

A Pilot Study of Maternal Sensitivity in the Context of Emergent Autism

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Published online: 4 February 2010
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Abstract Unstructured mother–toddler interactions were examined in 18-month-old high- and low-risk children subsequently diagnosed ($n = 12$) or not diagnosed ($n = 21$) with autism spectrum disorders (ASD) at 36 months. Differences in maternal sensitivity were not found as a function of emergent ASD status. A differential-susceptibility moderation model of child risk guided investigations linking maternal sensitivity to child behavior and language growth. Group status moderated the relation between sensitivity and concurrent child behavior problems, with a positive association present for children with emergent ASD. Maternal sensitivity at 18 months predicted expressive language growth from age 2 to 3 years among children with emergent ASD only. Findings underscore the importance of understanding parent–child interaction during this key period in the development of autism symptomatology.

Keywords Autism · Risk · Parenting · Parent–child interaction · Sensitivity · Language

Introduction

Studies of young typically developing children have highlighted the important role of parent–child interactions in early development. Maternal sensitivity across the first

2 years has been found to predict a host of child competencies at age three, including increased language abilities, school readiness, cooperation, compliance, and lower rates of behavior problems (NICHD Early Child Care Research Network 1999). Behavioral findings linking early sensitive caregiving to child competence have been strengthened by biological evidence suggesting that beneficial early environments can influence children’s neurobiological development in ways that promote resiliency (Cicchetti and Curtis 2006; National Scientific Council on the Developing Child 2007). The protective potential of early parenting has increased attention to the role that parent–child interactions might play in fostering positive outcomes among children with early forms of developmental risk—including very low birth weight (Landry et al. 2006), prematurity (Crnic and Greenberg 1987; Landry et al. 2001), and early developmental delay (Baker et al. 2007). The present study expanded upon previous work in families of children with early developmental risk by prospectively examining parental sensitivity toward toddlers at high and low risk for autism spectrum disorders (ASD) who did or did not receive later diagnoses of ASD. Moderation theories of risk are discussed, and we examine relations of parenting with concurrent behavior problems and later language growth to illustrate the usefulness of an interpersonal-transactional approach to the study of autism risk.

Autism Risk and Early Parent–Child Interaction

Autism spectrum disorders are neurodevelopmental disorders that are typically diagnosed in the preschool years and involve core impairments in social functioning and communication (Landa et al. 2007). Recent theories propose that early parent–child interaction may be key to maximizing beneficial outcomes among young children at risk

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for autism, and perhaps also in the prevention of autism itself (Aldred et al. 2004; Dawson 2008). Early child susceptibility genes and/or other risk factors might set the stage for altered patterns of interaction between the child and his or her environment which, in turn, might contribute to abnormal neural circuitry and the development of autism-related problems. An enriched early interactive environment could alter these relations and foster resilient outcomes. Support for the role of the environment in influencing developmental trajectories has been garnered from research involving children already diagnosed with autism. First, several studies note significant improvement in cognitive and linguistic functioning in some children with ASD through intensive behavioral intervention initiated in the preschool years (see Howlin et al. 2009, for a review). Secondly, Siller and Sigman (2002, 2008) found that mothers' synchronization with the attention of their preschool-aged children with autism predicted change over time in the children's language and attention abilities. Finally, interventions aimed at increasing parent-child synchrony and joint engagement in families of young children with ASD have reported improvements in children's social reciprocity and expressive language as a function of treatment (e.g., Aldred et al. 2004; Drew et al. 2002).

Although there is evidence that the environment can meaningfully affect the development of children with autism, little is known regarding the role of parenting in fostering competence in children at-risk for ASD who have not yet received a diagnosis. Due to an increased interest in this topic, several parent-focused interventions for toddlers with early signs of autism have been initiated (see Dawson 2008). These interventions aim to increase parenting behaviors that are consonant with empirically supported behavioral principles, but nest them in a more naturalistic, sensitive context known to be particularly important to development during toddlerhood (Smith et al. 2008).

Investigations utilizing observational-developmental designs are often precursors to the development of interventions, but little is currently known about how naturally occurring variation in maternal sensitivity relates to child functioning at the point where autism symptoms first begin to emerge. The relatively low prevalence of autism makes prospective developmental investigations difficult, and the fact that ASDs are not typically diagnosed until preschool age presents a challenge to the examination of ASD-related trajectories in infancy and toddlerhood. Innovative retrospective methods, such as the review of home movies, have been used (e.g., Osterling et al. 2002), but several understandable limitations exist. More recent prospective, longitudinal studies have examined younger siblings of children diagnosed with ASD due to the considerable

increase in risk for ASD observed in this population (see Zwaigenbaum et al. 2007).

In addition to prediction of disorder (Zwaigenbaum et al. 2005), it is important to investigate interactive processes leading to the emergence of problematic behavior and/or competence in at-risk populations (Cicchetti and Toth 2009). Rogers (2009) reviewed the literature to date generated from infant-sibling studies and, although a large range of child behavior has been investigated and the apparent plasticity of high-risk infants is recognized, studies have not focused on the possible role that early parenting might play in the development of these children. An exception is the work of Yirmiya et al. (2006) who investigated relations between mother-infant synchrony at 4 months during a brief free play and child social relatedness and language at 14 months. Although differences in early synchrony, later language, and later social relatedness were identified as a function of child risk, mother-infant synchrony did not predict any domain of child functioning at 14 months for either group. No study known to the authors has included observation of maternal sensitivity toward toddlers recruited on the basis of familial/genetic autism risk. Infant-sibling designs offer several advantages to research in this area. First, they afford investigation of the parenting of children at a very young age. Secondly, these designs enable researchers to examine relations between parenting and children's abilities and autism symptoms as trajectories first appear to deviate, which is likely to provide valuable information about developmental pathways not easily obtained by the study of children with existing diagnoses (Cicchetti and Toth 2009). Finally, prospective infant-sibling studies allow for the examination of key periods for the formation of language and behavior-regulatory abilities. Early language and behavior problems are among the most important areas to address for children with autism, the former representing a core domain of impairment and the latter a major source of stress for parents (Davis and Carter 2008).

Moderation Models of Risk and Parent-Child Interaction

There is an increasing appreciation for the possibility that certain child characteristics may moderate relations between parenting and child outcome. Early theories of moderation by risk status were essentially "diathesis stress" models, wherein particular forms of biological risk were thought to make children more vulnerable to negative environments. More recent theories propose that certain forms of risk may be associated with differential *susceptibility* to environmental influence, both "for better and for worse" (Belsky et al. 2007). This reframing emphasizes that positive parenting in the context of child risk may

foster child competence just as more negative environments can exacerbate risk. Several developmental and experimental studies across a variety of early child vulnerabilities support *risk-sensitivity* effects, wherein associations between parenting and child outcome are stronger as a function of child risk (Blair 2002; Feldman et al. 1999; Klein Velderman et al. 2006; Landry et al. 2001). In the area of developmental disabilities, Baker et al. (2007) examined maternal scaffolding of 4-year-old children with and without general developmental delays in toddlerhood and found stronger and more consistent relations between scaffolding and social skills at age six for the group with early delays. Indeed, scaffolding was a stronger predictor for this group than any child factor assessed at age four, including behavior problems, emotion regulation, and children's relative cognitive level. These findings provide some initial evidence for the powerful influence that parental sensitivity may have on the development of preschool children with early difficulties but raise questions as to how these processes may operate earlier in development and/or for children at risk for more pervasive problems (e.g., autism).

The marked deficits in social relatedness that characterize ASD might suggest that risk-sensitivity effects would not be observed for this population. Early deficits in sharing attention, affective communication, and social motivation (Cassel et al. 2007; Dawson 2008), along with a strong underlying genetic component (Szatmari et al. 1998), may limit the benefit of sensitive parental caregiving for children developing symptoms of ASD (van IJzendoorn et al. 2007). This notion is consistent with the differential-susceptibility model, but suggests the presence of *biological-constraint* effects, wherein biological deficits accompanying the development of ASD may make these children *less* susceptible to variations in parenting (i.e., would attenuate parent-child associations). Indeed, emerging evidence suggests that some of the most tightly held notions about the influence of parenting may not apply to children with autism. van IJzendoorn et al. (2007) found that, although many children with ASD achieved secure parent-child attachments, parental sensitivity was not predictive of attachment in these children. Travis et al. (2001) identified stronger relations between social cognition and interactive behavior among children with ASD as compared to children with developmental delays. The authors interpreted their results as supporting a model in which the difficulties in social understanding demonstrated by children with ASD may be particularly strong determinants of their social behavior—possibly limiting the contribution of environmental factors.

The applicability of the above models likely depends upon the specific parent factors considered. Maternal sensitivity is a multi-faceted construct, but behaviors

considered sensitive have often been grouped together based on theory and statistical inter-relatedness (e.g., Aber et al. 1999; Fenning et al. 2007; Landry et al. 2006). However, evidence also suggests some independence of behaviors typically described within disparate theoretical frameworks (e.g., emotional supportiveness vs. structuring/cognitive stimulation; Landry et al. 2006) and this separation may be more likely in families of children with ASD (Wachtel and Carter 2008). For example, ASD symptoms or related behavior problems may make it more difficult for some parents to remain both emotionally supportive and adequately structuring at the same time, and possible experience with behavioral interventions (with the older sibling) may result in a mismatch between learned teaching skills and parents' intuitive affective relatedness. A division of structuring from other aspects of sensitivity would suggest that the *structure* of parental sensitivity may be altered by the presence of autism risk and/or disorder. The importance of considering different aspects of sensitivity in this population is underscored by findings suggesting that some forms of sensitive parenting (i.e., limit setting) may be more beneficial to the behavioral development of ASD children than other aspects of sensitivity (Osborne et al. 2008). Understanding the inter-relatedness among different facets of maternal sensitivity, how these associations may be altered in the context of child risk, and how relevant behaviors are similarly or differentially related to aspects of child functioning would considerably inform efforts aimed at intervening with parental sensitivity toward toddlers at-risk for ASD.

The Current Study

In this study, we examined parent behavior during unstructured play sessions with high- and low-risk toddlers who did or did not receive later ASD diagnoses, and investigated associations with concurrent child behavior problems and later language growth. Although there are many ways to group families in infant-sibling studies (Rogers 2009), we chose to compare children with eventual diagnoses versus those without. Similar methods have been used in autism-risk studies (van IJzendoorn et al. 2007) and in infant-sibling studies (e.g., Landa and Garrett-Mayer 2006). However, we also provide descriptive follow-up analyses comparing families of high- and low-risk children within the group of children without eventual ASD.

Although this study focused primarily on parent-child associations, mean-level differences in parental sensitivity were examined as a function of eventual child diagnosis. Several studies have not found meaningful parenting differences between families of children with and without autism (Siller and Sigman 2002; van IJzendoorn et al. 2007), but some evidence suggests that parents of children

with autism may exhibit specific difficulty supporting their children's independence and autonomy—likely in response to child behavioral deficits (Kasari et al. 1988; Rutgers et al. 2007). We therefore predicted that parents of children with emerging ASD would demonstrate normative levels of sensitive structuring, but would demonstrate lower levels of emotional supportiveness than other parents. We also predicted that the interrelationship of different facets of parenting between groups would differ such that structuring would be less related to other aspects of maternal sensitivity (i.e., emotional supportiveness) for children with emergent ASD as compared to other families (Hypothesis 1). Given the dearth of research on the association between sensitivity and child behavior problems in young children with or at-risk for ASD, and mixed evidence from related studies (e.g., Baker et al. 2007; Osborne et al. 2008), no hypothesis was made regarding relations between these factors for the emergent-ASD group—although sensitivity was predicted to relate to fewer problems in children without later ASD (Hypothesis 2). Finally, consistent with the aforementioned studies of parent-focused interventions and the seminal work of Siller and Sigman (2002, 2008) showing positive relations between a specific form of maternal sensitivity and later language acquisition in older children already diagnosed with ASD, it was predicted that sensitivity would relate to language development for children with emergent ASD. Although positive relations between maternal sensitivity and language growth were also expected for children without eventual ASD diagnoses, we predicted that associations would be particularly strong for children with emergent ASD (Hypothesis 3), given the relatively stronger support for risk-sensitivity effects in studies involving children with other forms of early developmental risk.

Method

Participants

Data were drawn from a longitudinal study examining the development of infants with and without specific risk for ASD. At the time of this report, 37 of the children had reached the age of the diagnostic assessment. Diagnostic data at 36 months were available for 33 of these children. These 33 children entered the study between the ages of 2 and 18 months ($M = 7.18$, $SD = 4.38$), with 13 children enrolled prior to 6 months and three children enrolled later than 12 months. Participating children either had an older sibling diagnosed with ASD (Autistic Disorder, Asperger's Syndrome, or Pervasive Developmental Disorder—Not Otherwise Specified; $n = 24$) or an older sibling who showed no signs of ASD ($n = 9$). Families in the low-risk

group were recruited through community advertisements, and families in the high-risk group were recruited primarily through local centers serving children with ASD and related disorders. Older siblings of high-risk children all held community diagnoses of ASD at enrollment and diagnoses were confirmed using DSM-IV-TR criteria (American Psychiatric Association 2000) based on review of previous evaluations combined with clinical assessment using the Autism Diagnostic Observation Schedule (ADOS; Lord et al. 2000) and the Social Communication Questionnaire (SCQ; Rutter et al. 2003). Fifty-two percent of mothers reported themselves as European American, 19% Hispanic/Latino, 3% Asian, 3% Black, and 23% "Other or Mixed Race." Thirty-six percent of children were female and the children had an average of one to two siblings ($M = 1.65$, $SD = 1.35$). Eighty-two percent of families reported annual income over \$50,000 and 12% reported income under \$30,000. The mothers were highly educated overall, with 84% having completed college and 52% having obtained additional professional/advanced degrees.

Emergent-ASD status of the younger target siblings was determined by the presence or absence of an ASD diagnosis at 36 months. The children participated in the ADOS at 30 months, and the Autism Diagnostic Interview-Revised (ADI-R; Lord et al. 1994) was administered to their parents at 36 months. Clinical best estimate diagnoses were derived using DSM-IV-TR criteria based on the ADOS, ADI-R, and the clinical judgment of an experienced psychologist who was blind to the targets' sibling-group status. Diagnostic classifications of either Autistic Disorder, Asperger's Disorder, Pervasive Developmental Disorder—NOS, or No Autism Spectrum Disorder were assigned. Consistent with related studies (e.g., Landa and Garrett-Mayer 2006), the first three groups were combined due to these children's diagnoses falling under the autism spectrum (ASD). Reliability was calculated based on videotape and record review by a second expert clinician and was performed on approximately 90% of the cases. Kappa was .86 (93% agreement). Two diagnostic classification disagreements existed between the clinicians and these were resolved by consensus.

At 3 years of age, 12 of the target children (i.e., younger siblings) were diagnosed with an ASD (all were from the high-risk group), and 21 of the children did not receive an ASD diagnosis. Demographic information (e.g., family income, maternal education, maternal age, mother European American versus not) was not related to child diagnosis or to any of the variables of interest in ways that would influence the findings. Child gender related to eventual diagnosis at the level of a trend, $\chi^2 = 3.16$, $p = .08$, but was unrelated to any other variable of interest (e.g., maternal sensitivity, language growth, behavior

problems)—either within or across status groups—and was not controlled. The four children with available data at 18 months who did not attend the diagnostic visits (1 low-risk child, 3 high-risk children) did not differ significantly from the remainder of the group in sibling-group status or in any aspect of parent–child interaction.

Procedures

Families participated in laboratory visits when the target children were 18, 24, 30, and 36 months of age. A 5 min mother–child free play was conducted at the 18-month visit and was videotaped for later rating. A large, standardized set of developmentally appropriate toys was distributed throughout the center of the room and the dyad was asked to play as they typically would at home. Mothers were mailed forms addressing child behavior problems prior to the 18-month visit, and these forms were collected at the scheduled visit. Children’s language skills were evaluated with the Mullen Scales of Early Learning (MSEL; Mullen 1995) at the 24- and 36-month visits. Diagnostic evaluations were performed at the 30- and 36-month visits. All measures were administered by a child psychology doctoral student or staff clinical psychologist.

Measures

Maternal Sensitivity

Maternal sensitivity was evaluated with the parenting subscales of the NICHD Early Child Care Network scales (e.g., 1999). Five mother ratings were initially obtained, including those measuring responsiveness, respect for the child’s autonomy, positive regard for the child, structuring, and hostility. The term ‘structuring’ was preferred to the original label ‘stimulation of cognition’ in order to emphasize the sensitive and developmentally appropriate nature of the teaching behavior. Ratings were recorded on 7-point scales ranging from the absence of a behavior (1) to the distinct and abundant presence of the behavior (7) and were assigned based upon the entire 5-min play session. Mothers were rated from videotape by research assistants who were trained to reliability on the scales and who were blind to the children’s sibling-group status and eventual diagnosis. Reliability was calculated on 20% of the tapes using the conservative absolute-agreement intra-class correlation (ICC). Adequate reliability was obtained for all ratings (ranging from .74 for responsiveness to .87 for respect for autonomy) with the exception of maternal hostility, $ICC = .56$, due primarily to the low occurrence of this behavior during the free play. Maternal hostility was therefore excluded from further analysis. Maternal

responsiveness, positive regard, and respect for autonomy were averaged to form a composite of “emotional supportiveness,” which demonstrated good internal reliability for the entire sample, $\alpha = .93$, and within each status group (No ASD $\alpha = .86$; Emergent ASD $\alpha = .97$).

High ratings on emotional supportiveness represented behaviors that conveyed warmth and acceptance, reflected responsiveness to the child’s needs, and balanced maternal involvement with a respect for the child’s desires and emergent independence. The structuring rating measured the mother’s ability to provide sensitive and developmentally appropriate scaffolding for her child. Although the quantity of teaching was considered (i.e., the lowest ratings were reserved for mothers who did not even attempt to structure their children), high quality structuring required that scaffolding occur in a sensitive, appropriately paced manner, such that constant and/or intrusive teaching behavior would not receive a high rating.

Child Behavior Problems

Child behavior problems were assessed by maternal report on the Child Behavior Checklist—1½–5 year version (CBCL; Achenbach 2000). The CBCL is one of the most widely used parent-report measures of child socioemotional and behavioral difficulties and is appropriate for use with young children with ASD (Pandolfi et al. 2009). The CBCL contains a list of 99 problematic behaviors, which are rated by each parent on a 3-point scale from 0 (*not true*) to 2 (*very true or often true*) for their child and summed to produce the Total Raw Score. Raw scores are then standardized against established norms to generate *T*-scores, which were used in the current study.

Children’s Language Abilities

Children’s language abilities were measured with the Expressive and Receptive Language scales of the Mullen Scales of Early Learning (MSEL; Mullen 1995). The MSEL is a commonly used measure of cognitive-linguistic functioning that is appropriate for use with children with autism and has been included in similar studies of language growth in this population (Landa and Garrett-Mayer 2006; Luyster et al. 2008; Siller and Sigman 2002, 2008). Age equivalents were used instead of standardized *T*-scores in order to increase sensitivity to variations at the low range of scores (Siller and Sigman 2002). Change scores were created by subtracting the age equivalent of the 2-year Mullen score from the age equivalent of the 3-year score (Siller and Sigman 2002). Although we chose to use change scores based on age equivalence, it is worth noting that our findings were essentially identical when standardized *T*-scores were used.

Results

Data Overview and Analysis Plan

Non-parametric statistics were used to test group differences and within-group processes, given our relatively small sample size, the potential for outliers, and the possibility that the data would not be normally distributed. (Results were identical when using ancillary parametric analyses, which are available from the first author). Some data were missing due to difficulty scheduling families and obtaining questionnaires. Twenty-eight of the 33 families provided data on child behavior problems at 18 months (83% of Emergent-ASD children, 86% of No-ASD children). Children with missing CBCL data did not differ on any aspect of parent–child interaction or on Emergent-ASD status from those children with data. Twenty-seven families (92% of Emergent-ASD children, 76% of No-ASD children) provided sufficient data on language change. Although missing data were not associated with any parenting variable within the Emergent-ASD group, parents of No-ASD children who did not have Mullen change data (primarily due to a missed 2-year visit) were rated lower in emotional supportiveness at 18 months, $z = 2.37$, $p < .05$. The 3-year Mullen scores did not differentiate between children with and without 2-year Mullen scores.

Hypothesis 1: Subtle Differences Would Exist in Maternal Sensitivity as a Function of Emergent-ASD Status

No significant differences were found between groups on levels of structuring (Emergent ASD $M = 4.50$, $SD = .91$; No ASD $M = 4.76$, $SD = .94$) or emotional supportiveness (Emergent ASD $M = 4.58$, $SD = 1.26$; No ASD $M = 5.19$, $SD = 1.03$), as per Mann–Whitney U tests. Spearman Rho correlations indicated that emotional supportiveness related strongly to structuring for mothers of No-ASD children, $r_s = .75$, $p < .001$, but these factors were uncorrelated for mothers of children with Emergent ASD, $r_s = .09$, ns. Indeed, a Fisher’s z -test comparison indicated that the correlation for No-ASD families was significantly stronger than that of children with Emergent ASD, $z = 2.19$, $p < .05$. Visual inspection of the plot for families of children with Emergent ASD indicated that these mothers were more consistently rated as moderate in structuring, even at lower levels of emotional supportiveness, and that increased variation in structuring occurred at higher levels of emotional supportiveness. Of note, correlations were remarkably similar for families of No-ASD children who were high, $r_s = .77$, or low-risk, $r_s = .83$.

Although structuring and emotional supportiveness demonstrated some independence within the Emergent-

ASD group, these constructs were moderately correlated for the sample overall, $r_s = .54$, $p < .01$. To minimize Type I error, and because these forms of sensitivity were expected to operate in similar ways in relation to child outcome, structuring and emotional supportiveness were averaged to create a single sensitivity score for use in the remaining analyses. However, follow-up analyses were performed and are reported for instances in which the processes under examination appeared to operate differently for these two forms of sensitivity.

Hypothesis 2: Examination of Relations Between Parenting and Concurrent Child Behavior Problems

As predicted, children who were not eventually diagnosed with ASD exhibited a negative relation between maternal sensitivity and concurrent behavior problems, $r_s = -.54$, $p < .05$. Children with emergent ASD, however, exhibited a *positive* association between these factors, $r_s = .73$, $p < .05$, indicating that higher quality sensitivity related to a higher level of concurrent behavior problems in this group. Group status moderated the relation between maternal sensitivity and child behavior problems in that these correlations were significantly different from one another, $z = 3.36$, $p < .001$ (see Fig. 1). Again, correlations were very similar among No-ASD children who were high, $r_s = -.69$, or low-risk $r_s = -.56$.

Hypothesis 3: Maternal Sensitivity Would Predict Language Growth Between Age 2 and 3 Years, and the Relation Would be Stronger for Children with Emergent ASD

Descriptive data for children’s language is presented in Table 1. A wide range of change in expressive and receptive language existed for both groups, suggesting considerable variability in development. In “[Hypothesis 3](#)”, we posited that parental sensitivity might partially account for these individual differences in language development.

A significant positive relation was found between maternal sensitivity at 18 months and children’s expressive language change between age 2 and 3 years for children with Emergent ASD, $r_s = .66$, $p < .05$, but not for children without eventual ASD diagnoses, $r_s = -.14$, ns. These two associations were significantly different, $z = 2.05$, $p < .05$, suggesting that group status moderated the relation between sensitivity and expressive language change (see Fig. 2). Follow-up analyses suggested that sensitive structuring was uniquely important for expressive language change among children with Emergent ASD (structuring $r_s = .66$, $p < .05$; emotional supportiveness $r_s = -.15$, ns). No significant relations existed between sensitivity and

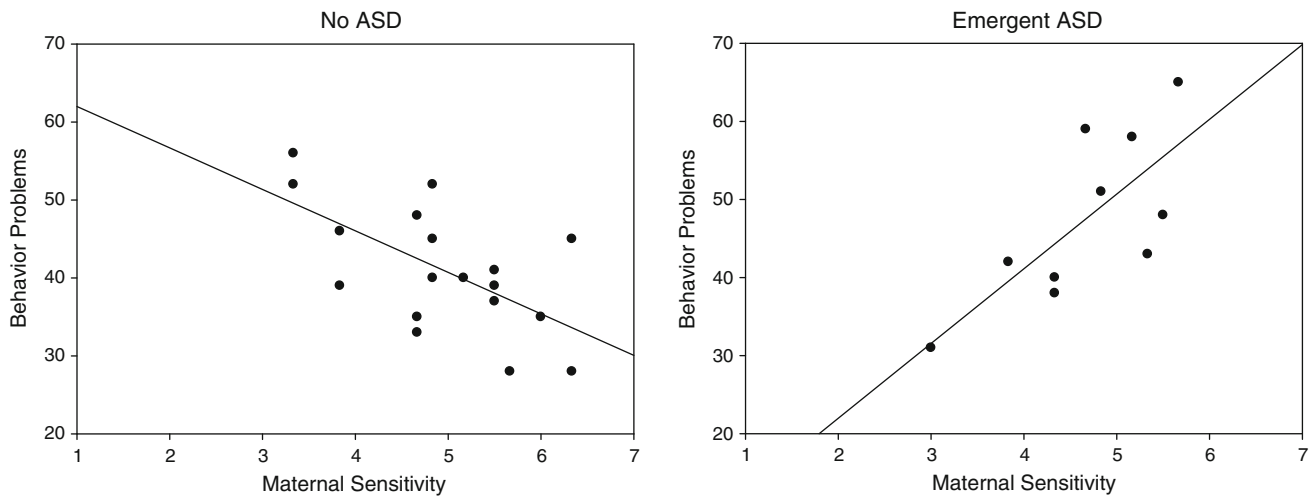


Fig. 1 Scatter plots for the relation between maternal sensitivity and concurrent child behavior problems at 18 months, by emergent autism spectrum disorder (ASD) status

Table 1 Descriptive statistics for language and language change scores from age two to three, by emergent autism spectrum disorder (ASD) status

Variable	No ASD				Emergent ASD			
	2-Year age equivalent	3-Year age equivalent	Mean change in months	Range of change	2-Year age equivalent	3-Year age equivalent	Mean change in months	Range of change
Expressive language	24.59 (5.79)	36.48 (5.06)	11.89 (3.55)	4–16.22	18.88 (5.82)	30.26 (9.68)	11.38 (8.27)	–6.47 to 22.70
Receptive language	24.46 (4.96)	34.42 (6.57)	9.96 (6.36)	0–23.20	20.11 (8.50)	24.84 (11.53)	4.73 (7.51)	–7.53 to 14

Standard deviations are in parentheses

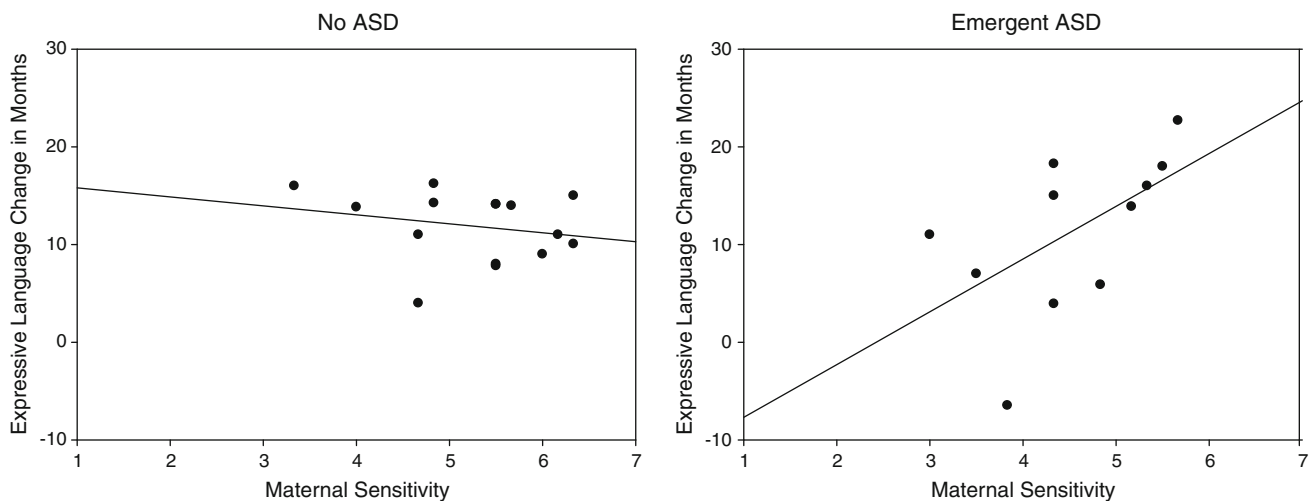


Fig. 2 Scatter plots for the relation between maternal sensitivity and children's expressive language change in months (based on age equivalence) from age 2 to 3 years, by emergent autism spectrum disorder (ASD) status

change in receptive language for either group. Although correlations between sensitivity and expressive language change for low-risk, $r_s = .10$, and high-risk, $r_s = -.31$, children in the No-ASD group were not identical, they were not significant, nor were they significantly different from each other.

Discussion

The current study examined maternal sensitivity in families of high- and low-risk toddlers with and without later diagnoses of ASD. Findings underscore the importance of parent–child interaction during the emergence of autism

and suggest caution in making assumptions as to how parenting is related to child outcome in this context. Differences emerged between diagnostic groups in associations between maternal sensitivity and children's concurrent behavior problems, and between sensitivity and later expressive language growth. Evidence from the current study also suggests that the construct of maternal sensitivity itself may differ as a function of risk status, with sensitive structuring and emotional supportiveness less associated in families of children with emergent ASD as compared to families of children without eventual ASD diagnoses.

Maternal Sensitivity and Emergent ASD

Largely consistent with the literature, no significant group differences existed in maternal sensitivity as a function of emergent ASD (Siller and Sigman 2002; van IJzendoorn et al. 2007). However, our sample was small and we considered only an overall composite of emotional supportiveness, so it remains possible that a more in depth analysis with a larger sample size might identify differences in more specific behaviors (e.g., directiveness; Kasari et al. 1988).

Although there is now an appreciation for considering process-level differences between constructs in studies of developmental risk, it is generally assumed that the constructs themselves remain identical. Findings from the current study challenge this notion and suggest that risk may alter the nature of certain forms of parenting. Although the relative independence of structuring from other facets of sensitivity observed in the parenting of children with emergent ASD did not appear relevant when considering concurrent behavior problems, this separation was important to the prediction of expressive language growth in children with emergent ASD in that structuring appeared to drive the effect. The importance of sensitive teaching methods for language growth among toddlers with emergent ASD supports intervention models integrating behavioral teaching principles with traditional sensitivity (e.g., Drew et al. 2002; Smith et al. 2008). Although maternal emotional supportiveness per se was not related to children's language growth, it is possible that this facet of sensitivity may relate to other aspects of children's development not measured over time in the current study (e.g., social-emotional adjustment, independence, and social competence).

Understanding the nature of the separation between structuring and emotional supportiveness may provide a window into the experience of parenting a child with emergent ASD (at least among those parents who also have older children with ASD). The majority of these parents engaged in moderate quality scaffolding regardless of their

level of emotional supportiveness. Given that all these parents had an older child with ASD and may have been growing increasingly concerned with the younger sibling, this effect could represent mothers' desire to maintain acceptable scaffolding even in the absence of warm, responsive, and autonomy-fostering behaviors. The distribution among this group also suggested that more variation in structuring was present at higher levels of emotional supportiveness. When faced with more difficult child behavior and/or with greater concern about their children's development, parents of children with developmental problems may find it more difficult to simultaneously engage in parenting behaviors that attend to their children's cognitive, behavioral, and emotional development (see Baker and Crnic 2009). Importantly, separation of structuring from emotional supportiveness may reflect a constellation of behavior that *feels* different to parents. Understanding parents' experience in response to emergent autism symptomatology may provide a gateway for communication in intervention contexts. Validating that this parenting style may not only represent a normative response, but that it may even be desirable (due to the potentially unique benefits of structuring for language growth) may promote feelings of efficacy among parents who experience difficulty reconciling their intuitive approach to parenting with their children's special needs.

Sensitivity, Behavior Problems, and Emergent ASD

Consistent with expectations, increased maternal sensitivity predicted fewer concurrent behavior problems for children without eventual ASD. Evidence that the opposite association held for children with emergent ASD is highly provocative. It is possible that child risk can moderate associations between parent and child factors to such a degree that relations in opposite directions are observed as a function of risk group. To our knowledge, there is no precedent in the literature for this type of "contrastive effect" (Belsky et al. 2007) on parenting-child associations by child risk. There are at least four plausible explanations for the positive association between sensitivity and child behavior problems in the emergent-ASD group. First, it is possible that traditional sensitivity is not beneficial to the social-emotional development of children with emerging ASD. However, although it is conceivable that high levels of certain sensitive parenting behaviors (i.e., respect for autonomy) may be less optimal for children with emergent behavioral deficits, it seems unlikely that structuring or other aspects of emotional supportiveness would be detrimental to this population. A second alternative is the possibility that more sensitive parents recognize behavior problems more accurately than less sensitive parents, although this would not explain why families of children

without eventual ASD demonstrated the expected negative association. A more likely explanation is that parental efforts to engage their toddlers with emergent ASD may challenge and frustrate the children in the short-term, producing elevated behavioral difficulties, but may promote positive developmental growth over time. Also, it is likely that parents of children with emergent ASD may have been responding to their children's increased behavioral needs with more sensitive parenting. Indeed, several studies have demonstrated that children with difficult temperaments may elicit poorer parenting from low-resource parents, but *more* sensitivity from parents high in socioeconomic status (see Paulussen-Hoogbeem et al. 2007, for a review). Mothers in our study were primarily high-resource. The current investigation measured child behavior problems concurrent with our parenting examination, and longitudinal research is needed in order to further address directionality. It is imperative that we understand associations between sensitivity and behavior problems in toddlers with emerging ASD given the serious implications for intervention.

Sensitivity, Language Growth, and Emergent ASD

As predicted, there was a significant positive association between maternal sensitivity at 18 months and expressive language growth across the third year for children with emergent ASD. Together, these findings and those of Siller and Sigman (2002, 2008) and Aldred et al. (2004) suggest that parenting is an important contributor to the promotion of language among children with or at-risk for ASD at various developmental stages. Furthermore, sensitivity promoted expressive language growth during a key period in which substantial individual differences in language trajectories were observed among children with emergent ASD, and many of these children were able to reach levels of expressive language on par with their peers by the time of their diagnosis at 36 months. Findings from the current study therefore lend considerable support to models suggesting the key role of parent–child interaction in mitigating the sequelae of early autism risk.

Follow-up analyses indicated that one form of sensitivity, maternal sensitive structuring, was a particularly important predictor of expressive language growth among children with emergent ASD. This construct is similar to forms of parenting identified as important to language for older diagnosed children (Aldred et al. 2004; Siller and Sigman 2002, 2008), and is related to the style of interaction promoted by interventions for toddlers with early signs of ASD (e.g., Smith et al. 2008). Our finding that maternal structuring may promote expressive language growth among toddlers with emergent ASD provides a

developmental-science foundation for the intervention work already underway with this population.

The presence of a significant interaction between child emergent-ASD status and sensitivity in the prediction of expressive language growth, and the absence of a significant relation between these constructs for children without eventual ASD diagnoses, appears to suggest risk-sensitivity effects. Indeed, given the consistency of our findings with those of Siller and Sigman (2002, 2008) and the number of investigations demonstrating significant developmental gain for some children with ASD as a result of early intervention, there is good reason to believe that parenting may take on increased importance in the context of emergent autism. However, our findings regarding language growth among children without eventual ASD should be interpreted with caution, due to the fact that families missing language change data in this group included parents rated lower on emotional supportiveness at 18 months. This pattern of missing data truncated the range of sensitivity and likely increased the chance of null findings. Furthermore, the association between parenting and expressive language growth for low-risk children (which was positive, but weak and not significant) was more consistent with the literature, suggesting that a closer examination of parenting and language growth among high-risk children without ASD (who exhibited a non-significant negative association) is warranted. Nonetheless, parenting clearly appears important to the language development of children with emergent ASD.

Despite a similar degree of variability in receptive and expressive language growth, parenting did not significantly predict receptive-language trajectories. Children with emergent ASD were more similar to their peers in receptive language (as compared to expressive) at the 2-year assessment but, as a group, tended to plateau across the third year. It is possible that the slowing of growth observed during this period may represent an ASD-related process that limited the contribution of parental behavior. Alternatively, it is possible that parents' structuring during this period may have targeted expressive language more than receptive language. Further study is clearly necessary. A lack of significant prediction of receptive language by parent sensitivity may have important implications for parent–toddler interventions targeting language promotion.

Limitations and Future Directions

The current study represents a first step in examining the important role of parenting across the emergence of autism spectrum disorder. In this way, our findings generated more questions than answers, and there are several ways that future investigations can build upon this study. The most notable limitation of this study was its small sample size.

Given that diagnoses of autism have been historically rare, relatively small sample sizes have often been included in this area. Furthermore, we examined children prior to diagnosis, based on familial risk rather than on a developmental screening, thus our sample was highly unique and understandably small. The fact that significant findings were nevertheless observed speaks to the strength of the effects under consideration. Nonetheless, it is likely that limited power affected some of the findings (particularly the null findings), and replication with a larger sample is critical.

Although the goal of the present study was not to predict diagnosis, we note that our sample exhibited a relatively high recurrence rate for ASD diagnoses as compared to similar reports (e.g., Garon et al. 2009; Zwaigenbaum et al. 2007). Our assessments followed the ‘gold standard’ of ASD diagnosis, and reliability on a large sub-sample was very high, providing confidence in the diagnostic-group assignments of the children. It is possible that issues related to enrollment (Rogers 2009) and/or recruitment (e.g., many of our families were recruited from a well-known autism center housed in the same building) may have resulted in a potentially less representative high-risk group. Mothers in the study were also generally very well-educated. Replication with a separate and more diverse sample would provide valuable information.

Other limitations exist. Longitudinal data on behavior problems were not available and there was a delay between our evaluation of parenting and the initial language assessment, so additional studies with alternate timing of assessments would be beneficial. Although the Mullen Scales have been used in several studies of language growth in children with ASD and correlate well with other language measures for this population (Luyster et al. 2008), the use of multiple assessment methods (e.g., augmenting direct evaluation with natural language samples and parent report) would likely provide a more robust measure of language functioning (Tager-Flusberg et al. 2009). Parenting in the current study was measured at only one time-point and during only one brief task. Studies examining the course of parenting and parent-toddler interaction across the entire toddler period, utilizing multiple parent-child tasks, would be particularly informative. Finally, intervention studies suggest that children with autism vary greatly in the degree to which the environment can foster certain competencies (see Howlin et al. 2009), making the identification of moderators of susceptibility to parenting effects among children with emergent ASD an important research task.

Despite these limitations, findings from the current study emphasize the importance of understanding parenting and parent-child interaction during periods in which autism symptomatology is emerging. Results suggest caution

regarding assumptions of how parent-child process may operate in families of children with emergent ASD, and provide initial empirical support for developmental models and intervention programs focused on parent-toddler interaction. It is noteworthy that none of the moderation findings from the current study supported a biological-constraint model of autism risk, suggesting that reduced susceptibility to parenting among children with emergent or early ASD may be limited to specific domains (e.g., attachment—van IJzendoorn et al. 2007). Cataloguing the areas of development for which various forms of parenting may be differentially important for children with emergent ASD is a valuable and fertile area of study, and related findings will be vital to parent-focused toddler interventions.

Acknowledgments This study was funded by NIH grants R01HD047417, T32 HD007473 (University of Miami), and T32 HD07489 (University of Wisconsin-Madison), Autism Speaks, and the Marino Autism Research Institute. We wish to thank the students and staff of the UM Sib Study for their efforts with data collection and management and Whitney Gealy, Silvana Guerra, Maria Kimijima, and Katelyn Vertucci for their superb rating of maternal sensitivity. We thank Rachel Fenning, Naomi Ekas, and Lisa Ibanez for their input on drafts of the manuscript and we are especially grateful to the families for their participation.

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