication core deficits in autism, such as joint attention and symbolic play. As children with autism rarely show objects to others or point to share attention (Loveland & Landry, 1986; Mundy, Sigman & Kasari,



1990; Sigman & Ruskin, 1999) and tend to engage in repetitive and object focused play, these core deficits of joint attention and symbolic play may be important to intervene on. Additionally, joint attention skills in the preschool years have been found to predict language outcome up to eight years later (Sigman & Ruskin, 1999).

There have been several different treatment approaches to intervene on these skills in children with ASD. Of particular note, Kasari, Freeman, and Paparella (2006) and Kasari et al. (2010) have developed an intervention focused on targeting several important core deficits in children with ASD: joint attention, symbolic play, and joint engagement (see Kasari et al., 2006 for further details on the treatment). Strategies used in this intervention (JASPER) include following the child's lead, expanding on the child's utterances, using environmental arrangements, imitating the child's play acts, and establishing play routines.

In a randomized controlled study, Kasari et al. (2006) found that this JASPER intervention extended children's joint engagement with others, and was associated with progress in joint attention initiations, play flexibility, and developmental level of play (Kasari et al., 2006). Importantly, children who received the targeted joint attention intervention showed greater language growth over the course of 12 months than did children in the control group (Kasari et al., 2008).

A more recent version of this treatment has also demonstrated promising outcomes. In a waitlist control design, the immediate treatment group made significant improvements compared to the toddlers randomized to the waitlist control group in the targeted areas of joint engagement (Kasari et al., 2010). The immediate treatment group also made significant improvements in their responsiveness to joint attention and their diversity of functional play acts. These findings maintained at a one-year follow-up

(Kasari et al., 2010).

On the other hand, many other treatments for ASD do not focus on core deficits of joint attention and symbolic play, despite the evidence that targeting these areas has been associated with positive child language (Mundy, Sigman, & Kasari 1990; Kasari et al., 2008) and social outcomes (Sigman & Ruskin, 1999). In fact, it was found that only 5% of commonly used curricula contained examples of joint attention skills (Wong & Kasari, 2004). Additionally, autism-specific applied behavior analysis treatment models (i.e. discrete trial teaching) also fail to incorporate specific objectives associated with joint attention (Lovaas, 2003).

As many of these behavioral treatments are available in schools and the community, children are likely to be exposed to these curricula. Moreover, the goals of these adult-directed curricula may differ from child-led interventions such as JASPER. In fact, particular strategies used in the community may directly conflict with strategies aligned with the JASPER intervention. This may have an impact on how well parents are able to maintain strategies and engage with their children over time.

### **The Current Study**

Many parent-mediated studies for children with ASD and their families have reported positive outcomes for both parents and children. Additionally, many parents are able to acquire various intervention strategies and engage with their children over the short term through parent-mediated models. However, there are several areas for improvement in many previous studies, such as examining the maintenance of effects, including data on fidelity of the procedures to teach the parents, and examining the trajectories of treatment strategies that particular parents use without direct teaching. We also have a very limited understanding about what is taking place after treatment

that may be associated with maintenance or loss of parent skills. The current study addressed the following questions regarding parent communication and engagement strategies for 86 parent and toddler dyads who participated in a 10-week intervention with a follow up six months later. Communication and engagement domains were chosen in order to capture both verbal and non-verbal communication strategies used by parents. Forty-three of these dyads participated in the parent mediated intervention with direct teaching on JASPER strategies and 43 dyads participated in a treatment as usual parent education intervention with no discussion of JASPER strategies.

**Research Question 1:** In each treatment condition, will parents with high levels of pre-treatment JASPER strategy use display more maintenance of communication strategies, engagement strategies, and time spent in dyadic joint engagement from exit to follow-up than parents with low levels of pre-treatment JASPER strategy use?

**Hypothesis 1:** Parents with high levels of pre-treatment JASPER strategies will show more resilience in their JASPER communication strategies, engagement strategies, and time spent in dyadic joint engagement from exit to the follow-up, particularly if they participated in the JASPER parent-mediated intervention.

**Research Question 2:** Is participation in adult-directed behavioral early intervention services (e.g. discrete trial teaching) after the conclusion of intervention associated with less maintenance of JASPER communication strategies, engagement strategies, and time spent in dyadic joint engagement from exit to follow-up?

**Hypothesis 2:** Participation in behavioral early intervention services as reported at the follow-up will be associated with less maintenance of JASPER communication strategies, engagement strategies, and time spent in dyadic joint engagement from exit to follow-up.

## Method

### Participants

**Inclusion criteria.** All children in the study were between 22 and 37 months and had a clinical diagnosis of autism and met criteria on the ADOS for ASD or autism at entry into the study. Children who had comorbid diagnoses, seizures, sensory or physical disorders, or head injuries were excluded.

**Child and family characteristics.** Children were recruited from an early intervention program at UCLA. All children who met the inclusion criteria for the study had consent from their caregivers to participate. No exclusions were made based upon gender, ethnicity, or developmental level.

A total of 86 participants were enrolled (consented) for a larger study (Kasari et al., in progress). One family dropped after consenting for the study but never began treatment. Two families dropped during the treatment phase of the study. Thus, eighty-three families completed the treatment portion of the study. Ten families dropped after completing exit assessments because they were unwilling or unable to come in for any of the follow-up assessments. A total of 38 families in the JASPER parent-mediated group and 35 families in the parent education group completed all time points.

The entire sample consisted of 86 children, 15 of which were female. The families were diverse, with approximately 40% of the sample from non-Caucasian backgrounds. The majority of caregivers had a college education. The average age of the caregivers was 36. Table 1 outlines child and parent characteristics of the entire sample at entry into the study.

Table 1.  
*Pre-Treatment Child and Parent Characteristics*

Child CA	Child exp. language	Child DQ	Caregivers with college degree
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<i>N</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>N(%)</i>
86	31.47 (3.21)	17.19 (9.44)	68.05 (20.32)	57 (67.1%)

## Measures

For the present study, child measures of interest included the *Autism Diagnostic Observation Schedule* (Lord et al., 2000) and the *Mullen Scales of Early Learning* (Mullen, 1997). Parent measures included a demographic survey. Caregiver-child interactions (PCXs) were also taped and coded using a *JASPER Parent Strategies coding scheme*.

**Autism diagnostic observation schedule (ADOS)** (from Lord et al., 2000). The ADOS is a semi-structured, standardized observation designed to assess behaviors related to autism and ASD. It is an assessment of communication, social interaction, and play or imaginative use of materials for individuals who have been referred because of possible autism. The goal of the ADOS is to provide standardized information concerning the diagnosis of autism in the areas of social behavior, use of vocalizations/speech and gestures in social situations, and play and interests. Structured activities and materials provide standard contexts in which social interactions, communication, and other behaviors relevant to autism spectrum disorders can be observed. Inter-rater and test-retest reliability, as well as internal validity, have been demonstrated for the ADOS.

**Mullen scales of early learning (MSEL; Mullen, 1989)**. This is a standardized cognitive assessment. The visual reception, receptive language, expressive language, and fine motor subscales were included in the administration. Children's expressive and

receptive language age equivalencies and early learning composite standard scores were of interest.

**Demographic survey.** Parents completed a demographic form that documented child, parent, and family information including parent's level of education, ethnicity, and other interventions that the child was receiving at the time. Caregivers were asked to list the programs and/or interventions that their children were involved in, the duration of each program in months, and the amount of time (in hours per week) their children spent in each. Early interventions of interest included behavioral interventions (e.g. DTT).

**Parent-child interaction** (from Kasari, Gulsrud, Wong, Kwon, & Locke, 2010). A ten minute videotaped interaction was collected for each parent-child dyad. Caregivers were asked to engage in free play with their child with ASD as they normally would at home using a standard set of toys (including dolls, dishes, puzzles, trucks, shape sorter, blocks).

**Coding of the parent-child interaction (PCX).** All parent-child interactions were coded for parent strategies. This coding system captures various strategies aligned with JASPER used by caregivers during interactions with their children. Five broad domains consisting of various specific strategies were coded for JASPER parent strategy use. These included 1) the environment 2) imitation 3) prompting 4) communication and 5) engagement (see table 2 & appendix I for further details). Each individual strategy was coded for each of the two-minute intervals within the ten-minute interaction. Specifically, communication fidelity, engagement fidelity, time in dyadic joint engagement, and total fidelity were of interest for this study.

Table 2.  
*Domains Coded for Parent Strategy Use*

Domain	Individual Parent Strategies
Environment	<u>a.</u> Minimized overt distractions? <u>b.</u> Objects maintained? <u>c.</u> New objects selected? <u>d.</u> At child's eye level? <u>e.</u> Developmentally appropriate objects? <u>f.</u> TOTAL
Imitation	<u>a.</u> Were the child's play acts imitated? <u>b.</u> Immediately following child's play act? <u>c.</u> In child's attentional focus? <u>d.</u> Marked at child's MLU? <u>e.</u> TOTAL
Prompting	<u>a.</u> Did the parent prompt when needed? <u>b.</u> Were the prompts app. timed/paced? <u>c.</u> Were the prompts appropriate? <u>d.</u> TOTAL
<b>Communication</b>	<u>a.</u> <b>Did the parent imitate or expand the child's language?</b> <u>b.</u> <b>Pace</b> <u>c.</u> <b>Non-directive</b> <u>d.</u> <b>TOTAL</b>
<b>Engagement</b>	<b>Total time in dyadic joint engagement</b> <u>a.</u> <b>Did the parent allow the child to select the toy within each episode of joint engagement?</b> <u>b.</u> <b>Was joint attention used in each episode of joint engagement?*</b> <u>c.</u> <b>TOTAL</b>

Independent raters blind to condition calculated reliability for a randomly selected 20% of the tapes. Intraclass correlation coefficients (average measures) ranged from .86 to .97, with a mean of .92.

### Procedure

#### Entry

At entry into the study, children were assessed with the *Mullen Scales of Early Learning* and their diagnoses were confirmed with the ADOS and ADI-R by independent

examiners. Parents also completed a demographic questionnaire. Information from these measures was used to describe the sample. Additionally, each dyad completed a parent-child interaction that was coded for JASPER parent strategy use.

### **Calculation of Parent Strategy Scores**

Parent strategy scores were then calculated from the coded data. Individual parent strategy variables were examined for each two-minute interval of the parent-child interaction. Numerators (number of correct opportunities) and denominators (number of total opportunities) were calculated for each individual parent strategy variable at entry, exit, and follow-up for the all parents in the sample (see Appendix II). A fidelity percentage was calculated for each of these individual variables by dividing the total numerator by the total denominator. Averages of these individual strategy percentages comprised domain fidelity percentages. Finally, each domain fidelity percentage was averaged to create a total fidelity percentage.

In the present study, primary outcomes focused on strategies in the communication and engagement domains. For the communication domain, a score of 4/5 (.80) can be interpreted as the parent using the strategy correctly for four out of five intervals within the ten-minute interaction. However, a score of 4/5 (.80) within the engagement domain needs to be interpreted as the parent using the strategy correctly within four of the five coded episodes of dyadic joint engagement that the parent and child were engaged in throughout the interaction.

Finally, total time in dyadic joint engagement was calculated for entry, exit, and follow-up. Very few dyads exhibited no time in dyadic joint engagement throughout the interaction at each time point. However, if this was the case, then both their time in dyadic joint engagement and their engagement fidelity were scored as zero.



## High and Low Pre-Treatment Fidelity Subgroups

All dyads were then randomized to one of two treatment conditions (see below). For both conditions, a median split on the variable of total JASPER fidelity at entry was conducted in order to determine the parents who demonstrated high or low pre-treatment JASPER strategies within the baseline taped parent-child interaction. The mean total fidelity for the low performance group assigned to the JASPER parent-mediated intervention (JASPER-low) was 36% and the mean for the high performance group (JASPER-high) was 58%. The mean total fidelity for the low performance group assigned to the parent education intervention (PE-low) was 37% and the mean for the high performance group (PE-high) was 57%.

Table 3 outlines pre-treatment child and family characteristics by subgroup. There were no statistically significant differences between subgroups.

Table 3.  
*Pre-Treatment Child and Parent Characteristics by Subgroup*

	<i>N</i>	Child CA <i>M (SD)</i>	Child exp. language <i>M (SD)</i>	Child DQ <i>M (SD)</i>	Caregivers with college degree <i>N(%)</i>
JASPER-high	21	30.43 (3.76)	16.00 (9.49)	70.24 (18.40)	13(61.9%)
JASPER-low	22	30.86 (3.23)	16.32 (9.56)	65.86 (22.15)	14(63.6%)
PE-high	22	32.90 (2.83)	19.00 (7.45)	71.23 (17.95)	14(66.7%)
PE-low	21	31.71 (2.41)	17.38 (11.33)	64.81 (23.04)	16(76.2%)
<i>F</i>		2.58	.44	.51	
<i>p</i>		>.05	>.05	>.05	

## Joint Engagement Treatment (from Kasari et al., 2010)

After entry assessments, all parent and child dyads participated in either the joint engagement treatment (JASPER) or a comparison parent education treatment. Forty-

three dyads participated in a 10-week parent-mediated JASPER intervention. The target intervention was adapted from an earlier intervention with preschool aged children with autism (Kasari, Freeman, & Paparella, 2006; Kasari et al., 2010). Core principals of the intervention were developed into 10 modules. Each dyad completed the modules in 20 sessions with a frequency of two sessions per week for 10 weeks. All sessions took place at the lab. Trained interventionists (graduate students in educational psychology experienced working with children with autism) worked with each caregiver–child dyad.

Each intervention session included interventionist coaching of caregiver and child engaging in play routines that were established through collaboration between parent and interventionist. The approach involved developmental procedures of responsive and facilitative interaction methods. Principles applied include following the child’s lead and interest in activities, imitating child actions, talking about what the child was doing, repeating back what the child said, expanding on what the child said, giving corrective feedback, sitting close to the child and making eye-contact, and making environmental adjustments to engage the child. Each caregiver–child dyad received approximately two thirty-minute sessions of direct instruction, modeling, guided practice, and feedback from the interventionist per week. Caregivers were presented with handouts that summarized the main objectives of each module.

**Fidelity.** Interventionist fidelity in adhering to treatment strategies was rated for 20% of each participant’s sessions. Interventionists were rated on a four-point Likert scale (1–4) for how well they demonstrated each objective or aspect of the treatment protocol. Fidelity ranged from 71% to 100%, with a mean of 91%.

### **Parent Education Treatment**

Forty-three dyads were randomized to the caregiver education treatment. This is a manualized intervention in which the aim is to provide education and support to caregivers of young children with autism (Brereton & Tonge, 2005). Caregivers received information about child development, behavior management, and resources from the interventionist. The treatment sessions included information on autism, features of communication, social, play, and behavioral impairments, services available, managing parental stress, and sibling, family, and community responses to autism. No hands-on interaction with the children took place during the sessions. No direct teaching or discussion of the strategies used in the JASPER intervention occurred within these sessions.

**Fidelity.** Interventionist fidelity in adhering to treatment strategies was rated for 20% of each participant's sessions. Interventionists were rated on a four-point Likert scale (1–4) for how well they demonstrated each objective or aspect of the treatment protocol. Fidelity ranged from 75% to 100%, with a mean of 93%.

### **Procedure at the Conclusion of Treatment**

At exit from the study, a 10-minute parent-child interaction was taped and coded for parent strategy use for all dyads. Parent strategy scores were calculated from the coded data. At the follow-up, parents completed another demographic survey and participated in another parent-child interaction that was coded with the same coding scheme. Again, parent strategy scores were calculated from the coded data.

## **Results**

### **Preliminary Findings**

Generalized linear mixed models with main effects for group (JASPER, PE), time, a group by time interaction and subject level random intercepts were used to

model the longitudinal trajectories from entry to follow-up of the primary and secondary outcomes, employing an identity link for continuous outcome variables and a log link for count outcomes (using SAS Proc Mixed and Glimmix respectively). Time was modeled using linear splines to allow the rate of improvement (slope) over the treatment period to differ from that of the follow-up period. These models were used to obtain all preliminary findings and results for aim one.

**Treatment Effects on Communication Strategies, Engagement Strategies, and Dyadic Joint Engagement at Exit.** First, we report if there were differential treatment effects on the strategies at exit. Table 4 outlines means at exit for both the JASPER and PE groups. At exit, dyads randomized to the JASPER condition had higher mean parent communication strategies ( $F(1,151)=30.09, p<.0001$ ), parent engagement strategies ( $F(1,151)=16.39, p<.0001$ ), and time spent in joint engagement ( $F(1,151)=47.32, p<.0001$ ) than dyads randomized to the PE treatment.

**Treatment Effects on Communication Strategies, Engagement Strategies, and Dyadic Joint Engagement at Follow-up.** Second, we report whether these treatment effects maintained at follow-up. Table 4 outlines means at follow-up for both the JASPER and PE groups. Dyads in the JASPER condition had higher mean parent communication strategies ( $F(1,151)=4.25, p=.041$ ) and time spent in joint engagement ( $F(1,151)=12.86, p=.0005$ ) than dyads in the PE condition, but there were no differences between groups for engagement strategies ( $F(1,151)=1.9, p=.17$ ).

Table 4.  
*Means by Treatment Group at Exit and Follow-up*

	JASPER <i>M(SD)</i>	PE <i>M(SD)</i>
Communication		
Exit	.72 (.24)	.51 (.16)
Follow-up	.43 (.21)	.35 (.11)

## Engagement

Exit	.71 (.26)	.44 (.32)
Follow-up	.70 (.28)	.60 (.31)

## Time in joint engagement (sec)

Exit	325.17 (120.20)	142.31 (117.94)
Follow-up	363.66 (132.50)	266.71 (119.90)

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### **Main Findings**

As mean scores for both conditions differed from exit to follow-up on particular strategy variables, we wanted to examine whether additional factors would be associated with parents' ability to maintain these strategies over time. First, we examined how parents' level of pre-treatment JASPER fidelity affected maintenance of communication strategies, engagement strategies, and time in dyadic joint engagement for both treatment conditions.

#### **Maintenance of Strategies by Subgroup**

Using the same generalized linear mixed models, maintenance of communication and engagement strategies and time spent in dyadic joint engagement from exit to follow-up were examined for all four subgroups (JASPER-high, JASPER-low, PE-high, PE-low). First, we compared mean scores at exit and follow-up for all subgroups. Second, we report on maintenance of each domain score by subgroup (defined as a change from exit to follow-up that did not reach a statistically significant negative trend). Third, differences between changes in scores from exit to follow-up (difference of differences scores--DOD) were compared for the high and low pre-treatment performance groups within both treatment conditions.

#### **Mean Parent Communication Scores at Exit by Subgroup**

Means for fidelity in the communication domain by subgroup are outlined in table 5. At exit, the JASPER-high group had a mean that was statistically significantly higher than both the PE-high and PE-low group. The JASPER-low group also displayed a mean that was statistically significantly higher than both the PE-high and the PE-low group (see table 6).

### Mean Parent Communication Scores at Follow-up by Subgroup

At follow-up, the JASPER-high group had a mean that was statistically significantly higher than the JASPER-low group. Additionally, the JASPER-high group mean was higher than both the PE-high group and the PE-low group (see table 6).

Table 5.  
*Means by Subgroup at Exit and Follow-up*

	JASPER-high <i>M(SD)</i>	JASPER-low <i>M(SD)</i>	PE-high <i>M(SD)</i>	PE-low <i>M(SD)</i>
<b>Communication</b>				
Exit	.72(.21)	.72(.26)	.52(.16)	.50(.17)
Follow-up	.51(.24)	.35(.13)	.36(.09)	.34(.14)
<b>Engagement</b>				
Exit	.72(.29)	.69(.23)	.52(.34)	.36(.28)
Follow-up	.76(.22)	.63(.33)	.66(.31)	.53(.31)
<b>Time in joint engagement</b>				
Exit	298.19(128.30)	353.50(106.97)	167.14(141.78)	117.48(84.38)
Follow-up	381.20(139.39)	344.17(125.43)	266.94(117.93)	266.44(125.96)

Table 6.  
*Differences in Communication Means by Subgroup*

	Estimate	SE	DF	t value	p
<b>Exit</b>					
JASPER-low – PE-high	.22	.05	147	3.69	.0003
JASPER-high – PE-high	.20	.05	147	3.81	.0002
PE-low – PE-high	-.024	.05	147	-.46	.65

JASPER-low – PE-low	.22	.05	147	4.15	<.0001
JASPER-high – PE-low	.23	.05	147	4.27	<.0001
JASPER-low – JASPER-high	-.004	.05	147	-.08	.94
<u>Follow-up</u>					
JASPER-low – PE-high	-.003	.06	147	-.05	.96
JASPER-high – PE-high	.16	.06	147	2.87	.005
PE-low – PE-high	-.007	.06	147	-.11	.91
JASPER-low – PE-low	.004	.06	147	.06	.95
JASPER-high – PE-low	.17	.06	147	2.90	.004
JASPER-low – JASPER-high	-.16	.06	147	-2.92	.004

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### **Maintenance of Communication Strategies by Subgroup**

In the communication domain, parents in all groups demonstrated statistically significant decreases in their scores from exit to follow-up for the communication strategy domain (see tables 7 & figure 1). However, subgroups varied in how much their scores decreased from exit to follow-up.

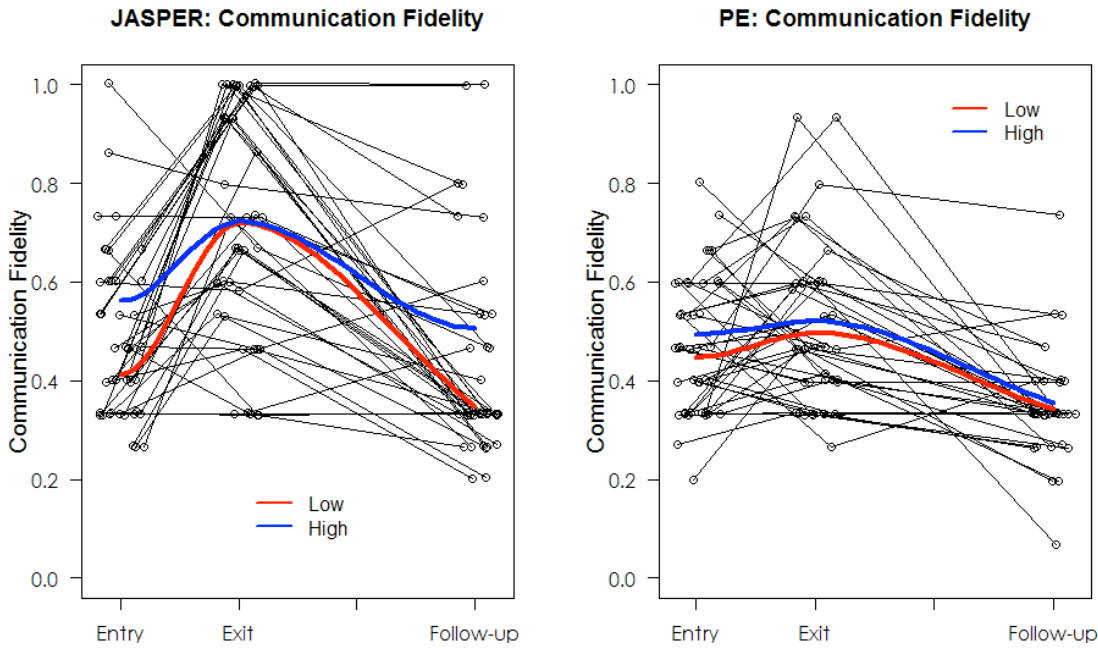
### **Differences in Maintenance of Communication Strategies by Subgroup**

In the parent education group, parents who demonstrated high versus low pre-treatment JASPER strategy use did not display differences in their changes in communication fidelity scores from exit to follow-up (see tables 7 & figure 1). However, there was a statistically significant difference between changes in communication fidelity from exit to follow-up for the subgroups within the JASPER condition. Within the JASPER parent-mediated group, parents who had high pre-treatment JASPER fidelity

had less decrease in communication fidelity from exit to follow-up than the subgroup that displayed low pre-treatment JASPER fidelity (see table 7 & figure 1).

Table 7.  
*Changes in Parent Communication Strategies from Exit to Follow-up*

	Exit M (SD)	Follow-up M (SD)	F	p	DOD F	DOD p	DOD Cohen's d
JASPER-high	.72(.21)	.51(.24)	21.99	<.0001	5.73	.02	.71
JASPER-low	.72(.26)	.35(.13)	61.01	<.0001			
PE-high	.52(.16)	.36(.09)	13.10	.00004	.07	.79	
PE-low	.50(.17)	.34(.14)	9.73	.002			



**Figure 1.** *Communication Fidelity Over Time for High and Low Pre-Treatment Performers*

**Mean Parent Engagement Scores at Exit by Subgroup**



Table 5 outlines mean engagement strategy scores for each group at exit and follow-up. At exit, the mean engagement fidelity score of the PE-low group was statistically significantly lower than both the JASPER-high group and the JASPER-low group. The mean for the PE-high group was also statistically significantly lower than both JASPER groups (see table 8).

### Mean Parent Engagement Scores at Follow-up by Subgroup

At follow-up, the JASPER-high group had a mean engagement score that was statistically significantly higher than the PE-low group (see table 8).

Table 8:  
*Differences in Engagement Means by Subgroup*

	Estimate	SE	DF	t value	p
<u>Exit</u>					
JASPER-low – PE-high	.18	.09	147	2.09	.04
JASPER-high – PE-high	.20	.08	147	2.42	.02
PE-low – PE-high	-.16	.08	147	-1.86	.06
JASPER-low – PE-low	.33	.09	147	3.93	.0001
JASPER-high – PE-low	.36	.08	147	4.28	<.0001
JASPER-low – JASPER-high	-.03	.09	147	-.30	.77
<u>Follow-up</u>					
JASPER-low – PE-high	-.02	.09	147	-.27	.78
JASPER-high – PE-high	.10	.09	147	1.10	.27
PE-low – PE-high	-.12	.09	147	-1.33	.19
JASPER-low – PE-low	.10	.09	147	1.06	.29
JASPER-high – PE-low	.22	.09	147	2.43	.02
JASPER-low – JASPER-high	-.12	.09	147	-1.38	.17

### Maintenance of Engagement Strategies by Subgroup

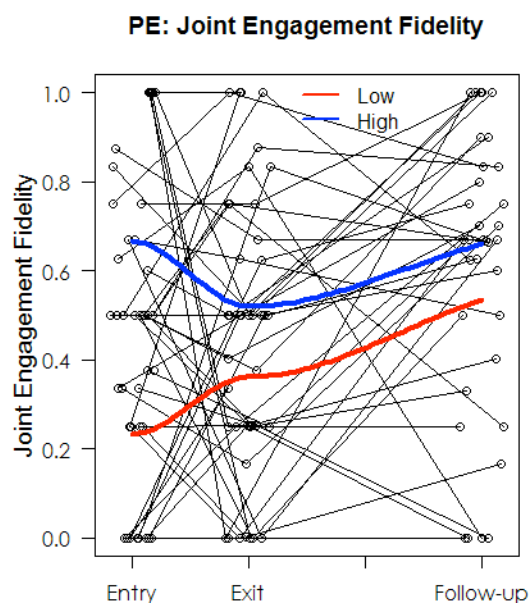
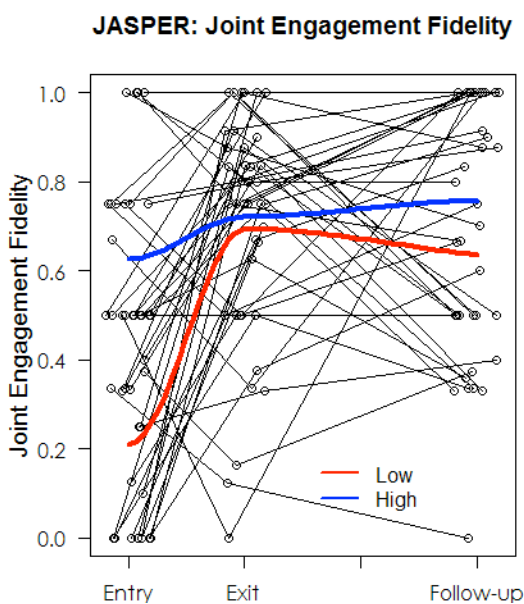
As shown in table 9 & figure 2, all groups maintained their scores from exit to follow-up for the engagement domain. Both JASPER groups and the PE-high group showed no statistically significant change in scores from exit to follow-up. The PE-low group displayed an increase in fidelity from exit to follow-up.

### Differences in Maintenance of Engagement Strategies by Subgroup

Parents who demonstrated high versus low pre-treatment JASPER strategy use did not display statistically significant differences in their changes in strategy scores from exit to follow-up for either condition (see table 9).

Table 9.  
*Changes in Parent Engagement Strategies from Exit to Follow-up*

	Exit M (SD)	Follow-up M (SD)	F	p	DOD F	DOD p
JASPER-high	.72(.29)	.76(.22)	.20	.66	.71	.40
JASPER-low	.69(.23)	.63(.33)	.55	.46		
PE-high	.52(.34)	.66(.31)	2.96	.09	.08	.78
PE-low	.36(.28)	.53(.31)	4.18	.04		



**Figure 2. Engagement Fidelity Over Time for High and Low Pre-Treatment Performers**

**Mean Time in Dyadic Joint Engagement at Exit by Subgroup**

Means for total time in dyadic joint engagement throughout the ten-minute interaction are outlined in table 5. On average, parents and children spent approximately 3.88 minutes jointly engaged at exit. At exit from the study, mean total time spent in joint engagement for the PE-low group was statistically significant lower than the mean for both the JASPER-low group and the JASPER-high group. The PE-high group also spent statistically significantly less time in joint engagement than both JASPER groups (see table 10).

**Mean Time in Dyadic Joint Engagement at Follow-up by Subgroup**

On average, parents and children spent approximately 5.30 minutes jointly engaged at follow-up. At follow-up, the JASPER-high group spent statistically significantly more time in joint engagement than both the PE-high and PE-low groups. Additionally, the JASPER-low group spent statistically significantly more time in joint engagement than the PE-low group (see table 10).

Table 10:  
*Differences in Time in Dyadic Joint Engagement by Subgroup*

	Estimate	SE	DF	t value	p
<u>Exit</u>					
JASPER-low – PE-high	189.76	37.56	147	5.05	<.0001
JASPER-high – PE-high	132.05	37.16	147	3.55	.0005
PE-low – PE-high	-.48.66	37.16	147	-1.31	.19
JASPER-low – PE-low	238.42	37.62	147	6.34	<.0001
JASPER-high – PE-low	180.71	37.22	147	4.86	<.0001
JASPER-low – JASPER-high	57.71	37.62	147	1.53	.13
<u>Follow-up</u>					

JASPER-low – PE-high	71.14	39.58	147	1.80	.07
JASPER-high – PE-high	114.63	38.73	147	2.96	.004
PE-low – PE-high	-14.73	40.56	147	-.36	.72
JASPER-low – PE-low	85.87	40.64	147	2.11	.04
JASPER-high – PE-low	129.36	39.81	147	3.25	.0001
JASPER-low – JASPER-high	-43.49	38.82	147	-1.12	.26

**Maintenance of Time in Dyadic Joint Engagement by Subgroup**

Time in dyadic joint engagement was also examined for maintenance from exit to follow-up. As shown in table 11 and figure 3, the JASPER-high group and both PE groups made statistically significant gains in time spent in joint engagement from exit to follow-up. The JASPER-low group maintained their scores from exit to follow-up with a change that did not reach a statistically significant negative trend from exit to follow-up.

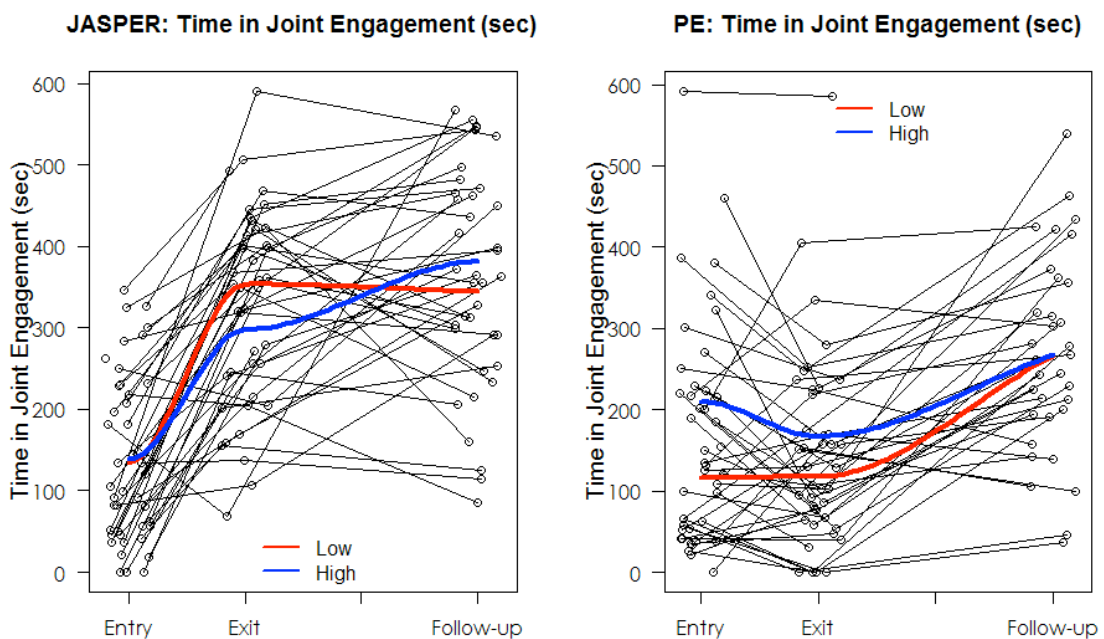
**Differences in Maintenance of Time Spent in Dyadic Joint Engagement by Subgroup**

Parents who demonstrated high versus low pre-treatment JASPER strategy use did not display statistically significant differences in their changes in fidelity scores from exit to follow-up for the PE condition. However, in the JASPER condition, parents who began treatment with high JASPER fidelity were able to display more maintenance of time spent jointly engaged from exit to follow-up than the group who displayed low pre-treatment fidelity (see table 11).

Table 11.  
*Changes in Time in Dyadic Joint Engagement from Exit to Follow-up (In Seconds/Minutes)*

	Exit M sec (min)	Follow-up M sec (min)	F	p	DOD F	DOD p	DOD Cohen's d
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JASPER-high	298.19 (4.97)	381.20 (6.35)	8.72	.004	5.49	.02	.78
JASPER-low	353.50 (5.89)	344.17 (5.74)	.17	.68			
PE-high	167.14 (2.79)	266.94 (4.45)	11.66	.0008	.58	.45	
PE-low	117.48 (2.44)	266.44 (4.44)	18.78	<.0001			



**Figure 3.** Seconds in Joint Engagement Over Time for High and Low Pre-Treatment Performers

### Associations Between Participation in Behavioral Early Intervention Services and Maintenance of JASPER Parent Strategies

Finally, we wanted to examine participation in adult-directed behavioral services in relation to maintenance of strategies. The vast majority of children in the total sample participated in behavioral intervention services (e.g. DTT) after exit from the study. Data on time spent in behavioral interventions (hours per week, duration in months) is outlined in table 12. The primary behavioral treatment was operationally defined as the

intervention each family had participated in for the longest duration. The average number of hours per week spent in this treatment as reported at the follow-up is reported in table 12.

Table 12.  
*Participation in Behavioral Interventions at Follow-up*

Hours per week in main tx <i>M(SD)</i>	Duration of main tx <i>M(SD)</i>	Total hours per week <i>M(SD)</i>	Total duration <i>M(SD)</i>
19.00(10.24)	6.69(5.16)	25.23(17.81)	7.52(5.56)

Spearman correlations between change scores of communication and engagement fidelity from exit to follow-up and hours/duration of participation in behavioral interventions as reported at the follow-up were examined. A spearman correlation was also examined for change scores of time in seconds spent in joint engagement from exit to follow-up and hours/duration of participation in behavioral interventions. A statistically significant association was found between changes in time in joint engagement from exit to follow-up and the number of total hours of participation in behavioral services per week ( $r=-.25, p<.05$ ) (see table 13). More total hours spent in adult-directed behavioral services was associated with more decrease in time spent in joint engagement from exit to follow-up for the entire sample.

Table 13.  
*Correlations Between Changes in Parent Strategies/Time Spent in Joint Engagement and Time Spent in Behavioral Treatments*

	Hours primary	Duration primary	Total hours	Total duration
Change in communication fidelity	.04	-.17	-.03	-.13
Change in engagement fidelity	.01	.15	-.02	.13

Change in time in joint engagement	-.18	-.07	<b>-.25*</b>	-.10
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\* statistically significant at  $p < .05$  level

## Discussion

This study examined maintenance of parent strategies in the engagement and communication domains for parents who participated in either a parent-mediated intervention (JASPER) or a comparison parent education treatment (PE). There were three main findings. First, while dyads assigned to the JASPER condition made improvements in parent strategies related to communication and engagement over the course of treatment relative to the PE comparison group, they had difficulty maintaining particular skills from treatment end to follow up. Some strategies seemed easier than others to maintain. Strategies related to communication were least likely to maintain, and may indicate how difficult these strategies may be for parents who have children who are language impaired. A second main finding was that maintenance of parent strategies was affected by where parents began in their pre-treatment display of JASPER strategies, which was further influenced by the intervention they received. Parents who displayed high levels of pre-treatment JASPER skills showed better maintenance of communication strategies and time spent in joint engagement with their children from exit to follow-up than parents who displayed low levels of pre-treatment strategies. However, this association held only for those parents who received the JASPER intervention. Third, decreased time spent in dyadic joint engagement during play from exit to follow-up was associated with participation in adult-directed behavioral services for the entire sample.

### **Maintenance of Parent Communication Strategies, Engagement Strategies, and Time Spent in Joint Engagement**

One explanation for why communication strategies were more difficult to maintain than engagement strategies may relate to child developmental changes. As children begin to talk more, it may be more difficult for parents to maintain strategies from the JASPER intervention that focused largely on nonverbal communication strategies. At study entry, most of the children would have been considered preverbal rather than verbal. Thus, there was a concentration in the JASPER intervention on improving pre-linguistic nonverbal gestures given their known association with improved language outcomes for children with ASD (Mundy, Sigman, & Kasari, 1990). Parents may have greater difficulty transitioning to strategies aimed at improving spoken language if this change in child language level occurred after exiting the treatment.

In contrast, parent ability to engage their children may have maintained, as these strategies were largely the focus on the intervention and may be more applicable to dyadic engagement regardless of child level of communication. Within the JASPER intervention, a large emphasis was placed on using strategies such as developing play routines around the child's interests and motivation in order to establish joint engagement between parent and child (Kasari et al., 2006). Once engagement was established, the focus moved toward increasing child joint attention skills, as joint attention is fundamental to future language outcomes (e.g. Mundy, Sigman, & Kasari, 1990; Siller & Sigman, 2002). Future research should attempt to examine additional variables such as parent perception and implementation difficulty of intervention components that may explain why some strategies are easier to maintain than others.

### **Maintenance of Naturally Occurring Strategies**

Many researchers fail to consider what baseline skills parents may bring to the interaction before the target intervention begins. Although heterogeneity is a hallmark of



autism and widely recognized by researchers, intervention researchers often apply a manualized intervention in a standard sequential way that may mask individual differences. Parents in this study varied in the degree to which they already displayed pre-treatment strategies that aligned with the JASPER model. This natural variation is important to examine as related to parental maintenance of strategies over time.

**Communication.** Many parents had difficulty maintaining their communication skills from treatment end to follow-up. However, within the JASPER parent-mediated group, parents who displayed high levels of pre-treatment JASPER strategy use displayed more resilience in their communication fidelity compared to parents who showed low levels of pre-treatment JASPER strategy use. This is consistent with Gallimore, Goldenberg, and Weisner's (1993) ecocultural theory that states that it is more effective to implement interventions that capitalize on existing features of the individual and family.

This finding suggests that a match between the parent's communication style and JASPER communication strategies is essential for maintenance of a greater number of skills in this domain after the conclusion of the target intervention. More specifically, JASPER-low parents easily revert back to their baseline communication style after the target treatment. This may be because maintenance of communication strategies that are not aligned with parents' existing strategies is very difficult when support from interventionists is removed. This finding may also be related to parent buy-in of the intervention. If the target JASPER intervention was in conflict with parents' natural communication style, this may have affected parent perception of the intervention, and thus led to less maintenance of skills after the target intervention concluded.

**Time in Dyadic Joint Engagement.** For the JASPER condition, time in dyadic joint engagement maintained at a higher level for parents with more pre-treatment JASPER strategies. Parents with more naturally occurring JASPER strategies may have found engaging with their children less challenging over time. Moreover, the strategies taught were a good match with their existing practices, and thus reinforced skills parents already utilized. This finding is significant, as joint engagement is associated with language acquisition (Tomasello & Todd, 1983; Kasari, Paparella, Freeman, & Jahromi, 2008), and provides an important context for the mutual regulation of affect, problem solving, as well as the negotiation of communicative intentions (Adamson et al., 2001).

### **Association Between Participating in Behavioral Services and Time in Dyadic Joint Engagement**

Previous research suggests that parents may facilitate a child's engagement by maintaining their attention to the child's interest in play objects and actions (McCollum & Hemmeter, 1997). Indeed, JASPER intervention strategies, such as maintaining the child's focus of attention, are associated with increased time in joint engagement between parents and children (Kasari et al., 2006, 2010). However, DTT instructors may have to redirect children's attention in order to get them to focus on objects, events, or language that are associated with mastering specific intervention goals (Bono, Daley, & Sigman, 2004). If parents have been exposed to this type of adult-directed intervention, they may model this behavior and attempt to shift their child's attention in order to program for skills within the parent-child interaction. This may be one reason why participation in more hours of adult directed behavioral treatment was associated with decreased time spent jointly engaged during play.

### **Limitations**

Despite contributing to the literature, this study has several limitations. First, as the entire sample was divided into four groups, sample sizes became small. Perhaps more associations would have been detected if there were more participants in each group. Additionally, parent strategies were coded from a very short interaction in a lab setting. How these findings would generalize to a longer, more natural interaction in the home or community is unclear. Furthermore, the sample consisted of very educated parents, the majority of whom had a college education. It would need to be determined whether results from this study would be similar for less educated or underserved families. Also, all therapists who were directly involved in each case were very well trained and fidelity was high across conditions. Parents' use of strategies over time may have differed with a greater variation in therapist fidelity across the study.

Finally, changes in child skills likely affected parent fidelity over time. However, no differences in child levels were displayed at baseline by subgroup, which suggests that some parents can in fact display high levels of fidelity with a more severely affected child. Moreover, in the natural environment, parent fidelity does not occur in a bubble, but is necessarily connected to child traits. Parents are taught intervention strategies in order to gain knowledge to further their specific child's skills. Thus, within an intervention framework, there is always a transactional relationship between parent and child.

However, in order to assess causality more accurately, future research should examine the relationship between parent fidelity and child outcomes with more controlled designs (Perepletchikova & Kazdin, 2005). For example, randomly assigning parents to receive the JASPER intervention in its entirety or a JASPER intervention with one component missing may shed light on the importance of that particular intervention

feature on child outcomes. These distillation models can inform the active ingredients of intervention, and eventually lead to matching ingredients to particular children (Chorpita, Daleiden, & Weisz, 2005).

Even within a controlled study design, it is likely that initial child skills would moderate the relationship between specific parent strategies and child outcomes. For example, even if a parent is taught to model joint attention within episodes of joint engagement and is implementing this strategy correctly, their child still may not imitate, or even respond to, these skills from the adult. However, another child with a different skill set may, in fact, be able to both respond to and imitate these modeled skills, which would likely have a positive impact on his or her language skills in the future. Thus, the parent strategy of modeling joint attention skills may only be important for a subgroup of children. Previous research has, in fact, documented that children with autism who are more responsive to others' bids for joint attention acquire language skills more efficiently than children who were less responsive to others' bids (Siller & Sigman, 2008). Thus, examining both parent and child characteristics when individualizing interventions may be essential to success.

## **Conclusion**

Results from this study suggest that parents will likely need continued training in order to implement strategies learned within a parent-mediated intervention over time, dependent on both their pre-treatment fit with the intervention approach, and their post-treatment intervention experiences. The results suggest maintenance of learned strategies is greatest when the parent is already demonstrating higher levels of the strategies naturally, thus suggesting that fit may influence intervention success. Post-treatment experiences in early intervention are also associated with maintenance of

skills over time. Results suggest that participation in adult-directed treatment models that likely conflict with strategies aligned with child-directed methods may affect maintenance of parent-child engagement during play. The goal for future interventions is to match both child and parent profiles to specific intervention models in order to achieve best outcomes. Thus, future research on the active ingredients of interventions for specific children and families is critical.

## Appendix I: Parent Strategies Codebook

**\*\*DO NOT CODE ANY INITIATIONS DIRECTED TOWARDS THE CAMERA PERSON, OR ANY OTHER ADULT IN THE ROOM. ONLY CODE BEHAVIOR BETWEEN TARGET CHILD AND TARGET PARENT\*\***

**\*\*For Majority Codes=50% or more\*\***

Page 1:

### 1. Environment

- a. *Minimized overt distractions (ONE INSTANCE CODE):*

**Note:** The camera or other adults/children in the room **do not** count as a distraction that can be minimized. If these are present mark N/A here

**Note:** Bringing out a snack/beverage during the MCX is a distraction if it keeps the child from playing with the toys.

  - i. **Y**-the parent **attempts** to remove any distractions in the environment
    1. **EX:** Child perseverates/becomes excessively object focused/extremely rigid with a toy
  - ii. **N**- distractions were present and parent didn't **attempt** to remove them
  - iii. **N/A**-there were no distractions
- b. *Objects maintained and set up close to child (ONE INSTANCE CODE):*
  - i. **Y**- more than one object was pulled out within child's reach
  - ii. **N**- objects weren't set up close to child, objects were still in the bin
  - iii. **N/A**- parent and child weren't engaging with objects
- c. *New Objects selected (ONE INSTANCE CODE):*
  - i. **Y**- the parent/child selected new objects/toys
    1. **EX:** Parent/child goes to the bin to retrieve new toys/transitions to a new toy that's already in the environment. \*Child must actually play with the toy
  - ii. **N**- the parent/child didn't select new objects, but should have (i.e. the child became unengaged/uninterested in the toys)
  - iii. **N/A**- no need to select new objects (i.e. the parent and/or child are playing with the toy the entire time)
- d. *At child's eye level (MAJORITY CODE):*
  - i. **Y**- parent was in front of the child and at child's eye level for the majority of the interval
  - ii. **N**- parent wasn't in front of the child or at child's eye level the majority of the interval (i.e. parent was sitting behind, or to the side of the child)
  - iii. **N/A**- parent was out of the room majority of the interaction
- e. *DAP objects (MAJORITY CODE):*

**Note:** This code refers to actual toys, and not play actions

  - i. **Y**-toys that were played with in the immediate environment were developmentally appropriate
  - ii. **N**- toys that were played with in the immediate environment were not developmentally appropriate
    1. The toys were SUBSTANTIALLY lower/higher than what was appropriate for the child.

- iii. **N/A-** if parent/child are person engaged

## 2. Imitation

**\*\*Do NOT code physical prompts as acts of imitation\*\***

**\*\*Do NOT include imitation during “clean up” tasks\*\***

- a. *Were the child’s play acts imitated?*
  - i. **Y-** child’s spontaneous AND prompted play acts were imitated by adult, includes delayed imitation
    - 1. Imitation must be CLEAR.
    - 2. Helping the child activate/use a toy, does not count as imitation.
    - 3. For parents imitating on a different object imitation must be clear, in or close to the child’s attentional focus, and immediately following the child’s play action. If it’s unclear if the parent is imitating or modeling DO NOT count this as imitation
  - ii. **N-** child’s spontaneous AND prompted play acts were not imitated by adult
  - iii. **N/A-** child had no play acts to imitate
- b. *Was the imitation immediately following the child’s play act?*
  - i. **Y-** The parents imitation followed the child’s play act within 3 seconds
  - ii. **N-** The parents imitation was delayed, 4+ seconds after child’s play act
- c. *In the child’s attentional focus?*
  - i. **Y-** The imitated action was in the child’s attentional focus
  - ii. **N-** The imitated action was not in the child’s attentional focus
- d. *Marked with language the child’s MLU?*
  - i. **Y-** The imitation was marked with language at the child’s MLU
  - ii. **N-** The imitation was not marked with language at the child’s MLU

## 3. Prompting

**\*\*Do NOT code prompting that occurs off camera\*\***

**\*\*\*Do NOT code prompting for clean up/during clean up\*\*\***

- a. *Did the parent prompt?*
  - i. **Y-** The parent prompted the child, within the context of toy play, for elaborating play/recruiting attention/language/JA/BR using a verbal prompt, physical prompt, or a model
    - 1. Including these examples: “All Done” and “Ready, Set, Go” and “Look”
    - 2. DO NOT include commands such as: “Come here” and “Sit down”
  - ii. **N-** The parent didn’t prompt the child, but should have
  - iii. **N/A-** No prompting was necessary
- b. *Were the prompts appropriately timed/paced?(Majority Code)*
  - i. **Y-** Prompts were delivered when child needed them and parent gave child adequate time to respond to prompt
  - ii. **N-** Parent over prompted and didn’t give child enough time to respond, or parent needed to prompt more but didn’t
- c. *Were prompts developmentally appropriate? (Majority Code)*

- i. **Y-** The type of prompts were developmentally appropriate, the prompted actions were developmentally appropriate,
- ii. **N-** The type of prompts were not developmentally appropriate (e.g. asking test questions, full physical prompts etc)

Page 2:

## 1. Communication

**Note 1:** For verbally fluent children, an active verbal exchange between the parent and child counts as parent imitation/expansion of child's language

**Ex:** A conversation about the same referent at the child's target MLU, or continuing with the next lyrics if they're singing a song

**Note 2:** Words used as sound effects are counted as instances of communication.

**Ex:** "Vroom", "beep", "roar", "choo choo", etc.

**Note 3:** If the parent and child are singing a song, the parent pauses, the child fills in the lyric/word, the parent continues with the song count this as EXPANDING language.

**EX:** Parent: The itsy bitsy...

Child: spider

Parent: went up the water spout

**Note 4:** CLEAR sign language should be counted as communicated. Imitation or expansion can either be verbal or imitating the sign.

### a. Did the adult imitate and/or expand child's language?

- i. **Y-** The adult imitated and/or expanded the child's communicative attempts
- ii. **N-** The adult did not imitate and/or expand any of the child's communicative attempts
- iii. **N/A-** The child had no communicative attempts to imitate/expand

### b. Pace

- i. **Y-** The parents rate of communication and MLU matched the child's rate of communication and MLU
- ii. **N-** The parents language did not match the rate of the child's

### c. Directive

- i. **Y-** The parents language was directive (i.e. commands/demands/test questions)
- ii. **N-** The parent's language was not directive (i.e. imitative/commenting)

## 2. Dyadic Joint Engagement

### a. Definition:

- i. A global code relating to whether parent and child are playing together within the interaction
  - 1. Parent and child need to be interacting together around the same object



- a. This engagement can include the use of language and/or play acts around the same toy/activity
  - b. Parent and child need to be attending to the same object (e.g. body orientation toward the same object/activity)
- b. Use of JA: coordinated and shared attention between two people on an object or an event (skills: give, point, show)
  - i. **Y-** JA skills (not including language) are used within the episode of joint engagement (at least once)
  - ii. **N-** No joint attention is used throughout the episode of joint engagement
- c. Toy Choice:
  - i. **Y-** The child showed interest in a toy an the adult brought it over/child physically chose the toy, episode of joint engagement began
  - ii. **N-** Parent chose toy, episode of joint engagement began
  - iii. **N/A-** Unknown who initiated

## Appendix II: Directions for Scoring Parent Strategies

### Section 1- Environment:

#### 1. The Numerators:

- a. Min. Overt Distractions
  - i. Y= 1, N=0, NA=1
  - ii. Across the entire video, add up the total number of Y's and NA's that have been circled
- b. Objects maintained and set up close to child
  - i. Y= 1, N=0, NA=0
  - ii. Across the entire video, add up the total number of Y's that have been circled
- c. New objects selected
  - i. Y= 1, N=0, NA=1
  - ii. Across the entire video, add up the total number of Y's and NA's that have been circled
- d. At child's eye level
  - i. Y= 1, N=0, NA=0
  - ii. Across the entire video, add up the total number of Y's that have been circled
- e. DAP objects
  - i. Y= 1, N=0, NA=1
  - ii. Across the entire video, add up the total number of Y's and NA's that have been circled

### Section 2- Imitation:

#### 1. The Numerator:

- a. Were the child's play acts imitated?
  - i. Y= 1, N=0, NA=1
  - ii. Across the entire video, add up the total number of Y's and NA's that have been circled

### Section 3- Imitation:

#### 1. The Numerators:

*Disregard sections A-F for the intervals with **NA** circled in the section "were the child's play acts imitated."*

- a. Immediately following child's play act
  - i. Y= 1, N=0,
- b. In child's attentional focus
  - i. Y= 1, N=0,
- c. Mark at child's MLU
  - i. Y= 1, N=0,
- d. TOTAL
  - i. Add up the total for quantity and the number of Y's circled in B-E

### Section 4- Prompting

#### 1. The Numerator:

- a. Did the parent prompt?

- i. Y= 1, N=0, NA=1
- ii. Across the entire video, add up the total number of Y's and NA's that have been circled

**Section 5- Prompting**

**1. The Numerators:**

*Disregard sections A-D for the intervals with **NA** circled in the section "did the parent prompt"*

- a. Were the prompts app. timed/paced
  - i. Y= 1, N=0,
- b. Were the prompts appropriate
  - i. Y= 1, N=0,
- c. TOTAL
  - i. Add up the total for quantity and the number of **Y**'s circled in A-C

**Section 6- Communication**

**1. The Numerators:**

*Disregard Quantity for the intervals with **NA** circled in the section "did the adult imitate or expand"*

- a. Did the adult imitate or expand
  - i. Y= 1, N=0, NA=1
  - i. **\*\*NA is given full credit in this section\*\***
  - ii. Across the entire video, add up the total number of Y's and NA's that have been circled

**Section 7- Communication**

**1. The Numerators:**

- a. Pace
  - i. Add up the number of **Y** circled
- b. Directive
  - i. Add up the number of N circled

**Section 8- Engagement**

**1. Total time in joint engagement**

- a. The sum of time (sec) in joint engagement.
- b. This is across all episodes of joint engagement, not individual episodes

**2. The Numerators:**

- a. Use of JA
  - i. For each coded episode, add up the number of **Y** circled
- b. First step initiated by child

For each coded episode, add up the number of **Y** and **NA** circled

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