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Developmental Delays or Typical Development

The transactional model of development (Sameroff & Chandler, 1975) asserts that the

child and environment interact with one another to contribute to individual developmental

trajectories. Consistent with this model, parenting is known to play a vital role in supporting

development and promoting positive social-emotional, cognitive, and adaptive skills outcomes in

children (Warren & Brady, 2007; Fenning & Baker, 2012; Landry, Smith, Swank, Assel, &

Vellet, 2001). Additionally, among children at risk for poor outcomes, parenting may be

especially important in fostering developmental resilience (Baker, J., Fenning, Crnic, Baker, B.

& Blacher 2007). As the acquisition of productive language is a milestone of universal

importance for all children, this is a particularly potent outcome to examine. Accordingly,

extensive literature documents the effects of parenting behaviors, such as warmth, affect, and

responsiveness, on early communication skills in both typical and vulnerable children (Warren &

Brady, 2007; Tamis-LeMonda, Bornstein, & Baumwell, 2001; Hart & Risley, 1992).

Despite this body of research on parenting and early language development before age 3,

few studies have examined the continued contribution of parenting to more complex language

skills through the preschool years. Those that have examined this relationship have focused on

how parent language input influences complex syntax growth (Huttenlocher, Vasilyeva,

Cymerman, & Levine, 2002; Jackson & Roberts, 2001), ignoring the role of interactional

constructs of affect, intrusiveness, and sensitivity. As present knowledge does suggest that there

is considerable variability in child use and acquisition of complex sentence structures past age 3

(Huttenlocher, Waterfall, Vasilyeva, Vevea, & Hedges, 2010; Vasilyeva, Waterfall, &

Huttenlocher, 2008; Huttenlocher et al., 2002), it is crucial to examine the role of the parent-child

interaction in these individual differences. As children progress past their first words and through syntactic development, parent interactional behaviors may operate differently in supporting later language development than they do for early language milestones. It is also possible that there are parallel differences in how these relationships are moderated by child risk factors over the course of development.

Parent-child interactions have been examined thoroughly for specific behaviors that may promote child development. Although these behaviors have been given many labels, they frequently measure similar constructs: responsiveness (e.g., the parent's tendency to respond contingently to the child's communication bids), synchronicity (e.g., the parent's tendency to produce speech and actions that are related to the child's current focus of interest), sensitivity (e.g., the ability of the parent to pick up on and attend to the child's needs and wants), and scaffolding (e.g., the parent's ability to provide developmentally appropriate emotional, technical, and motivational support to achieve goals and promote learning). For the purposes of this paper, these strategies will be considered as a broader set of behaviors, called positive interaction strategies.

These positive interaction strategies have been linked to many positive outcomes before age two, including age of first words, early vocabulary size, play skills, social-emotional development, and cognitive skills (Tamis-LeMonda, Bornstein, & Baumwell, 2001; Tomasello & Farrar, 1986; Tamis-LeMonda, Bornstein, Baumwell, & Damast, 1996; Landry, Smith, & Swank, 2006). In general, the research in typical development becomes less robust past age three; however, there appears to be continued support for the positive impact of these parent interaction strategies. Jackson and Roberts (2001) found that children from more responsive homes were more likely to use increasingly complex grammatical forms in their speech at ages 3 and 4.

Similarly, maternal "maintaining" or synchronous behaviors were shown to be directly associated with child language, cognitive, and social outcomes at 42 months (Landry, Smith, Swank, & Miller-Loncar, 2000). Significant amounts of research have also extended these findings to many different groups of vulnerable populations, including children with autism spectrum disorders, Down's syndrome, Fragile X, intellectual disabilities, and very low birth weight (Siller & Sigman, 2002; Hauser-Cram et al., 1999; Warren, Brady, Sterling, Fleming, & Marquis, 2010; Warren & Brady, 2007). These studies more frequently continue into the preschool years and beyond, due to delayed language acquisition in these populations. One study found that maternal verbal scaffolding at 40 months predicted broad language skills on a standardized assessment at 54 months, and further, that scaffolding at 54 months predicted word decoding skills at 8 years old in both children born term and pre-term (Dieterich, Assel, Swank, Smith, & Landry, 2006). Similarly, maternal synchronicity of gestures and speech predicted later initiation of joint attention and long terms gains in language skills on standardized assessments in children with autism spectrum disorders from over 16 years (Siller & Sigman, 2002; Siller & Sigman, 2008).

Researchers have also examined the effect of negative interaction strategies on child development. Negative interaction strategies are often defined as overtly negative, intrusive, or controlling verbal and nonverbal behaviors (e.g., criticism, unnecessary instructions, interrupting child actions or agenda). These dimensions of parenting have been associated with poor social, behavioral, and academic outcomes (Heller & Baker, 2000). When specifically examining language outcomes, rates of negative parenting have independently explained variation in both expressive and receptive language in typically developing toddlers and preschoolers (Pungello, Iruka, Dotterer, Mills-Koonce, & Reznick, 2009; Keown, Woodward, & Field, 2001). While

most studies have supported inverse relationships between negative parenting and child IQ and receptive language, some research has indicated that negative parenting does not contribute independently over and above positive parenting characteristics (Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004).

The Current Study

As evident from the literature, the role of parents is demonstrably important for early child language learning milestones. However, previous research has infrequently looked beyond age 3. In papers that have spanned past early language milestones, the parenting interaction behaviors examined has been largely limited to various iterations of responsiveness, failing to capture the full range of constructs present in parent-child interactions. Similarly, as children age, the predominant outcome measure transitions from vocabulary to standardized language assessments. Further, the majority of the current research has been conducted with either typically developing children or children with developmental delays, without examining the two populations simultaneously. By applying the same coding scheme to evaluate parent behaviors and child language across both populations in the same study, potential differences in the mechanisms through which parents impact child development could be elucidated.

The current study seeks to address these gaps by investigating the impact of multiple aspects of parenting interaction behaviors on the development, use, and mastery of complex grammatical structures in child language during natural interactions. To do so, the current study will first answer the following two preliminary research questions, then seek to address the third and primary question.

1. Are there differences in complex syntax use across time, from ages 3 to 4, and across groups, between children with developmental delays and typically developing children?

2. Do parents of children with developmental delays differ from parents of typically developing children in their use of various positive and negative interaction behaviors?

3. Is change in complex syntax use from age 3 to 4 predicted by mother's positive and/or negative parenting at age 3? Further, do these relationships differ by developmental status?

Research in these areas would create direct knowledge, easily translated to recommendations for parents as their child grows. Ultimately, these results will inform early intervention and parent training programs to promote language development across all children. This is especially critical for families of children with developmental delays. Although some developmental disorders are identifiable at birth, many children with undifferentiated delays are not identified until age 2 or later. Given this later age of diagnosis, information about aspects of parenting behaviors that are influential to child development at these later ages is essential.

Methods

Participants

Participants were a randomly selected sample of families (*n*=60) drawn from a larger pool (*N*=208). This larger sample consisted of English-speaking families with complete data at ages 3 and 4 enrolled in a longitudinal study of children with (DD) and without (TD) developmental delays. This study, the Collaborative Family Study, was conducted across three national sites (see Baker, Blacher, Crnic, & Edelbrock, 2002 for a thorough description of original study procedures). In the current study's sample, each of the three sites was represented: University of California, Los Angeles (n=29), the University of California, Riverside (n=15), and Pennsylvania State University (n=16). Families were recruited from community service providers and local preschools.

Within the larger CFS study, participants were classified as either TD or DD based on the child's Mental Development Index (MDI) on the BSID-II at age 3 (Bayley, 1993). Children were classified as TD if they demonstrated normative cognitive development (MDI$\geq$85) and as DD if they demonstrated delayed cognitive development (MDI<85).

Selection of Study Sample.

Drawing from the full sample of children with complete data at ages 3 and 4 (*N*=208), data from 38 additional families were excluded because valid Index of Productive Syntax (Scarborough, 1990) scores, the outcome measure of the current study, could not be obtained. To obtain a valid IPSyn score, the child must use at least 50 non-imitated and understandable utterances across the defined set of parent-child interaction tasks. Families were excluded if at age 3 the child did not reach this benchmark number of utterances or was largely unintelligible. As expected, this exclusionary criterion impacted the DD group more so than the TD group, with 35 children being excluded from the DD group and three children excluded from the TD group. The random selection process continued, maintaining equal distribution across the DD (*n*=30) and TD (*n*=30) groups, until the final sample (*n*=60) was created.

Sample Characteristics.

The sample included families from diverse backgrounds, with 66.7% of mothers identifying as Caucasian, 18.3% as Hispanic, 8.3% as African American, 3.3% as Asian, and 3.4% of mothers identifying as "Other" (none of the above categories). Child race and ethnicity were similar to the above; however, there were more children listed in the "Other" category, which captured children from multi-racial backgrounds. Mothers, on the whole, were married (86.7%) and well educated, with some college education ($M_{grade\ completed}$=15.25, *SD*=2.62). Children came from a wide range of socioeconomic backgrounds, with 51.7% of families

reporting incomes below $50,000/year. Overall, the sample included more male children (n=40)

than female children (n=20). Mothers of typically developing children had achieved, on average,

higher levels of education ($M_{grade\ completed}$=16.27, SD=2.36) than mothers of children with

developmental delays ($M_{grade\ completed}$=14.23, SD=2.50), t(58)=3.24, p=.002. There were no other

significant differences on demographic variables between the two groups. See Table 1 for

demographic data of both the typically developing and developmentally delayed groups,

respectively.

Procedures

The institutional review boards of the three participating universities approved all study

procedures. All assessments were conducted by trained graduate students or research staff. At

intake, age 3, the BSID-II was administered to assess early cognitive development and determine

TD/DD classification. The BSID-II was administered in the home, with the child's mother

present. Following this home visit and classification, families were scheduled for a laboratory

visit. One component of the lab visit included a videotaped mother-child interaction, consisting

of several parts: 10 minutes of free play, 3 minutes of cleanup, 5 minutes of snack, and 10

minutes of joint problem-solving tasks. The procedures of this lab visit were repeated at the age

4, with slight modifications to make the materials and tasks developmentally appropriate.

Although modifications to the materials and tasks occurred across time points, these were

standardized and consistent within time points and across the three sites. For this study, child

language during the 10-minute free play interaction was transcribed for all children using

Computerized Language Analysis (CLAN) software and Child Language Database Exchange

System (CHILDES) transcription conventions (MacWhinney, 2007). In some instances, child

language was transcribed beyond free play and through the different activities to reach the

number of spontaneous utterances required to assign a valid IPSyn score. Child language was

then coded using specified manualized criteria.

Child Transcription.

Trained undergraduate research assistants transcribed all child language during the

parent-child interaction, creating a draft transcript. Following this initial pass, the first author

reviewed all transcripts and edited as necessary to ensure accuracy. This version was considered

to be the final transcript. This level of oversight was considered necessary due to the poor

intelligibility of the children, the at times poor sound quality, and the highly precise nature of the

child complex syntax coding system. Twenty percent of final transcripts were randomly selected

for reliability checks by a third impartial judge: a team member who had been extensively

trained in child and adult transcription, but who had not individually contributed to any of the

final transcriptions. Reliability was calculated by dividing the number of utterances in which the

reliability judge agreed exactly with the final transcript. Average reliability was 98.56%, with no

one transcript below 92.80% agreement.

Measures

Parenting Interaction Strategies.

Building from the wide literature base associated with positive and negative parenting

strategies (e.g., sensitivity, responsiveness, intrusiveness), global ratings of both positive and

negative features were coded using the Parent-Child Interaction Rating Scale (Belsky, Crnic, &

Woodworth, 1995). The PCIRS measures six dimensions of parenting: positive affect, negative

affect, sensitivity, stimulation of cognition, intrusiveness, and detachment. See Table 2 for

definitions of each dimension. Coding teams rated each mother in each dimension using a 5-

point Likert scale (1=*not at all characteristic,* 5=*highly characteristic*). Undergraduate research

assistants were trained by watching videotaped lab observations until reliability was established, defined as reaching a criterion over 70% exact agreement and 95% agreement within one scale point with the criterion coder. Once reliable, two research assistants were paired to code the tapes as a team. To maintain inter-reliability within and across contexts, a master coder, usually an advanced graduate student, was designated. Reliability was collected for 30% of the tapes. Kappa for inter-rater reliability was 0.71 (range = .68 – .77), which is considered acceptable. Once collected, these Likert ratings were then converted into z-scores and combined into two composites, positive parenting and negative parenting, using a previously derived factor structure (Fenning et al., 2007). Positive parenting consisted of positive affect + sensitivity + stimulation of cognition – detachment. Negative parenting consisted of intrusiveness + negative affect.

Child Complex Syntax.

The Index of Productive Syntax (IPSyn; Scarborough, 1990) was used to measure child complex syntax use. The IPSyn is a reliable and developmentally sensitive measure of syntactic growth in the preschool years that has been used with both typically developing children and children with a variety of developmental delays (Scarborough, Rescorla, Tager-Flusberg, Fowler, & Sudhalter, 1991). Although past research has frequently used mean length of utterance (MLU) as a measure of grammatical complexity, there is evidence to suggest that MLU becomes less sensitive to growth past age three and may overestimate the language complexity of children with developmental delays (Scarborough et al., 1991). For this reason, the IPSyn was used as the primary outcome measure of complex syntax. The IPSyn is scored off of a 100-utterance sample of the child's non-imitative language. The IPSyn rubric contains 60 unique syntactic structures (e.g., use of a conjunction, use of the present progressive "-ing" ending, use of a relative clause) for which the child can receive up to two points for use of that structure (i.e., 0 pts for no

observed use, 1 pt for one exemplar, 2 pts for two or more exemplars). Thus, the highest possible

IPSyn score is 120. Each child's language was IPSyn scored at ages 3 and 4 from the transcripts

produced during the mother-child interaction. In this study, we examined how various parenting

variables, described above, predicted the rate of growth in complex syntax over this time period.

Coding teams consisting of two trained coders established reliability in IPSyn coding by meeting

90% item agreement with the first author master coder on three transcripts in a row. Twenty

percent of transcripts were coded twice. A master IPSyn scoresheet was then created through

consensus of the two scoresheets. Reliability was calculated as the percent agreement with this

master IPSyn scoresheet, by the first coder/coding team. Average reliability was 97.08%, with no

transcripts falling below 91.67% agreement, indicating a high level of accuracy in the initial

coding pass.

Results

Child Complex Syntax

To answer our first question about differences in complex syntax use across time and

between groups, paired samples t-tests and one-way ANOVAs were conducted. As expected, data

revealed that as children age, their language becomes more syntactically complex, as measured

by IPSyn scores. To examine the effect of age only, a paired sample t-test supported a significant

difference between IPSyn scores at ages 3 and 4, when collapsing across groups. On average,

children at age 4 received significantly greater IPSyn scores (*M*=67.67, *SD*=13.73) than at age 3

(*M*=52.02, *SD*=17.89), *t*(59)=10.24, p<.001. Further, within each group, significant complex

syntax growth from age 3 to 4 occurred. Typically developing children received significantly

higher IPSyn scores at age 4 (*M*=75.93, *SD*=7.96) than at age 3 (*M*=64.10, *SD*=9.17), *t*(29)=7.32,

p<.001. Similarly, children with developmental delays also showed significant change, with age

4 IPSyn scores (*M*=59.40, *SD*=13.37) being significantly greater than age 3 (*M*=39.93,

SD=16.27), *t*(29)=8.02, *p*<.001. To explore group differences present at a singular time point,

one-way ANOVAs were conducted at both age 3 and 4. Children with developmental delays used

less complex language than typically developing children did at age 3, *F*(1,58)=50.25, *p*<.001. A

year later, at child age 4, this discrepancy across groups was maintained, *F*(1,58)=33.88, *p*<.001.

Despite the low likelihood of a Type I error given these statistics, the ANOVA results should be

interpreted with caution, as the assumption of homogeneity of variances was violated at both age

3 and 4. However, the F test is known to be robust against inequality of variances when sample

sizes are equal, as they are in these analyses, which provides increased confidence.

Parenting Interaction Strategies

Our second research question pertained to exploring differences in the interaction

behaviors utilized by parents of children with and without developmental delays. Overall, parents

used a range of both negative and positive parenting interaction strategies. The average positive

parenting factor score, collapsing across DD and TD, was 13.32 (*SD*=1.97), where the range of

possible scores was 4-20. On the whole, the parents in this sample had a lower base rate of

negative interaction strategies; the average negative parenting factor score within the entire

sample was 3.87 (*SD*=1.26), with the full range of possible scores being 2-10. In the following

analyses, these factor scores were converted into a sum of the standardized individual

dimensions (i.e. sensitivity, positive affect, detachment reverse coded, stimulation of cognition,

negative affect, and intrusiveness). This method enabled each domain to have similar scales and

variances, enhancing interpretability. When comparing these standardized sums using a one-way

ANOVA, results revealed that parents of typically developing children (*M*=-1.03, *SD*=1.46) were

significantly less negative than parents of developmentally delayed children (*M*=0.72, *SD*=1.61),

$F(1,58)=19.58$, $p<.001$. In contrast, parents of TD children ($M=0.63$, $SD=3.25$) were more likely

to use higher levels of positive interaction strategies than parents of DD children ($M=-1.23$,

$SD=2.82$), $F(1,58)=5.58$, $p=.022$. Parents of TD and DD children also demonstrated differing

relationships between the two dimensions of interactional elements. Specifically, positive and

negative parenting showed no significant relationship for TD children, $r=-.24$, $p>.05$, indicating

that these constructs are independent of each other. Conversely, parents of DD children showed a

strong inverse relationship between positive and negative strategies, $r=-.70$, $p<.001$, suggesting

that as parents of children with DD engaged in increasing amounts of positive interaction

strategies, their use of negative strategies declined.

Multiple Regression Model

Multiple regression analyses were used to address the third and primary research

question. The current study's aim, which sought to determine the effects of global parenting

interaction characteristics on change in child complex syntax over time, was analyzed using a

four step hierarchal regression. The outcome variable used was child IPSyn score at age 4. In the

first step of the analyses, the centered IPSyn score at age 3 was entered, to control for prior

language capacity. This was done in an attempt to separate out baseline between-child

differences and isolate the effects of parenting on the growth in complex syntax from age 3 to 4.

Additionally, since there were significant differences in mother's education achievement between

the TD and DD groups, this variable was initially also entered as a covariate; however, maternal

education did not significantly contribute to the model over and above IPSyn score at age 3.

Therefore, the results reported below refer to the model after being rerun without maternal

education. In the second step, three variables were entered: delay status of the child as a

dichotomous variable, the positive parenting factor score, and the negative parenting factor

score. The third step included all possible two-way interactions using the variables in step 3. The

final step included the three-way interaction of delay status x positive parenting x negative

parenting. This final model, including the three-way interaction, was highly significant,

$F(8.51)=13.02$, $p<.001$. The full set of variables and interactions explained 67.14% of the

variance in children's IPSyn scores at age 4; however, the bulk of the explained variance was

accounted for by prior language at age 3 ($R^2_{IPSYN36}=.56$). The addition of the three-way interaction

in the fourth model resulted in a significant increase in explained variance, $F_{change}(1,51)=10.49$,

$p=.002$. The significant three-way interaction indicates that positive parenting and negative

parenting interact with each other differently for children with developmental delays and

typically developing children.

   To further understand this three-way interaction, simple two-way interactions between

positive and negative parenting were examined for both groups of children (TD and DD). Results

revealed that for typically developing children, the simple two-way interaction between positive

and negative parenting was significant, $t(25)=2.06$, $p=.050$. Similarly, the simple two-way

interaction term was also significant for children with developmental delays, $t(24)=-2.53$,

$p=.018$. Thus, for both TD and DD children, the effect of negative parenting on complex syntax

growth from age 3 to 4 is dependent on the level of positive parenting interaction strategies.

Further analyses of the simple slopes were conducted to probe this simple two-way interaction.

Simple slopes were calculated to observe the effect of negative parenting on complex syntax

while holding positive parenting constant at varying levels or "spotlights". The standardized

positive parenting factor score was held constant at the mean plus or minus 1SD. The significant

simple two-way interactions were graphed for both TD and DD children (Figures 1 and 2,

respectively) to depict the effect of negative parenting at these varying positive parenting levels and visually compare across the two groups.

For typically developing children (Figure 1), it appears that the effects of negative parenting differ as a function of positive parenting, such that increasing negative parenting is detrimental in the context of below average positive parenting, but augmentative in the context of above average positive parenting. However, simple slopes analyses revealed that the relationship between negative parenting and complex syntax at age 4 was non-significant, at each level of positive parenting. One simple slope approached significance, $t(25)=1.90$, $p=.069$, indicating that for TD children in high positive parenting contexts, increases in negative parenting interaction strategies correspond to enhanced complex syntax growth from age 3 to 4. Although each individual slope was not significantly different than 0, the relationship between negative parenting and complex syntax at high positive parenting was significantly different than the same relationship at low positive parenting, $t(56)=2.16$, $p=.035$.

When examining the graphed relationship between negative parenting and complex syntax at various positive parenting levels for children with developmental delays, as seen in Figure 2, it seems as though negative parenting has a particularly deleterious effect in the context of high positive parenting. Simple slopes analyses were conducted to test this apparent effect and determine whether negative parenting had a significant impact at any given level of positive parenting. Results suggest that there is a significant negative association between levels of negative parenting at age 3 and complex syntax at age 4, but only for those DD children whose parents are above average on positive parenting interaction strategies, $t(24)=-2.14$, $p=.043$. This suggests that the effect of high levels of positive parenting on complex syntax growth over this period is dependent on the level of negative parenting present in the interaction. Specifically, at

high levels of positive parenting (i.e., a standard deviation above the mean), child complex syntax proficiency decreases significantly as negative parenting increases. The simple slope predicts that as the standardized negative parenting factor score increases by 1 point that IPSyn scores at age 4 will decrease by 5.00 points. However, at low and average levels of positive parenting, there was no significant effect of negative parenting, indicating no significant interaction between negative and positive parenting at those levels.

Discussion

The current study set out to elucidate the effects of parenting interaction style on the continued acquisition of language through the preschool years. At this time, children move past simply expanding their vocabulary and begin to learn the grammatical and syntactical rules that govern language use. Through complex syntax, children learn to communicate and understand increasingly complex ideas and thoughts, an essential developmental task, using dependent clauses and multi-clause sentences.

Findings suggest that the effect of negative parenting interactional elements is dependent on the extent of positive parenting parenting elements present for typically developing (TD) children. Interestingly, simple slopes suggest that the negative parenting interaction behaviors may actually have a positive benefit to complex syntax change from age 3 to 4, but only if high levels of positive parenting interaction behaviors are present. These results are somewhat consistent with prior research supporting a divergence model of emotion understanding development in TD children, which posits that TD children benefit when their parents demonstrate different emotional reactions to situations (McElwain, Halberstadt, & Volling, 2007). However, it is also worth noting that on the whole, parents in this sample used lower levels negative parenting. Thus, average or high levels of negative parenting in the current study

may not correspond to the level of negativity necessary to instigate detrimental effects. An alternative explanation may be that for TD children, complex syntax learning is fueled simply by increased language input, irrespective of the emotional context. Therefore, language learning at older ages may be founded on basic statistical learning, where children notice and generalize the grammatical patterns present in language input, rather than occurring through a dynamic interactional process. This could be true as both positive and negative parenting constructs contain variable that may be confounded with increase language input directed at the child (e.g., stimulation of cognition for positive, intrusiveness for negative). This hypothesis would suggest that while these positive interaction strategies may be essential for initial word learning and early milestones (Tamis-LeMonda et al., 2001; Tomasello & Farrar, 1986; Tamis-LeMonda et al., 1996; Landry et al., 2006), they are not the sole avenue toward syntactic learning. That is syntactic learning can occur within positive and negative parent-child interaction contexts. These differences across periods of development are face valid, since very young children may require these additional interactional supports to establish a level of engagement that enables learning. As TD children become older, the interactional supports for engagement may not be necessary for children to cue into syntax and grammar rules as they already have the foundational knowledge and ability to use language to interact socially.

     In contrast to typically developing children, these results indicate that parenting interaction strategies remain important for preschoolers with developmental delays, significantly predicting language outcomes at age 4. This is consistent with prior research that suggests that environment, including parenting context, is especially important for children at high developmental risk (Baker et al., 2007; Green, Caplan, & Baker, 2014). In particular, it appears that positive parenting interactions that include high levels of positive affect, sensitivity,

engagement, and devotion to cognitive stimulation are especially beneficial for children with developmental delays. However, the advantages conferred by positive parenting interactions are eliminated completely if high levels of negative parenting interactional elements (e.g., negative affect, intrusiveness, control) are present as well. Comparing this result to typically developing children, it appears that language learning for DD children is dependent on the emotional context of the interaction.

Limitations

A limitation of the current study is the small sample size. When conducting analyses with multiple predictors and groups, samples should be large enough to accommodate the loss in degrees of freedom. It is probable that the models presented in this paper were significantly underpowered to detect significant effects. Even so, the age and child status difference were consistent and significant, and the presence of a significant three-way interaction supports that there are indeed differences in how parenting operates to influence typically developing children as compared to children with developmental delays. A second limitation is the considerable variability in the developmentally delayed group's scores. As compared to typically developing children, children with developmental delays showed a wider range of IPSyn scores at both age 3 and 4. This discrepancy in variance across groups may have affected some of the results. Further, this study is limited in its ability to capture the complete development of complex language. For most children, early combinatorial speech begins around age 2 and continues to grow in complexity well through preschool (Fenson et al., 1994); however, given the focus of the present study in examining growth beyond early language milestones and capturing the onset of a wide range of complex syntactical structures (e.g., relative clause, inverted auxiliary, multiclause sentences), the age range between 3 and 4 is sufficient to answer the current research question.

Future Directions

To explore the effect of parenting on complex syntax development in children further, it would be important to examine the role of parent language input, another explanatory source of variability in child language trajectories during this time period. Parent language input, most frequently defined as measures of the number of utterances, total number of words, number of different words, and mean length of utterances spoken to the child, has been linked to larger child vocabularies (Tomasello, Mannle, & Kruger, 1986; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Hart & Risley, 1995) and complex syntax use (Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002; Huttenlocher, Waterfall, Vasilyeva, Vevea, & Hedges, 2010). This limited body of research in relation to complex syntax is in need of replication within typical development and extension to children with developmental delays. In the context of the current study's findings that high positive and high negative parenting resulted in the best growth in complex syntax from age 3 to 4 in TD children, examining the role of input would determine whether amout parent language input is indeed one of the propelling mechanisms behind syntactic growth, and that this process is robust regardless of the emotional context of the parent-child interaction.

Further, no known papers to date have examined both parent language input and parent interaction strategies (e.g., positive and negative parenting, as discussed in the current paper), simultaneously. It would be intriguing to determine whether these two larger categories of parenting interact with one another. For example, it may be possible that the impact of input quality is strengthened in the presence of an ideal interaction setting. Further, by analyzing these components of parenting together, one could determine the independent and shared variance each accounts for, suggesting which may be the most fruitful intervention target.

Lastly, as language, broadly, has been associated with a myriad of child outcomes, including social, academic, and mental health outcomes (St Clair, Pickles, Durkin, & Conti-Ramsden, 2011), these data call for a fine-grained analysis of how a specific component of child language ability – syntactic complexity – predicts these same outcomes in typically developing children and children with developmental delays.

Implications

Overall, these results suggest that interaction strategies continue to contribute to language development past early communication milestones, but only for children with developmental delays. As such, the current study has particularly clear implications for intervention efforts with these children and families. As high levels of negative parenting have deleterious effects, canceling out benefits of positive parenting, reducing negative interaction elements from parent-child interactions may be a primary treatment target. Secondly, as children with developmental delays appear to flourish under the combination of low negative and high positive interactions, boosting parental warmth, sensitivity, and engagement is also essential to promoting positive language outcomes. Although positive interactions seem to continually benefit, it is necessary that the method of delivery of positive parenting strategies may change over a child's development. In particular, constructs such as sensitivity, stimulation of cognition, and engagement may each require fine-tuning throughout the preschool years. These results provide strong support for continued parent education regarding how to adapt and best respond to their children as they develop.

Further, although the data indicate that neither positive nor negative parenting predict growth in complex syntax from age 3 to 4 in typically developing children, it is essential to consider the isolated outcome measured. Complex syntax use, though important, does not equate

to optimal child functioning in the preschool years. These findings should be interpreted in light

of research supporting relationships between similar parenting constructs and other important

outcomes, such as externalizing behavior (Combs-Ronto, Olson, Lunkenheimer, & Sameroof,

2009).

References

Baker, B. L., Blacher, J., Crnic, K. A., & Edelbrock, C. (2002). Behavior problems and parenting stress in families of three-year-old children with and without developmental delays. *American Journal on Mental Retardation, 107*(6).

Baker, J. K., Fenning, R., Crnic, K., Baker, B. L., & Blacher, J. (2007). Prediction of social skills in 6-year-old children with and without developmental delays: Contributions of early regulation and maternal scaffolding. *American Journal on Mental Retardation, 112*, 375-391.

Bayley, N. (1993). *Bayley scales of infant development: manual*. Psychological Corporation.

Belsky, J., Crnic, K., & Woodworth, S. (1995). Personality and parenting: Exploring the mediating role of transient mood and daily hassles. *Journal of Personality, 63,* 905–929.

Bindman, S. W., Hindman, A. H., Bowles, R. P., & Morrison, F. J. (2013). The contributions of parental management language to executive function in preschool children. *Early childhood research quarterly, 28*(3), 529-539.

Combs-Ronto, L. A., Olson, S. L., Lunkenheimer, E. S., & Sameroff, A. J. (2009). Interactions between maternal parenting and children's early disruptive behavior: Bidirectional associations across the transition from preschool to school entry. *Journal of abnormal child psychology, 37*(8), 1151-1163.

Culp, A. M., Hubbs-Tait, L., Culp, R. E., & Starost, H. J. (2000). Maternal parenting characteristics and school involvement: Predictors of kindergarten cognitive competence among Head Start children. *Journal of Research in Childhood Education, 15*(1), 5-17.

Dieterich, S. E., Assel, M. A., Swank, P., Smith, K. E., & Landry, S. H. (2006). The impact of

    early maternal verbal scaffolding and child language abilities on later decoding and

    reading comprehension skills. *Journal of School Psychology*,*43*(6), 481-494.

Ellingsen, R., Baker, B. L., Blacher, J., & Crnic, K. (2014). Resilient parenting of preschool

    children at developmental risk. *Journal of Intellectual Disability Research, 58*(7), 664-

    678.

Fenning, R. M., Baker, J. K., Baker, B. L., & Crnic, K. A. (2007). Parenting children with

    borderline intellectual functioning: A unique risk population. *American Journal*

    on Mental Retardation, 112, 107–121.

Fenning, R. M., & Baker, J. K. (2012). Mother–child interaction and resilience in children with

    early developmental risk. *Journal of Family Psychology*, *26*(3), 411.

Fenson, L., Dale, P. S., Reznick, J. S., Bates, E., Thal, D. J., Pethick, S. J., ... & Stiles, J. (1994).

    Variability in early communicative development. *Monographs of the society for research*

    in child development, i-185.

Green, S., Caplan, B., & Baker, B. (2014). Maternal supportive and interfering control as

    predictors of adaptive and social development in children with and without

    developmental delays. *Journal of Intellectual Disability Research, 58*(8), 691-703.

Hart, B., & Risley, T. R. (1992). American parenting of language-learning children: Persisting

    differences in family–child interactions observed in natural home environments.

    Developmental Psychology, 28, 1096–1105.

Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experiences of young*

    children. Baltimore, MD: Paul H. Brookes Publishing.

Heller, T. L., & Baker, B. L. (2000). Maternal negativity and children's externalizing

behavior. *Early Education and Development, 11*(4), 483-498.

Hess, R. D., & McDevitt, T. M. (1984). Some cognitive consequences of maternal intervention

techniques: A longitudinal study. *Child Development*, 2017-2030.

Huttenlocher, J., Haight, W., Bryk, A., Selzer, M., & Lyons, T. (1991). Early vocabulary growth:

Relation to language input and gender. *Developmental* Psychology, 27, 236–248.

Huttenlocher, J., Vasilyeva, M., Cymerman, E., & Levine, S. (2002). Language input and child

syntax. *Cognitive* Psychology, 45, 337–374.

Huttenlocher, J., Waterfall, H., Vasilyeva, M., Vevea, J., & Hedges, L. V. (2010). Sources of

variability in children's language growth. *Cognitive psychology*,*61*(4), 343-365.

Jackson, S. C., & Roberts, J. E. (2001). Complex syntax production of African American

preschoolers. *Journal of Speech, Language, and Hearing Research*,*44*(5), 1083-1096.

Keown, L. J., Woodward, L. J., & Field, J. (2001). Language development of pre-school children

born to teenage mothers. *Infant and Child Development*, *10*(3), 129-145.

Landry, S. H., Smith, K. E., Swank, P. R., Assel, M. A., & Vellet, S. (2001). Does early

responsive parenting have a special importance for children's development or is

consistency across early childhood necessary? *Developmental psychology, 37*(3), 387.

Landry, S. H., Smith, K. E., Swank, P. R., & Miller-Loncar, C. L. (2000). Early maternal and

child influences on children's later independent cognitive and social functioning. *Child

development, 71*(2), 358-375.

Landry, S. H., Smith, K. E., & Swank, P. R. (2006). Responsive parenting: establishing early

foundations for social, communication, and independent problem-solving

skills. *Developmental psychology, 42*(4), 627.

MacWhinney, B. The CHILDES project: tools for analyzing talk. 2007. Electronic edition;

      childes.psy.cmu.edu

Pungello, E. P., Iruka, I. U., Dotterer, A. M., Mills-Koonce, R., & Reznick, J. S. (2009). The

      effects of socioeconomic status, race, and parenting on language development in early

      childhood. *Developmental psychology*, *45*(2), 544.

Sameroff, A. J. (1975). Early influences on development: Fact or fancy?. *Merrill-Palmer*

      quarterly of behavior and development, 267-294.

Scarborough, H. S. (1990). Index of productive syntax. *Applied psycholinguistics*, *11*(01), 1-22.

Scarborough, H., Rescorla, L., Tager-Flusberg, H., Fowler, A., & Sudhalter, V. (1991). The

      relation of utterance length to grammatical complexity in normal and language-

      disordered groups. *Applied Psycholinguistics*, *12*, 23–45.

Siller, M., & Sigman, M. (2002). The behaviors of parents of children with autism predict the

      subsequent development of their children's communication.*Journal of autism and*

      developmental disorders, *32*(2), 77-89.

Siller, M., & Sigman, M. (2008). Modeling longitudinal change in the language abilities of

      children with autism: parent behaviors and child characteristics as predictors of

      change. *Developmental psychology*, *44*(6), 1691.

St Clair, M. C., Pickles, A., Durkin, K., & Conti-Ramsden, G. (2011). A longitudinal study of

      behavioral, emotional and social difficulties in individuals with a history of specific

      language impairment (SLI). *Journal of communication disorders*, *44*(2), 186-199.

Tamis-LeMonda, C. S., Bornstein, M. H., Baumwell, L., & Melstein Damast, A. (1996). Responsive parenting in the second year: Specific influences on children's language and play. *Early Development and Parenting*, *5*(4), 173-183.

Tamis-LeMonda, C. S., Bornstein, M. H., & Baumwell, L. (2001). Maternal responsiveness and children's achievement of language milestones. *Child development*, *72*(3), 748-767.

Tamis-LeMonda, C. S., Shannon, J. D., Cabrera, N. J., & Lamb, M. E. (2004). Fathers and mothers at play with their 2-and 3-year-olds: contributions to language and cognitive development. *Child development*, *75*(6), 1806-1820.

Tomasello, M., Mannle, S., & Kruger, A. C. (1986). Linguistic environment of 1- to 2-year-old twins. *Developmental Psychology*, *22*, 169— 176.

Tomasello, M., & Farrar, M. J. (1986). Joint attention and early language. *Child development*, 1454-1463.

Vasilyeva, M., Waterfall, H., & Huttenlocher, J. (2008). Emergence of syntax: Commonalities and differences across children. *Developmental Science*, *11*(1), 84-97.

Warren, S. F., & Brady, N. C. (2007). The role of maternal responsivity in the development of children with intellectual disabilities. *Mental retardation and developmental disabilities research reviews*, *13*(4), 330-338.

	TD percentage or mean (*SD*)	DD percentage or mean (*SD*)	t or χ^2
Gender (% male)	60.00%	73.33%	1.20
Race (% minority)	30.00%	40.0%	0.66
Family Income (% >$50,000)	40.00%	63.33%	3.27[+]
Mother Education (last grade completed)	16.27 (2.36)	14.23 (2.50)	3.24[**]
BSID-II MDI	108.23 (10.92)	68.03 (10.18)	14.75[***]

Table 1. Demographic data of selected sample of typically developing children and

developmentally delayed children. [+]*p*<.10, [*]*p*<.05, [**]*p*<.01, [***]*p*<.001

Parenting Interaction Dimension	Description
Positive Affect	Expression of positive regard, either verbal or nonverbal (e.g., smiling, praising)
Sensitivity	Ability of parent to respond appropriately and consistently to the child's needs in a developmentally appropriate way, the extent to which parent is "child-centered"
Stimulation of Cognition	Attempts to foster cognitive development (e.g., academic skills such as numbers or letters, problem-solving)
Detachment (reverse coded in analysis)	Passivity or being unaware of child (e.g., mother reading magazine while child plays)
Negative Affect	Expression of negative regard, either verbal or nonverbal (e.g., scolding, tone of voice, facial expressions)
Intrusiveness	Imposition of adult agenda on child activities, overstimulation

Table 2. Description of the six dimensions of parenting interaction style coded in the Parent

Child Interaction Rating System (PCIRS).

Figure 1. Significant simple two-way interaction between positive and negative parenting for

typically developing children, *t*(25)=2.06, *p*=.050. A marginally significant positive association

between levels of negative parenting at age 3 and complex syntax at age 4 was detected for those

TD children whose parents were above average on positive parenting interaction strategies,

t(25)=-1.90, *p*=.069.

Figure 2. Significant simple two-way interaction between positive and negative parenting for

children with developmental delays, *t*(25)=-2.58, *p*=.016. A significant negative association

between levels of negative parenting at age 3 and complex syntax at age 4 was detected for those

DD children whose parents were above average on positive parenting interaction strategies,

t(25)=-2.34, *p*=.027.