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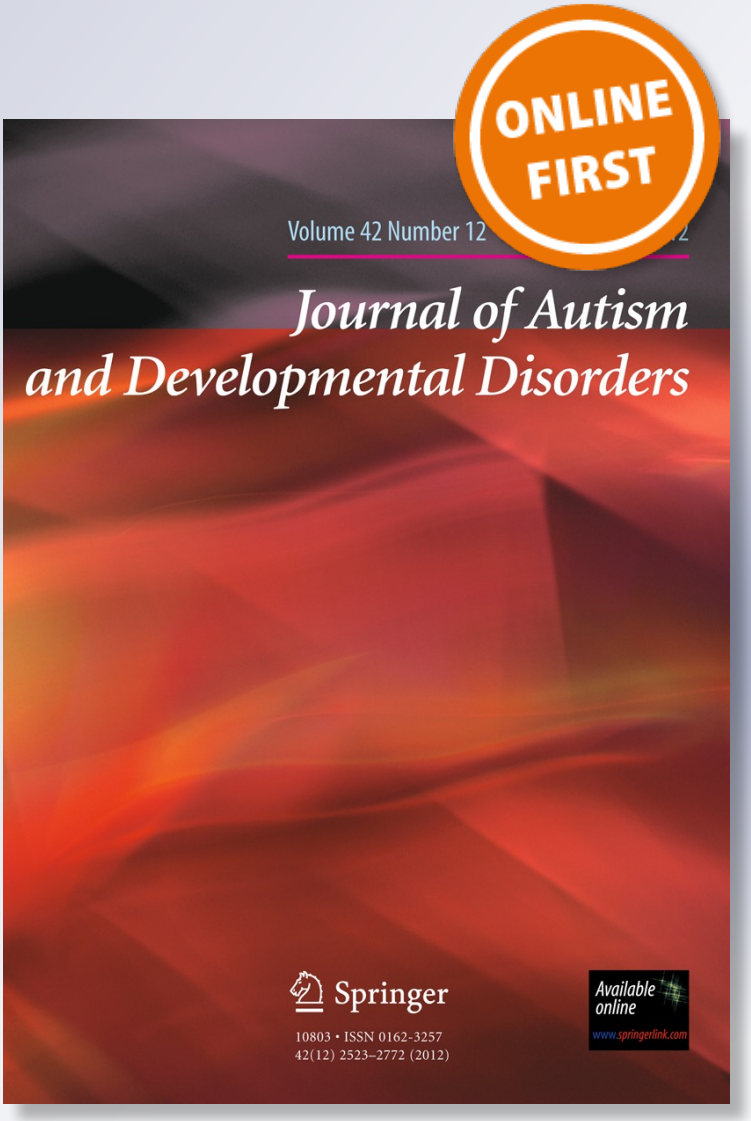

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BRIEF REPORT

Brief Report: Parental Child-Directed Speech as a Predictor of Receptive Language in Children with Autism Symptomatology

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Abstract Facilitative linguistic input directly connected to children's interest and focus of attention has become a recommended component of interventions for young children with autism spectrum disorder (ASD). This longitudinal correlational study used two assessment time points and examined the association between parental undemanding topic-continuing talk related to the child's attentional focus (i.e., follow-in comments) and later receptive language for 37 parent–child dyads with their young (mean = 21 months, range 15–24 months) children with autism symptomology. The frequency of parental follow-in comments positively predicted later receptive language after considering children's joint attention skills and previous receptive language abilities.

Keywords Autism · Parent responsiveness · Receptive language · Parent–child interaction

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Past research has shown that there is a strong positive association between the amount of responsive caregiver language and language growth (McDuffie and Yoder 2010; Siller and Sigman 2002, 2008; Tomasello and Farrar 1986; Tomasello and Todd 1983). For caregivers' language to be considered verbally responsive, it must first be connected to the child's current focus of attention or the object that the child is looking at, touching, playing with, or communicating about. Researchers have hypothesized that when input is related to the receivers' focus of attention it maximizes language learning, given the limits of the auditory and visual short-term memory, by reducing cognitive demands of competing stimuli (Atkinson and Shiffrin 1971; Shiffrin and Schneider 1977; Tomasello and Todd 1983). In contrast, it is believed that language input paired with an externally imposed shift of attention diminishes children's ability to process language (Akhtar et al. 1991; Tomasello and Farrar 1986; Tomasello and Todd 1983).

Children with Autism Spectrum Disorder (ASD) have shown deficits in attention shifting (i.e., sticky attention; Landry and Bryson 2004; Zwaigenbaum et al. 2005) and attention-following when compared to their typically developing peers or peers with other developmental disorders (Adamson et al. 2009; Happé & Firth, 1996; Leekam et al. 1998; Mundy et al. 1990). Consequently, reducing the cognitive load for language processing by matching the child's focus and limiting obligations to shift

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attention can be especially critical for children with ASD. In addition to language matched to children's attention, there is another aspect of parental verbal style receiving a significant amount of consideration in research: directive (i.e., demands) vs. non-directive (i.e., commentary) utterances. Some studies have shown that a highly directive or intrusive communication style used by an adult language partner may result in fewer opportunities for children to initiate (Warren and Brady 2007), fewer communication functions (Duchan 1989), and a neutral or negative relationship with comprehension development (Baumwell et al. 1997). It has also been argued that the frequent use of directives may cause children to become more passive or reticent in communication interactions over time compared to the use of less demanding facilitative comments (Landry et al. 2000).

Siller and Sigman (2002, 2008) demonstrated a strong, positive correlation of early follow-in comments and later expressive language level in children with ASD. The synchronous and undemanding parental talk type studied by Siller and Sigman is comparable to a *follow-in comments* verbal responsiveness variable examined by McDuffie and Yoder (2010) who also found a positive relation between follow-in comments and later expressive language in children with ASD. Similar to Siller and Sigman, the McDuffie and Yoder sample had a mean chronological age that was over 3 years. Thus, it remains to be seen whether children showing symptoms of ASD (i.e., screened positive for ASD) and younger than 3 years will reap the same benefits from attention matched non-directive speech (i.e., follow-in comments).

In addition to parental responsiveness, children's ability to initiate and respond to joint attention with their language partners is also thought to support their overall language growth. Joint attention episodes naturally promote meaningful communication and teaching opportunities. When children initiate or respond to joint attention, they are providing the opportunities for parental linguistic input.

In the current study, the unique contribution of parental linguistic input in predicting later receptive language growth above and beyond joint attention skills was examined. In contrast to the combined language measure used in the Siller and Sigman study or expressive vocabulary used in McDuffie and Yoder study, we chose to focus on receptive language because the comprehension of symbols typically emerges prior their use in expressive language. Focusing on receptive language may capture progress for children who understand some language but have yet to produce verbal speech and removes concerns that verbal behavior may occur without comprehension for children with autism who are using speech (Volden et al. 2011).

Methods

Participants

Thirty-seven children (32 boys and 5 girls) with symptoms consistent with a diagnosis of ASD and their parents participated in the study. These parent–child dyads represented a subset of participants from a larger randomized control trial of a parent implemented intervention (Carter et al. 2011). The mean age of participants during the pre-study eligibility determination assessment was 21 months (SD = 2.7; range 15–24 months). Twelve (32 %) of the 37 families involved in the study identified their child as Hispanic. The remaining 25 parents were non-Hispanic, with 19 self-identifying as White. Fifty-one percent of the parents reported educational levels at or beyond a bachelor's degree. The inclusion criteria for participants in the current study included: a) children at or under 24 months with a predetermined classification of being 'at risk' for ASD via the Screening Tool for Autism in Two-Year-Olds (STAT; Stone et al. 2004; Stone et al. 2008) and expert clinical judgment that the child met DSM IV symptom criteria for ASD (see Carter et al. 2011), b) no identified genetic disorders or syndrome, and c) codeable parent–child sessions from both data collection time points. Children were initially screened and assessed for eligibility in the larger study. Upon completion of the study, 87 % of the sample received a diagnosis of ASD (i.e., autistic disorder or pervasive developmental disorder-not otherwise specified) based on scores from the ADOS (Lord et al. 2000) in combination with clinical impressions from a psychologist, the DSM-IV, and parent interviews.

Procedures

The children received a battery of assessments during the initial screening and eligibility determination visit and during two follow-up visits (Time 1 = approximately 5 months and Time 2 = approximately 9 months after initial visit). During the initial visit, the children were assessed in the context of the earlier study (Carter et al. 2011) using the *Mullen Scales of Early Learning* (MSEL; Mullen 1995) to quantify pre-study language levels. The pre-study receptive language scores (raw) were only included in the current study's analysis to control for initial receptive language abilities. At Time 1, the children were assessed using the *Early Social Communication Scales (ESCS;* Mundy et al. 2003) to measure joint attention levels and a parent–child free play (PCFP) session to assess parent-provided follow-in comments. At Time 2, the MSEL was repeated. See Table 1 for scores on these measures.

Table 1 Summary of participant (child) characteristics

	Pre-study ($n = 37$) M ± SD	Time 1 ($n = 37$) M ± SD	Time 2 ($n = 37$) M ± SD
Child age (months)	21 ± 2.6	26 ± 2.8	30.7 ± 2.8
Mullen expressive T score[a]	21.3 ± 4.4	–	30.3 ± 12.1
Mullen expressive AE	7.5 ± 3.9	–	17.4 ± 8
Mullen receptive T score[a]	21.2 ± 9.51	–	29.2 ± 12.1
Mullen receptive AE	8.54 ± 4.11	–	17.5 ± 7.9
Initiating joint attention[b]	–	9.2 ± 9.4	–
Response to joint attention[c]	–	2.1 ± 1.8	–
Follow-in comments[d]	–	61.9 ± 20.1	–

[a] T score (mean = 50, SD = 10)

[b] The group mean for the number of acts classified as initiation of joint attention during ESCS

[c] The group mean for the number of acts classified as a response to joint attention during ESCS

[d] The group mean for the number of parental verbal behaviors classified as follow-in comments during parent–child free play session

Measures

The *MSEL* provides a measure of language development. The current study reported raw scores from the receptive and expressive subscales. Pre-study standard scores are provided for descriptive purposes. Raw receptive language subscale scores were analyzed to address the research question.

The *ESCS—Abridged* (Mundy et al. 2003) is an observational measure that was designed to characterize and measure nonverbal communication behaviors in young children between the ages of 8 and 30 months. In this report, the abilities measured using the ESCS were initiating joint attention and responding to joint attention. Initiation of joint attention refers to the frequency with which a child uses eye contact, points and shows to initiate shared attention to objects or events. Response to joint attention refers to the child following the examiner's line of regard and pointing gestures. Response to joint attention was coded during four looking trials that were administered twice during the assessment. Coding for the initiation of joint attention and response to joint attention variables were completed from videotape. Inter-observer reliability was calculated through blind, independent coding of randomly selected videotapes (20 % of the sessions). The intra-class correlation coefficient (ICC) for the number of initiations of joint attention at Time 1 was .96. The intra-class correlation coefficient (ICC) for the number of responses to joint attention (correct) at Time 1 was .95.

The Parent–Child Free Play (PCFP) sessions were coded for parent–child interaction variables. The PCFP session included two sections: (a) a 10 min play segment involving age appropriate toys and (b) a 5 min book sharing segment (choice of three books). During the play segment, parents were provided with a basket of toys and instructed to present toys they believed would be interesting to their child. For the book sharing segment, the toys were cleared from the room and the parent was given three books to look at with their child. For the entire PCFP session the child and parent were seated adjacently, at a child sized-table, facing the camera to ensure that both verbal and nonverbal communicative behaviors were captured on video.

The follow-in comments variable was coded using a five second partial interval coding system. With the partial interval coding system, the targeted behavior is coded as present if it occurs at any point during the five second interval. For an interval to be considered as codeable, the child needed to be visible to the camera and open for linguistic input (i.e., not crying or unengaged). A follow-in comment was coded as present when the parents' utterance matched the following criteria: (a) contained linguistic information that was facilitative of language development (i.e., words that a one- or two-word user would be able to comprehend or might say); (b) was considered to be a non-directive label or comment (i.e., did not tell the child what to do/not do or oblige him to communicate); and (c) matched an actively engaged child's focus of attention or actions. The number of codeable intervals containing child-directed speech utterances matching the above criteria was added together to create the follow-in comments variable. Intra-class correlation coefficient (ICC) was estimated from an independent coding of a random selection of approximately 20 % of the sessions. The ICC was .95.

Results

Preliminary Analyses

A bivariate regression analysis revealed an outlying case which was excluded from all other analyses because it

Table 2 Summary of intercorrelations for predictors and dependent variable

Measure	1	2	3	4	5
1. Pre-study receptive (Mullen)	_	.21	.62**	.23	.43**
2. Initiation of joint attention	.21	_	.10	.11	.15
3. Response to joint attention	.62**	.10	_	.23	.50**
4. Follow-In comments	.23	.11	.23	_	.46**
5. Time 2 receptive (Mullen)	.43**	.15	.50**	.46**	_

* $p < .05$; ** $p < .01$

Table 3 Summary of regression model analysis predicting receptive language while adjusting for initial comprehension skills

Variable	β	95 % CI	$R_{a(b.c)}$	ΔR^2
Pre-study receptive (Mullen)	.14	[−37, .88]	.11	.16
Response to joint attention	.33	[−10, 2.5]	.26	.23
Follow-in comments	.35*	[.02, .21]	.34	.39*

* $p < .05$

violated assumptions for undue influence and was an extreme outlier using the guidelines of Kutner et al. (2004). See Table 2 for zero-order correlations among study variables.

Primary Analysis for Hypothesis Testing

A multiple linear regression with follow-in comments at Time 1, response to joint attention at Time 1, and Mullen pre-study receptive raw scores as predictor variables showed that follow-in comments at Time 1 ($B = .12$, $SE = .05$, $p = .02$) was the only significant variable for predicting Mullen receptive raw scores at Time 2, R^2 change $= .12$, $t(33) = 2.51$, $p = .02$ (see Table 3). Given the proportion of Hispanic children in our sample, we also examined whether the positive relationship between follow-in comments and Time 3 receptive language varied as a function of ethnicity. This statistical interaction was non-significant, $t(33) = -57$, $p = 57$.

Discussion

The purpose of this study was to examine the association between parental follow-in comments and receptive language level in a particularly young sample of children presenting with social and communication deficits indicative of ASD. The findings indicate that for very young children showing symptoms of ASD, parental linguistic responsiveness is a significant predictor of early receptive language growth. Unlike the child's joint attention, parental use of follow-in comments was associated with increases in receptive language after accounting for initial language skills.

The findings from our study were consistent with those reported by others (e.g., McDuffie and Yoder 2010; Siller and Sigman 2002, 2008). However, the current study adds a unique contribution by extending the investigation to a younger and more diverse sample of children with ASD symptoms and by focusing on receptive language abilities. Our findings suggest that a higher frequency of follow-in comments is associated with higher levels of receptive language among children from non-Hispanic and Hispanic backgrounds; therefore, it lends support to targeting a high frequency of follow-in comments as an objective in intervention programs for toddlers with social-communication concerns, including those from culturally and linguistically diverse families. Our examination of the commonly suggested practice of attention matched and undemanding linguistic input appears to support the use of this interactional style with children around the age of 24 months who are showing symptoms of ASD.

While findings from this study are consistent with similar studies in the literature, there are some limitations to be considered. When contemplating how this study generalizes to other populations, the disproportionate number of families with higher incomes relative to the general population and the moderately small sample size should be taken into account as these factors may constrain comparison to the general ASD population. Additionally, the pre-study receptive language scores were included only to control for initial receptive language abilities and are not necessarily indicative of the children's receptive language abilities 5 months later when the Time 1 data were collected. However, the high correlation between the pre-study and Time 2 receptive language suggests intra-individual consistency of the scores over the course of the study. Finally, given the correlational design of this study, we are not able to rule out the possibility that other unmeasured variables are accounting for the changes seen in the children's receptive language.

Future Research

It is important to consider whether follow-in comments have a causal influence on subsequent receptive language and, if so, on which aspect of receptive language (e.g., noun vocabulary, verb vocabulary, or morpho-syntax). If found to be causally related to language, it will be useful to identify which factors may hinder or enable this parental behavior style, particularly if children have greater deficits in social communication that reduce their ability to contribute to social interactions.

In conclusion, there was a significant and moderately positive relationship between the use of follow-in comments and later receptive language in pre-linguistic children with

autism symptomology, even after accounting for children's initial receptive language abilities and concurrent joint attention skills. Thus, even very young children, under the age of 24 months, with social-communication deficits appear to benefit from this increasingly popular intervention strategy.

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Conflict of interest One co-author receives the author share of royalties from sales of the Screening Tool for Autism in Two-Year-Olds (STAT).

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