

Teacher Responsivity to Preschoolers with Autism Relative to Levels of
Challenging Behavior

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Abstract

Understanding how child characteristics influence teacher behavior is crucial for knowing the impact that differentiated teacher responses may have on later development. This study explored the relation between levels of problem behavior and adult language acts for 15 matched pairs of preschoolers with autism. Frequencies, types, and timing of teacher language acts were examined relative to engagement and communicative acts for children with high and low levels of problem behavior. Matched pairs were created from a pool of 205 children who participated in a larger evaluation study. Teacher ratings on the Child Teacher Rating Form (CTRF) were used to establish the top or bottom quartiles from which the high and low problem behavior groups were formed. Pairs, differentiated by level of challenging behavior, were then matched on language skills. Videos from natural play routines were coded and analyzed using t-tests and sequential analyses. Teacher *redirectives* occurred significantly more often for the high problem behavior group. Both groups displayed similar levels of engagement and time spent in child led activities.

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Adult involvement in play and social interactions with young children may have lasting effects on later language ability for children with autism spectrum disorders (ASD; Mundy, Sigman, Kasari, 1990; Siller, Hutman, & Sigman, 2013; Siller & Sigman, 2002). In exploring the relation between adult behaviors and language ability, responsive language acts of parents of children with ASD reliably predicted improved child language abilities across time (Siller & Sigman, 2002). Parents who were more responsive during play interactions and to their child's focus of attention at a young age (mean chronological age of 50.3 months) had children who made larger improvements in their language abilities over 10 and 16 years later, compared to parents who were less responsive originally. The relation between responsiveness and gains in language abilities was not explained by early individual differences in child characteristics, including mental age, language age, IQ, or joint attention abilities.

In subsequent work, it was demonstrated that children with limited object interest gained greater communication abilities through a responsivity-based treatment when compared to a contrast treatment (Yoder & Stone, 2006). The responsiveness of adult behavior was a key characteristic encouraging communication skills at a later age (Adamson et al. 2009; Baker et al. 2010; McDuffie & Yoder 2010; Siller and Sigman 2008). Parent comments and directions that relate to a child's current focus of attention assisted language acquisition for children with autism. Parent expansion on a child's utterance has also shown to predict language ability, after controlling for child talkativeness (McDuffie & Yoder, 2010).

Parent responsiveness has also appeared to positively affect child initiation of joint attention. Child bids for joint attention increased in frequency when an adult modeled joint attention behavior, using an object of interest and under the child's current focus of attention (Siller & Sigman, 2002). This "synchronization" of parent utterances with child behaviors also predicted better language outcomes (Siller & Sigman, 2002). "Synchronization" is used to refer to a caregiver's ability to align their behavior and language with a child's focus of attention or interests. Synchrony is demonstrated in a caregiver's ability to make utterances relating to the child's play, through comments or directives focusing on the child's current activity. Caregivers who used more synchronous language in relation to a child's play at early ages had children who developed stronger language abilities up to 1, 10, and 16 years later when compared to caregivers using less synchronous language (Siller & Sigman, 2002). Although synchronization of utterances was important, utterances that were synchronized *and* undemanding predicted better outcomes, even if the demanding utterance was regarding the child's current focus of attention. Utterances considered "undemanding" were viewed as comments or talk that did not require a child to change or alter their behavior in any way. Comments made did not place an expectation on the child or make suggestions for play, rather, undemanding comments simply provide language and interaction with an adult without enhancing response effort for the child.

Synchronized interactions between adults and children that include a referent object, such as a toy or item, provide opportunities for not only expanding language skills, but enhancing social interactions with a child without having to compensate for the

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potential attentional deficits affecting the interaction (Siller & Sigman, 2002). The child may also gain an understanding that others attend to and have intentions for objects of the child's interest, an important skill to acquire to develop later joint attention abilities. Lastly, synchronized interactions that follow a child's attentional lead may also create opportunities for more positive experiences with other individuals that may increase motivation to engage in social interactions over time (Siller & Sigman, 2002).

Although adult interaction and responsivity have been shown to lead to better child outcomes, the type, timing, and frequency of interactions may differ depending on developmental characteristics of the child and the context in which the child is exposed to adult interactions. Previous research has often been conducted with caregivers in the home and reviewed the natural occurring language environment of children with autism (Siller & Sigman, 2002; Siller, Hutman, & Sigman, 2013; Kasari et al., 1988). It is important to continue this research in the classroom to determine how the language environment changes. Specifically, classroom contexts involve a higher child to adult ratio with children who may exhibit a diverse set of developmental characteristics. How these environmental factors may impact the type, timing, and frequency of adult responsivity or interactions with children in a structured classroom context warrants exploration.

Beyond differing contexts of adult interactions, it is also important to consider how a child's history of behavior patterns may be impacting teacher behavior. As challenging behavior is a common characteristic for many children with autism, (Matson & Nebel-Schwalm, 2007), it is important to have an understanding of how this and other

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child characteristics may impact a teacher's interaction with a child. This knowledge would offer some evidence as to how teachers can alter their behavior to create a positive interaction with the child in attempts to promote the best outcome. Although certain adult interactions with children with autism spectrum disorder (ASD) are found to promote positive language outcomes, challenging behavior may influence the type, timing, and frequency of these interactions, potentially facilitating or inhibiting the development of enhanced language skills. Increasing knowledge of the relation between children's historical patterns of behavior and teachers' current behavior within context, along with the resulting impact on child outcomes, may allow researchers and practitioners to design treatments for, and guide adult interactions with, specific groups of children (Stahmer, Shriebman, & Cunningham, 2010). This could lead to improved outcomes for many children with autism and increase current knowledge of how child variables impact child-teacher interactions.

Understanding how child characteristics may influence teacher responsivity is crucial for knowing the impact differentiated teacher responses may have on later development of children with ASD, including language acquisition. Although teachers are more likely to respond to children displaying low levels of aggression compared to those who are identified as high aggressors (McComas, Johnson, & Symons, 2004), there is limited knowledge of how child characteristics, like aggression or problem behavior, may influence the quantity or content of teacher responses.

The purpose of the current study was to further explore how the level of problem behavior aligns with adult language responsivity, and if there is a difference in the

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frequency and type of teacher language acts for those children displaying high versus low
levels of problem behavior, as measured by the Caregiver Teacher Report Form
(CTRF/2–5; Achenbach, 1997). Specifically, I examined:

- (a) teachers' use of language in relation to child language ability and level of problem behavior.
- (b) the extent to which teachers used language acts to redirect children who were unengaged.
- (c) teacher responsiveness to the verbal utterances of children with and without problem behavior.

Methods

Participants

The sample of children for the present study were drawn from a larger pool of 163 children across four study locations throughout the United States who participated in a larger study of comprehensive treatment models. All children were between the ages of three and five and met criteria for autism spectrum disorder (ASD) confirmed through assessments that included the Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, DiLavore, Risi, & Gotham, 2001). All were receiving special education services from classrooms catering to the needs of children with autism. All classrooms were screened prior to recruitment of children and deemed to be of high quality on a direct observation tool designed to measure implementation of effective practices for children with ASD. The tool is a reliable and valid implementation measure made up of subscales assessing the instructional and environmental properties of a classroom (Professional

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Development for Autism Center, 2008; Hume et al., 2011). Each classroom reflected one of two comprehensive treatment models or an eclectic mix of treatment approaches. The Treatment and Education of Autistic and Communication related Handicapped Children (TEACCH) (Mesibov, Shea, & Schopler, 2005) and Learning Experiences and Alternative Programs (LEAP) (Hoyson, Jamieson, & Strain, 1984) are two different models implemented in classrooms to adapt to the specific needs of children with autism or related disabilities. The classrooms that implemented an eclectic mix of strategies were considered non-model specific classrooms, or business as usual (BAU) classrooms (Boyd et al., 2014). The treatment models implemented within the classrooms did not direct or encourage specific types of teacher behaviors and were not expected to influence the relations being explored in this study.

All of the participants were assessed following IRB approval and consent from parents or caretakers of the children. To obtain the subsample of children included in this study based on a matched pairs design, a sample of 30 participants was created from the original pool of 163 for whom all relevant data were available.

Pairings were created such that a child with high problem behavior and a child with low problem behavior were included in each pair that were matched on language ability. The pairing process started with identifying children within the original pool of data who scored within the top and bottom quartile on the CTRF. The CTRF is a questionnaire that was completed by teachers to provide ratings of children's social and behavioral competencies.

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Two groups of children were identified with those in the bottom quartile having standard scores between 38 and 56, and the top quartile having scores between 65 and 84. The standard scores between these two groups were found to be significantly different ($t(28) = 10.55$ $p < .001$). From these two groups, 15 pairs were identified based on similar language abilities as measured by the Preschool Language Scale - 4 (PLS-4; Zimmerman, Steiner, & Pond R. E., 2002). The PLS-4 is a standardized, norm-referenced evaluation tool used to obtain measures of a child's language abilities, including receptive and expressive language skills. Children from the high challenging behavior group (High CB) and the low challenging behavior group (Low CB) were paired if their overall standard score on the PLS-4 was within three points of each other. This process resulted in identification of 30 participants separated into 15 matched pairs. CTRF and PLS-4 Scores for each matched pair are included in Table 1.

Table 1

High-Low Challenging Behavior Pairings based on CTRF with Matched PLS

Pair	CTRF High	CTRF Low	PLS High	PLS Low
1	82	53	50	50
2	67	50	91	91
3	68	48	70	71
4	70	53	70	72
5	79	52	50	50
6	69	38	84	87
7	69	51	81	82
8	74	56	50	50
9	75	56	50	50
10	72	56	59	58
11	80	56	50	50
12	73	55	50	50
13	68	54	64	66
14	66	55	86	86
15	65	55	81	84

Note. CTRF = Caregiver Teacher Report Form. PLS = Preschool Language Scale – 4. High = High Challenging Behavior Group. Low = Low Challenging Behavior Group.

Direct Observation of the Preschool Language Environment

Thirty-minute videotapes were gathered for each participant and used for later coding. Each video was gathered by a researcher who limited their interaction with the participant to prevent reactivity to the observer. Videotaping took place during a time that was prearranged with the child's teacher. Each teacher was asked to identify a 30 minute period during their typical classroom routines when the child would be engaged in play as part of a planned free play or center time. Once videos were obtained, each was coded for further examination of the language environment focusing on the environmental context as well as specific child and teacher behaviors.

Context for the language environment. Given that all videos were gathered during naturally occurring opportunities for play within a broad range of preschool

Teacher Responsivity to Preschoolers with ASD 9 classrooms, two contextual features of the language environment were coded given the hypothesized relations to teacher behaviors. First, durational codes were used to determine if the child was *actively engaged* or *not engaged*. A child was considered *actively engaged (ae)* if the child showed at least three consecutive seconds of engagement in an object, person, or by on-looking another's activity. A child was determined *not engaged (ne)* if they did not meet criteria for the definition above to be considered actively engaged. Second, although the videos were to be obtained during free play, there were occasions of teacher directed activities, including small group instruction and table activities. To account for this, the durational codes of *teacher directed activity* and *child directed activity* were included. *Teacher directed activities (td)* were activities that were planned and instructed by the teachers, whereas *child directed activities (cd)* were activities that did not have a teaching agenda from teachers. Children chose to play with certain activities or toys.

Child language acts within the language environment. Child behaviors were coded to examine teacher responsivity to child language acts. Only one code was developed to encompass all child acts. A *child act (ca)* included any utterance of the child's that contained at least one audible vowel sound.

Teacher language acts within the language environment. Discrete teacher behaviors were coded to examine how the type and timing of teacher language acts may relate to child characteristics. Teacher language acts included *follow-in directives (fd)*, which encompassed requests from the teachers and conveyed an expectation of the child, but did not require the child's current focus of attention to change. *Follow-in comments*

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(fc) were utterances that described an action or play that was in the child's current focus of attention. *Redirectives (re)* were utterances used to redirect the child to change their focus of attention to an activity or an object different from the child's current focus of attention. *Other Talk (ot)* was used for utterances that did not meet the definition of the codes described above.

To examine responsivity, researchers analyzed a teacher's response to the act of a child becoming unengaged to determine if teachers quickly encourage reengagement while creating more opportunities for social interactions. A sequential analysis was used to determine how frequently a teacher language act occurred following a child's unengagement as well as exploring which types of language acts were used when teachers responded. I also examined responsivity through a teacher's ability to respond to child language acts, again through analyzing how frequently a response occurred within a five second window and what type of language act with which the teacher responded.

To examine synchronization and demand, based on the work of Siller and Sigman (2002) the codes were also conceptualized as either synchronized or unsynchronized, and undemanding or demanding. *Follow-in comments* and *follow-in directives* were considered synchronized acts, as they related to the child's current focus of attention. *Other talk* and *redirectives* were considered unsynchronized as they did not relate to the child's current play activity, or potentially lacked specificity to be certain they pertained to the child's focus of attention. *Follow-in comments* and *other talk* were codes considered undemanding because they did not require the child to respond in any way. The teacher language act did not have any expectations for the child. *Follow-in directives*

Teacher Responsivity to Preschoolers with ASD 11 and *redirectives* were considered demanding, as the child was expected to change some aspect of their behavior, whether it was related to their current focus of attention or not. This does not mean the child demonstrated a change in behavior, only that the teacher utterance placed an expectation on the child.

Procedures

From each 30-minute video, 15 minutes were identified for coding. This was done given the preponderance of videos in which the first or last 5-10 minutes included a transition in and out of free playtime based on the naturally occurring routines of the classroom. Prior to coding the videos, each video was prescreened and a coding start time was assigned based on the first available time on the video when the child was engaged in free play. The coding continued for 15 minutes from that start point. For all but one case, coding began 10 minutes into the video and ended at 25 minutes to provide a standardized context. One video began at eight minutes to reach the 15-minutes required for coding, as only 23 minutes of video were recorded.

A training phase was used to establish the degree to which two independent coders were able to agree on application of the coding scheme to the videos. Three training videos were used to initially establish reliability between observers and to gain familiarity with the coding scheme. Coders were required to demonstrate at least 80% reliability on the same video three consecutive times, before proceeding to the next training video. A new video that had not been previously viewed was used to test each researcher's understanding of the codes and agreement with each other. Following this training, one coder was designated as the primary researcher, who then coded the 30

Teacher Responsivity to Preschoolers with ASD 12 videos for the participants in this study. The second coder provided reliability coding for a random sample of 20% of the videos. All coding was done through the use of Lily Collector (Tapp, 2010), which allows the researcher to create a coding system and code real time observational data. Multiple Option Observation System for Experimental Studies (MOOSES; Tapp, Wehby, & Ellis, 1995) was used to analyze code files and determine inter observer agreement. Average inter observer agreement for all 30 videos was 94%.

Data Analysis

To determine if there was a significant difference in a teacher's use of language with children in either behavioral profile, a matched pairs t-test was conducted. A matched pairs t-test is often used to examine group differences, and can be used with pairs matched on a certain variable with population differences between the matched pairs falling in a normal distribution. As both conditions were met, and the primary concern of the current study was to determine if there were differences between the High and Low CB groups, a matched pairs t-test was an appropriate test to use. This allowed us to determine if there were significant differences in the frequency of overall language acts as well as certain types of language acts delivered to children in either group, independent of the child's language ability. A matched pairs t-test was also used to determine if there were significant differences in the duration of time spent in *child* or *teacher directed activities*, as well as time spent engaged or unengaged.

To examine teacher responsivity to a child's unengagement a sequential analysis was conducted, providing a resulting Yule's Q value, which offers an

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interpretation of the relation between two possibly related events by examining the likelihood of two events occurring sequentially to one another. Yule's Q was selected because it provides easily understood values of a relation while controlling for the total count and probability of a target event. Yule's Q is not influenced by the base rate of a certain event (McComas, Moore, Dahl, Hartman, Hoch, & Symons, 2009). This was again used to determine teacher responsivity to child language acts. The resulting Yule's Q value falls between -1.0 and 1.0, with a perfect negative relation at -1.0, indicating if event A occurs, event B never occurs or vice versa, and a perfect positive correlation at 1.0, indicating if event A occurs, event B always occurs or vice versa. When analyzing the sequential variables, a pooled analysis was conducted with each group first to determine overall teacher responsivity, regardless of type of language act. Then, another sequential analysis was run to examine specific types of language acts.

Results

Teacher Language Acts in Relation to Levels of Problem Behavior

The environmental context for children's language development was explored first to examine if there were contextual differences between the classroom experiences of children with high and low levels of challenging behavior that may be influential when examining teacher's use of language. Table 2 includes the descriptive information for duration and frequencies associated with the contextual variables of engagement and activity type. Engagement, examined as *actively engaged* or *not engaged*, was examined first and did not occur differently when the high and low challenging behavior groups were compared on two dimensions of engagement, duration and frequency. The high

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challenging behavior group was engaged, on average, for 84.79% (SD = 20.52%) of each observation compared to a mean of 91.00% (SD = 10.00%) for the low challenging behavior group. This was not a statistically significant difference ($t(14) = \pm 0.93, p = 0.365$). The frequency counts of the engagement codes were also examined as higher counts of moving in and out of engagement were considered to be an indicator for difficulties maintaining attention or sustaining engagement within activities. The frequency of entering into engagement did not differ significantly between groups, with the High CB group entering engagement, on average, 3.40 times within an observation, and 2.87 times, on average, per observation for the Low CB group ($t(14) = 0.72, p = 0.484$).

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Table 2

Group Means and Standard Deviations for Duration (Overall Percent of Time) and Frequency Counts

	High CB		Low CB	
	Mean	SD	Mean	SD
Contextual Factors				
Actively Engaged; Duration	84.79%	20.52%	91.00%	10.00%
Actively Engaged; Frequency	3.40	1.76	2.87	1.92
Not Engaged; Duration	14.76%	20.52%	9.11%	10.00%
Not Engaged; Frequency	3.40	1.50	2.87	2.07
Teacher Directed Activities; Duration	25.64%	36.00%	12.96%	17.93%
Teacher Directed Activities; Frequency	0.47	0.52	0.40	0.51
Child Directed Activities; Duration	74.47%	36.00%	87.16%	17.93%
Child Directed Activities; Frequency	1.44	3.69	0.40	0.63
Teacher Language				
Follow in Comment; Frequency	10.60	8.58	8.20	5.23
Follow in Directive; Frequency	20.60	13.88	15.47	9.43
Redirective; Frequency	5.80	3.55	2.00	1.36
Other Talk; Frequency	13.53	6.39	9.07	4.65
Child Language				
Child Act; Frequency	18.33	11.16	15.93	10.47

Note. High CB = High Challenging Behavior Group. Low CB = Low Challenging Behavior Group. SD = Standard Deviation.

Activity type was then examined as another contextual factor that could influence the amount and type of teacher language acts. The duration of time spent in two activity types, teacher directed or child directed, were compared for the high and low challenging behavior groups. As *teacher directed activities* typically involve a high frequency of directive language and place more expectations on the child, when compared to child directed activities, it is possible that more *redirectives* would be seen for those children participating in higher durations of *teacher directed activities*. When compared, the high and low challenging behavior groups again displayed no significant

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difference in duration of *teacher directed activities* and *child directed activities* ($t(14) = -1.56, p = 0.141$). The High CB group was engaged in teacher directed activities, on average, for 25.64% (SD = 36.00%) of each observation compared to 12.96% (SD = 17.93%) for the Low CB group.

Given findings that children with high and low levels of challenging behavior experienced similar classroom contexts (engagement and activity types), frequency and type of teacher language acts were then examined. Table 2 provides the mean frequencies and standard deviations for teacher's use of *follow in comments*, *follow in directives*, *redirectives*, and *other talk* with children in the high and low challenging behavior groups. Across both groups, children experienced similar amounts of teacher follow-in comments (High CB group, $M = 10.60$ $SD = 8.58$; Low CB group, $M = 8.20$, $SD = 5.23$) that did not differ statistically when compared using a paired samples t-test ($t(14) = 0.98, p = 0.343$). Teachers also used similar amounts of follow-in directives and other talk when the two groups were compared. In combination, similar amounts of follow-in comments, follow-in directives, and other talk used by teachers suggests that children with high and low levels of challenging behaviors had similar language experiences despite differences in overall levels of challenging behavior. The use of follow-in comments and follow-in directives indicate interactions that are synchronized with the child's attentional focus. Though the occurrence of each did not differ between the groups, it is important to note that follow-in directives occurred at mean rates that nearly doubled when compared to teachers' use of follow-in comments (Table 2). Though interactions were synchronized, most of the interactions involved placing a demand on

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the child. Redirectives are also considered to be a form of interaction that places a demand on a child. Redirectives did occur at significantly different amounts when the groups were compared (High CB group, $M = 5.80$, $SD = 3.55$; Low CB group, $M = 2.00$, $SD = 1.36$; $t(14) = 3.93$ $p = 0.002$), with the children in the High CB group experiencing teacher redirectives at a rate of almost three to one.

Teacher Responsivity to Non-Engagement

As teachers' language acts that are synchronized to the child's attentional focus are considered important for language acquisition, it was important to explore teachers' use of certain types of language acts with children who may spend less time engaged in activities thought to promote language development. To do this, a sequential analysis was completed to examine whether or not teachers responded relatively quickly and in what way teachers interacted with a child once that child became unengaged in an activity. Sequential analyses were completed for each pooled group as well as across groups to explore both differences that may exist in interactions in relation to a child's level of problem behavior as well as teacher behavior regardless of level of problem behavior.

To examine whether or not teachers responded relatively quickly to a child becoming unengaged in an activity, a time lag of 10 seconds was set for the sequential analysis. A 10 s window was hypothesized to be a reasonable amount of time in which to expect some form of response from a teacher when a child becomes unengaged in an activity. For exploratory purposes, the groups were pooled for the first sequential analysis. Of the occasions in which children became unengaged, irrespective of group membership and across all participants, teachers only responded within ten seconds on 25

Teacher Responsivity to Preschoolers with ASD 18 occurrences. As seen in Table 3, there were over 3,000 occurrences, across the pooled groups, in which a child became unengaged and the teacher did not respond with any of the observed language acts. This indicates teachers responded to unengagement, within ten seconds, for only 0.65% of the observed opportunities. Table 3 provides the counts of opportunities and responses, as well as the Yule's Q relation, which indicates the likelihood of the events occurring together. For all but one teacher behavior, *redirective*, there was a negative relation between unengagement and a teacher language act, as shown in Table 3.

Specific types of language acts were then explored to examine what teachers did when they did respond to a child's unengagement. Most often *redirectives were used by teachers with children in both the High CB and Low CB groups*. For the Low CB group, the likelihood of a *redirective* to follow child unengagement was moderate (Yule's Q = 0.54). For the High CB group, this relation was a bit weaker, indicating there were fewer occurrences of teachers responding to a child's unengagement with a *redirective* (Yule's Q = 0.20). As the child is not engaged and there is no current focus of attention, *redirectives* was the expected response from teachers to reengage the child. Any occurrences of child unengagement followed by a *follow in comment* or a *follow in directive*, seen in Table 3 was a result of the child quickly entering back into engagement, within the ten-second window, and the teacher then displaying one of those types of language acts. *Follow in comments* and *follow in directives* should not occur during unengagement, as there is no attentional focus on which to base an interaction.

Table 3

Pooled Groups Sequential Counts for Teacher Response to Unengagement

Given	Target	Yule's Q	Frequency of Given followed by Target	Frequency of Given and Target Independent
<u>High CB</u>				
Unengagement	Follow in Comment	-0.73	1	526
Unengagement	Follow in Directive	-0.15	9	518
Unengagement	Other Talk	-0.24	5	522
Unengagement	Redirective	0.2	5	522
<u>Low CB</u>				
Unengagement	Follow in Comment	-1	0	440
Unengagement	Follow in Directive	-0.78	1	439
Unengagement	Other Talk	-0.64	1	439
Unengagement	Redirective	0.54	3	437

Teacher Responsivity to Child Utterances

To assess teacher responsivity to child utterances, a sequential analysis was implemented to determine the likelihood of a teacher response, within a five second window, to children in the low or high level problem behavior group. A 5 second window was used for this set of sequential analyses as it seemed reasonable to expect that in an environment in which teachers are working to enhance language skills, teachers should be responding to children's language acts within a very brief period of time. Table 4 presents information for both the High CB and Low CB groups about the frequency of child and teacher acts occurring and their occurrence in relation to one another. It was found the relation between child utterances and teacher language acts had similar tendencies for both behavioral profiles. For children in the High CB group, teachers responded to child utterances with a low to moderate positive relation (Yule's $Q = 0.366$).

Similarly, for children in the Low CB group, teachers responded to child utterances with a slightly lower positive relation (Yule's $Q = 0.289$).

Specific language acts were then examined to determine how teachers did respond to a child utterance during the occurrences of a response. It appeared teachers were most likely to respond with a *follow in comment* to children in either behavioral profile. As shown in Table 4, *follow in comment* had a fairly high frequency of occurrences resulting in moderate to strong relations (High CB, Yule's $Q = 0.63$; Low CB, Yule's $Q = 0.76$). Of all teacher responses *redirective* was the only code to display a negative relation, but only for the Low CB group (Yule's $Q = -0.46$), indicating a moderate negative relation. For the High CB group, there was a weak but positive relation between child utterances and *redirectives*, indicating there were more occurrences of teachers responding to a child's utterance with a *redirective* (Yule's $Q = 0.15$).

Table 4

Pooled Groups Sequential Counts for Teacher Response to Child Act

Given	Target	Yule's Q	Frequency of Given followed by Target	Frequency of Given and Target Independent
High CB				
Child Act	Follow in Comment	0.63	50	1,272
Child Act	Follow in Directive	0.52	76	1,246
Child Act	Other Talk	0.17	27	1,295
Child Act	Redirective	0.15	11	1,311
Low CB				
Child Act	Follow in Comment	0.76	50	1,104
Child Act	Follow in Directive	0.52	52	1,102
Child Act	Other Talk	0.33	21	1,133
Child Act	Redirective	-0.46	1	1,153

Discussion

Across studies, there is evidence that many longstanding child characteristics can impact a teacher's interaction with a child (Irvin, Boyd, & Odom, 2015; Kasari, Sigman, Mundy, & Yirmiya, 1988; Watson, 1998). It is important to understand how such characteristics may influence teacher behavior, as this can have an impact on adult-child interactions, which in turn, can greatly affect later child outcomes. Although there is evidence to suggest teachers interact differently with children displaying high levels of aggression, there is limited information on how the type and timing of interactions may differ between children displaying high or low levels of problem behavior.

The purpose of the current study was to assess if teachers were more or less likely to deliver synchronized and undemanding utterances to children displaying high levels of problem behavior, when compared to their low problem behavior counterparts. Teacher responsivity was examined from three perspectives: responsivity to child play, responsivity to child unengagement and responsivity to child utterances. When reviewing child play, teacher interactions were significantly more redirective with children in the High CB group when compared to the Low CB group. All other teacher responses occurred in similar frequencies for both high and low problem behavior groups. Results indicate children with problem behavior are not necessarily receiving less synchronized or undemanding language, but did in fact receive significantly more demanding and unsynchronized language. Although synchronized and undemanding adult commenting has been associated with better later verbal abilities (Siller & Sigman, 2002) it is

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unknown if receiving more unsynchronized or undemanding language is associated with worse outcomes, if it is balanced with equally as many follow-in comments and responses.

This result appears to be consistent with trends found in similar research in which longstanding child characteristics potentially influence teacher and caregiver interactions with children with autism (Irvin, Boyd, & Odom, 2015; Kasari, Sigman, Mundy, & Yirmiya, 1988; Watson, 1998). Mothers of children with ASD have been shown to direct as many verbalizations related to the child's focus of attention, as did mothers of typically developing children, but mothers of children with ASD also made more verbalizations unrelated to the child's current focus of attention than did mothers of typically developing children. Some have suggested that this difference may be a result of the mother's desire to direct their child's attention, as children with ASD may have a history of difficulty attending when compared to typically developing children (Watson, 1998). Many children with ASD have a common characteristic of attentional deficits (Garretson, Fein, & Waterhouse, 1990; Gold & Gold, 1975), which may manifest itself as the child not being engaged for lengths of time. In this study, the children in the High CB group may have established a history of not sustaining engagement, or expressing behaviors that are incompatible with engagement. Though children in both groups displayed similar amounts of engagement, a history of inattention or problem behavior may be affecting how teachers are interacting with the child.

Children in the current study, who were identified as displaying high levels of problem behavior, were identified based on teacher ratings using the CTRF, a valid and

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reliable tool for identifying children with not just transient problem behavior, but also longstanding and persistent problem behavior (Achenbach, 1997). It is plausible that the persistent problem behavior displayed by some children may have shaped the behavior of adults interacting with them. Though the brief observation sessions examined in this study did not include any contextual differences, there were still differences in adult behavior between the High CB and Low CB group. This difference may suggest the history of a child's behavior is driving adult language rather than the child's current behavior in a given interaction. As the videos were only 15 minutes, this may not represent the child's longstanding behavior habits, but may still show a pattern of adult behavior that has been shaped by persistent child characteristics.

A child's history of problem behavior can be a strong driver of teacher behavior regardless of the child's behavior in a given interaction. Teacher expectations or perceptions of a child's problem behavior have been shown to affect their interaction with children. Dobb & Arnold (2009) found that children who were perceived as displaying more total behavior problems and specifically, externalizing problem behavior, based on teacher rating scales, received more commands from classroom teachers. This difference was still significant after controlling for the subjective variance between two teachers' ratings of one child. The unique variance in ratings from the target teacher were significantly related to their behavior with the child rated (Dobb & Arnold, 2009). Dobb and Arnold suggest that teachers' individual and subjective impressions of children's problem behavior can impact their interactions with certain children, beyond

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impressions of a child's problem behavior held by all teachers, which may be consistent with findings in the present study.

There are many ways in which children's histories and established patterns of behavior have been shown to relate to differentiated teacher behavior. With longer observations sessions and typically developing preschoolers, McComas, Johnson, & Symons, 2004 found teacher behavior to differ in the frequency of responses for children with high levels of problem behavior. Frequency of teacher responding was not found to be different for the preschoolers with ASD in the current study. However, though frequency of responding did not differ, the content of the interaction did, with children in the High CB group receiving different types of language than children in the Low CB group. One way in which this difference manifested was in teacher response to child utterances. Teachers were very unlikely to respond to a child utterance with a redirective for the Low CB group, but interestingly, there was a weak but positive relation with child utterances and teacher use of a redirective for the High CB group.

A difference in the content of the interactions is consistent with other research examining the types of adult language towards children with autism. Certain child characteristics, such as age and autism severity, have been found to be significantly related to the content of adult talk (Irwin, Boyd, & Odom, 2015). More specifically, children in a preschool classroom who had higher levels of problem behavior received more language that was related to behavior management (Irwin et al., 2015). These findings lend support to the premise that child behavior may shape adult behavior and

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create interaction patterns that are based in stable and persistent child characteristics, as opposed to the immediate context for child-teacher interactions.

Though current behaviorally based intervention strategies involve redirection and extinction for problem behavior, teachers are potentially using more reactive than proactive measures to encourage engagement or prevent the occurrence of problem behavior. In this study, for children with low levels of challenging behavior, if the teacher delivered a redirective, it was likely in relation to the child becoming unengaged. For children with high levels of problem behavior, redirectives were again observed, but with no clear association to the child becoming unengaged. When combined with no observed differences in teachers' use of synchronous intervention strategies that might build new engagement and language skills for children with problem behavior, there is a need to more closely examine the content and frequency of teachers' interactions with children. There is evidence to suggest that follow in directions or follow in comments might facilitate joint engagement and promote more active learning that prevents problem behavior, while creating opportunities to improve social communication skills (Horner et al., 2002; Shire et al., 2015). If teachers are not utilizing these strategies, they may be caught in a cycle of reacting to instances of problem behavior.

There is evidence suggesting that following a child's attentional lead, as opposed to employing more redirective strategies, not only encourages engagement but also could produce better language outcomes for children with autism (Shire et al., 2015). Although these strategies have been effective in home-based interventions (Siller & Sigman, 2002; Siller, Hutman, & Sigman, 2013; Kasari et al., 1988) there has been

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limited examination of them in classroom settings. As joint attention and shared engagement are critical for later language development for children with autism, it is important parents, as well as teachers, are able to establish shared engagement within an activity to provide a context in which to develop language skills (Markus, Mundy, Morales, Delgado, & Yale, 2000). Creating shared engagement to encourage language development is best done by following the child's lead. Natural language teaching paradigms that embed learning into naturally occurring events have been linked to greater language gains when compared to a contrast treatment (Koegel, O'Dell, & Koegel, 1987). Beyond the improved outcomes using a natural language teaching paradigm, adults appear to enjoy delivering instruction through a more natural, pivotal response-training format as opposed to a more structured discrete trial training design (Shreibman & Koegel, 1991).

As embedded language learning strategies, utilizing synchronized and undemanding adult commenting, have been associated with better language outcomes for children with autism, it is important for teachers to employ these strategies for all children. As child characteristics have been shown to lead to differentiated teacher interactions (Irvin, Boyd, & Odom, 2015; Kasari, Sigman, Mundy, & Yirmiya, 1988; Watson, 1998), it is important for teachers to be cognizant of how child history may impact their interaction with certain children. Modifying teacher behavior given individual child characteristics may help to ensure each child is receiving similar content and frequency of adult talk to attempt to promote the best outcomes possible.

Limitations

There are several limitations to consider when interpreting the findings from this study. One large limitation is the size of the sample. With only 15 matched pairs to assess, it is difficult to determine if this sample is representative of the larger population of preschoolers with autism. Replication is necessary to determine if the patterns found would be seen in a larger sample. It is important to observe if the pattern of redirective use with children with high levels of challenging behavior is replicated on a larger scale, as there was a limited frequency of this variable in the present study in either group. While it is a small sample, efforts were made to systematically match the kids to look empirically at what differences might exist in teacher behavior.

A larger sample size would also allow researchers to better control for extraneous child characteristics that may further convolute findings. A matched pairs design controlling for one variable, though a critical characteristic for mediating that amount of language a child may receive, may leave other child characteristics to explain why a difference may occur. Characteristics such as autism severity and nonverbal IQ may equally impact the type and frequency of language a child is receiving from an adult as much as the child's language ability. Controlling for other variables may provide a clearer picture of the whole child and how an interaction of child characteristics influences teacher behavior or language directed toward the child. Future research could look at potentially mediating variables, and through different analysis techniques, such as an analysis of covariance (ANCOVA), be able to account for each of these variables and look at the relation between only a child's level of problem behavior and teacher utterance type and frequency.

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Being able to account for other child characteristics as well as the actual

occurrence of problem behavior would help give contextual references for examining the frequency and type of teacher interactions. This study did not measure the occurrence of problem behavior, which will be important to include in future research to provide more contextual details that will aid in the examination of varying types of interactions with varying types of children. Though not explicitly measured in this study, anecdotally, problem behavior was rarely observed during coding of video recordings. The observed environment was not expected to elicit or evoke problem behavior, as observations were made during naturally occurring free play and few demands are placed on the children. It is possible that the small amounts of problem behavior that did occur might explain the difference seen in the amount of *redirectives* given to children of the two groups. Again, this explanation could suggest teachers are reacting to occurrences of problem behavior and employing less proactive or preventative strategies to minimize the incidences of challenging behavior.

Other environmental factors could also account for some of the difference seen and would be important to review in future research. Staff and child ratio and the presence of peers, along with many other environmental factors, could affect why and how a teacher is interacting with a child. The parameters used in the sequential analyses limited the ability to account for the environmental factors potentially impacting the frequency of teacher response. The lack of relation between unengagement and teacher utterances could be a result of children becoming reengaged before the teacher has time to make a comment and redirect them back to activity. Although a ten-second window

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was used, this does not indicate a child was unengaged for ten seconds, only that the code of *unengaged* occurred and within ten-seconds a teacher utterance may or may not have occurred. A child might have re-entered *actively engaged* before the ten-second window closed.

Future Research

It is important for future research to address some of the limitations with larger samples. A study involving a larger sample with more data taken on each child could offer a platform for a different type of statistical analysis, which would allow for more careful examination of other important variables influencing teacher child interactions. Findings from such a study would allow for clearer interpretations of the effect child characteristics may have on teacher behavior. It is also important for future studies to be able to directly observe and account for the occurrence of problem behavior. Being able to empirically examine child problem behavior and teacher interactions in the same context would allow researchers to establish an observed relation between problem behavior and interactions in the context in which both are occurring.

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