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PAPER

The impact of child maltreatment on expressive syntax at 60 months

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Abstract

Although child maltreatment has often been described as leading to language deficits, the few well-controlled investigations of language acquisition in maltreated children have focused on language content rather than form, or have used qualitative rather than quantitative measures. This study examines syntactic complexity in 19 maltreated and 14 nonmaltreated preschool-aged children. Mother–child dyads participated in play sessions that were transcribed and scored for the presence of morphosyntactic forms in child speech and for specific sentence constructions in maternal speech. Findings indicated that child maltreatment was associated with language delay in both vocabulary and production of syntactic structures. There were also qualitative differences in characteristics of maternal utterances between maltreating and comparison groups. Because maltreatment initially occurred before age 2, this study highlights the long-lasting negative influence of maltreatment on language development and also provides the first demonstration of child language delays and differences in maternal speech within a single maltreatment sample.

Introduction

Although the process of language acquisition in normally developing children is a highly robust phenomenon, clinicians and educators have often noted that children who have been maltreated exhibit language delays and deficits. However, because of the clear impact of maltreatment on socio-emotional development (Cicchetti & Toth, 1995; Finkelhor & Kendall-Tackett, 1997), well-controlled studies of linguistic development in maltreated children have focused on language content rather than form. Furthermore, those studies examining language structures have used qualitative rather than quantitative measures (McFadyen & Kitson, 1996; Beeghly & Cicchetti, 1994; Lynch & Roberts, 1982; Allen & Wasserman, 1985; Elmer, 1981). To date, it has been difficult to uncover the mechanisms that contribute to the range of developmental outcomes observed in maltreating environments (National Research Council, 1993). A central principle of developmental psychopathology is that the study of perturbations in development can illuminate the constraints on normal development (Cicchetti, 1984, 1993). Thus, research on atypical routes to language learning, such as may be found in maltreated populations, can lead to a better understanding of both the process of maltreatment and also of the robustness of the acquisition process.

The current study investigates the language of a sample of 19 maltreated and 14 nonmaltreated preschool-aged children from similar socioeconomic backgrounds, comparing the syntactic complexity of their spontaneous utterances. Mother–child dyads participated in free play sessions that were subsequently transcribed and scored for specific morphosyntactic forms. The characteristics of maternal utterances addressed to the child were also examined. The study addresses the questions of whether maltreatment is correlated with language delays, particularly in the domain of syntactic development, and whether these delays are related to the quality of maternal utterances.

Resilience of language acquisition and the role of child-directed language input

Acquisition of a native language appears to involve a type of learning that is highly constrained. The learning

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process follows a predictable course and leads to similar outcomes in essentially all normally developing children. For example, despite variations in home environments (e.g. languages, cultures and child-rearing norms; Lieven, 1994; Pye, 1986) and variations within a child (e.g. differences in short-term phonological memory; Gathercole, Hitch, Service & Martin, 1997), normally developing children acquire their native language proficiently and within a predictable timeframe (Gleitman, 1981).

Despite the predictable unfolding of the developmental process of language acquisition and the stability of the outcome (i.e. native fluency), a potentially important aspect of the environment is the kind and quality of linguistic input made available to the developing child. Substantial data are available regarding the impact of differences in exposure to speech on the rate of vocabulary growth. One study found that maternal differences in talkativeness captured a significant proportion of the variance (20%) in individual child vocabulary size and rate of vocabulary growth, suggesting that the number of word learning trials to which a child is exposed is an important factor in the acquisition of vocabulary items (Huttenlocher, Haight, Bryk, Selyzer & Lyons, 1991). Huttenlocher and colleagues concluded that the relationship between maternal talkativeness and vocabulary growth of the child reflects parent effects on the child rather than hereditary factors. Smolak and Weinraub (1983) found that mothers of children with large vocabularies produced significantly more speech during a brief laboratory play session. Tomasello, Mannle and Kruger (1986) found significant correlations between the number of maternal utterances and number of different words produced by toddlers during a brief play session. The relationship between maternal input and child language is found in at-risk populations as well. For example, depressed mothers speak less to their children than do other mothers (Breznitz & Sherman, 1987), and lower verbal IQs have been reported in the children of such depressed mothers (Cicchetti, Rogosch & Toth, 2000; Cohler, Gallant, Grunebaum, Weiss & Gamer, 1977; Murray, Fiori-Cowley, Hooper & Cooper, 1996). Similarly, the quality of mother–child interactions was found to predict cognitive and linguistic outcomes in a sample of high social risk mothers and their preschoolers (Kelly, Morisset, Barnard, Hammond & Booth, 1996).

In syntactic development, the language learner requires rich and complex input data early in the learning process (Chomsky, 1981; Saffran, Aslin & Newport, 1996; Wexler & Culicover, 1980). Although one might intuit that simple sentences lead to the most efficient learning, simple sentences fail to exhibit all aspects of syntactic structure[1] and thus a learner provided only with simple sentences faces a large deductive problem in finding the correct underlying grammar. Perhaps because it is widely assumed that there are not significant individual differences in skill level for the domain of syntax, there have been few systematic investigations of the extent of individual differences or of the possible relationship between such differences and language input. However, Huttenlocher, Levine and Vevea (1998) demonstrated substantial effects of input (with respect to schooling) on the development of the comprehension of syntactic forms as well as vocabulary in kindergarteners and first-graders. Longitudinal studies have examined the impact of the corpus of utterances spoken by the mother on a child's syntactic development and have shown the complexity of interactions between input and acquisition (see Hoff-Ginsberg & Shatz, 1982, for a review). For example, the overall syntactic complexity of the maternal corpus (as measured by the number of clausal units per utterance) has been found to be positively correlated with a child's linguistic growth (Gleitman, Newport & Gleitman, 1984).

The correlations between the overall syntactic complexity of maternal input and child language may derive from the impact of more specific types of maternal utterances. Shatz, Hoff-Ginsberg and Maciver (1989) reported that 2-year-old children were influenced in acquisition of modal auxiliaries by hearing additional auxiliary input in varying sentence contexts. In a naturalistic study, Newport, Gleitman and Gleitman (1979) found that maternal use of yes-no questions was positively correlated with children's production of verbal auxiliaries, and that maternal use of verbal deixis was positively correlated with children's inflection and noun-phrase development. Interestingly, they found that maternal use of positive imperatives (*go get your ball*) was inversely correlated with children's learning of the verbal auxiliary. Similarly, maternal self-repetitions (e.g. *Get it! Get it*!) correlated negatively with children's production of verbal auxiliaries (but see Sokolov & Snow, 1994).[2]

If exposure to speech is relevant for syntactic development, then the amount that parents speak should be

[1] If a learner is exposed only to simple sentences like '*Is the dog sleeping*?', she has no way of building a correct representation of auxiliary movement. The learner must hear sentences such as '*The dog who is nice is sleeping*' and '*Is the dog who is nice sleeping*?' rather than '**The dog who is nice sleeping*?' to understand auxiliary movement.

[2] It should be noted that other maternal factors, such as engaging in joint attention episodes (Tomasello & Farrar, 1986) and maternal responsiveness (Tamis-LeMonda, Bornstein & Baumwell, 2001) have been found to play an important role in child language development. The influence of characteristics of maternal utterances must be taken as only one of multiple influences on language learning.

related to the rate of acquisition of syntactic structures. These data would be correlational, leaving open the question of causality. Clearly, one possibility is that both parent speech and child syntactic development depend on a third factor, which could reflect a hereditary similarity in verbal ability between parents and children, reflected in talkativeness of parents and in acquisition rate in children (Huttenlocher *et al.*, 1991). However, we need not assume a priori that parental talkativeness is a good reflection of verbal ability; the kinds of structures and words parents use with children certainly do not exhaust the parents' underlying capacity (Broen, 1972; Phillips, 1973). A second possibility is that children with greater linguistic sophistication elicit more speech from their parents. However, a number of studies suggest that, in fact, parental talkativeness is a relatively stable factor that remains consistent across individual within-child differences in development (Cohen & Beckwith, 1976; Moss, 1967; Nelson & Bonvillian, 1973) as well as across children with varying language abilities (e.g. the same mother talks the same amount with children of different language levels; Smolak & Weinraub, 1983). Thus, there is reason to believe that significant correlations between child language level and parental talkativeness (e.g. exposure to speech quantity) reflect a causal effect of the amount of exposure, particularly if effects continue to be significant when parent variability in verbal skills is held constant.

Consequently, although the process of child language acquisition is robust in terms of the eventual outcomes, language input may play an important role in an individual's rate of acquisition of specific syntactic structures. Experimental study of poor or impoverished input is typically difficult. However, ever since initial descriptions of the 'battered child syndrome' (Kempe, Silverman, Steele, Droegemuller & Silver, 1962), clinicians and researchers have noted that parent–child interactions in maltreating families appear to be different. There is ample evidence that maltreating parental language input differs in quality or quantity (Rogosch, Cicchetti, Shields & Toth, 1995). Maltreating parents are less likely to be guided by developmentally appropriate expectations (Pianta, Egeland & Erickson, 1989). In a study of interactions in mother–infant dyads, neglecting mothers were found to be unresponsive whereas abusing mothers were controlling (Crittenden, 1981, 1988). Maltreating mothers have been found to produce less language to their 1-year-old children (Christopoulos, Bonvillian & Crittenden, 1988) and have been shown to be less likely to clarify ambiguous statements (Westerman & Haustead, 1982). Egeland and Sroufe (1981) found that the conversation of maltreating mothers was less frequent overall, and that they were less likely to use verbal means of instruction and less likely to respond to children's initiatives. Similarly, Allen and Wasserman (1985) studied toddler–mother dyads and found that abusing mothers were more likely to ignore their children and were less likely to label objects, explain aspects of the environment and ask questions of the child.

Previous research on language development in maltreated children

Given the prevalence of child maltreatment and its negative impact on development, researchers have explored the influence of maltreatment on many aspects of development, including language acquisition. Even though adults maltreated as children do not necessarily exhibit atypical language abilities, the pathways of acquisition could differ (Cicchetti & Rogosch, 1996, 1997). There are a number of uncontrolled studies examining language skills in a maltreated sample (Culp, Watkins, Lawrence, Letts, Kelly & Rice, 1991; Fox, Long & Anglois, 1988). In these studies, maltreatment was confounded with SES or there was no comparison sample. However, all found language delays to be an outcome of maltreatment.

Although the number of well-controlled studies is small, they have typically detected differences in maltreated children's language. For instance, Coster, Gersten, Beeghly and Cicchetti (1989) investigated language in 31-month-old toddlers compared with children carefully matched for SES, age, sex, ethnicity and a number of family environment variables by assessing spontaneous utterances in a free play session with the mother. They found that the maltreated children exhibited delays in language structures (e.g. shorter mean length of utterance, MLU), delays in expressive, but not receptive, vocabulary development, as well as pragmatic and discourse differences potentially reflecting deficits in emotional or self-concept development (fewer topic-maintaining utterances, less self-descriptive language). Looking at the same sample, Beeghly and Cicchetti (1994) demonstrated that maltreated toddlers used fewer words referring to their internal states than controls. Lynch and Roberts (1982) examined physically abused children at a variety of ages, compared with their unharmed siblings, and found that verbal IQ scores were lower than performance IQ scores in the physically abused group. Similarly, Allen and Oliver (1982) also uncovered language delays in a study of physically abused, neglected, and both abused and neglected 47-month-old children, with a low SES comparison sample. They found that neglect (but neither physical abuse nor the interaction between physical abuse and neglect) was

associated with decreased verbal abilities, and proposed that delays were due to insufficient parental input.

There are negative findings. In the same sample assessed in the Coster *et al.* (1989) and Beeghly and Cicchetti (1994) studies, Gersten, Coster, Schneider-Rosen, Carlson and Cicchetti (1986) found no differences in MLU at 25 months. Their findings indicated that the quality of mother–toddler attachment was a better predictor of linguistic complexity than either maltreatment status or cognitive development. The difference in outcomes across several age points suggests an interaction between age, the cumulative impact of the ongoing experience of maltreatment, and language outcomes.

The negative impact of maltreatment on language abilities is potentially long lasting. Elmer (1981) studied performance on a picture narration task in 9-year-old maltreated children, and found that their expressive language skills were impoverished compared to a group of nonmaltreated hospitalized children and a low SES comparison group. Examining spontaneous language in a sample of maltreated adolescents, McFadyen and Kitson (1996) observed that their language was more repetitive and less self-descriptive than in a comparison group.

In summary, although previous findings have been mixed, there is reason to expect language delays in maltreated children. There are two important confounding factors to consider: socioeconomic status and cognitive development.

Socioeconomic status (SES)

Because maltreatment is often confounded with SES, the effects of the social context in which a child is raised are critical in any study of maltreatment. SES has been found to correlate with language differences, specifically the variety of different words used by children from different backgrounds in their spontaneous speech (Hoff-Ginsberg, 1991, 1998). The differences appear to hinge on maternal input: mothers from low SES groups are found to talk less with and to use a less varied vocabulary in talking to their children than are mothers from middle SES groups. Similarly, Hart and Risley (1995) found that despite the rich and varied interactions experienced by children from low SES backgrounds, these youngsters reached school age knowing fewer words. (In contrast, Wells, 1985, reported very little relationship between family background and child language until school entry, when correlations were greatly amplified.)

Bee, Barnard, Eyres, Gray, Hammond, Spietz, Snyder and Clark (1982) found that assessments of mother–infant interactions and general environmental quality were the best predictors of IQ and language at each age tested, more so than perinatal status, child performance at previous ages and family characteristics. In several studies, home environment provided a unique prediction of children's intelligence when controlling for socioeconomic status and maternal intelligence (Church & Katigbak, 1991), particularly in younger children (Luster & Dubow, 1992). Thus, it is *critical* for studies of maltreatment to include appropriate comparison samples experiencing similarly impoverished environments (Augoustinos, 1987; Coster & Cicchetti, 1993).

Cognitive development

The pathway from maltreatment to language deficits could be mediated by differences in cognitive development. Specifically, maltreatment could lead to general deficits in cognitive development; indeed, in a longitudinal investigation, Egeland and Sroufe (1981) found that maltreated children at 24 months were likely to exhibit significant delays in cognitive development. These cognitive deficits could in turn cause language delays, with no direct effects of the maltreating environment on language. (Conversely, of course, language deficits could be responsible for delays in cognitive development.) A pertinent question for the current study is the extent to which maltreatment exerts a direct, rather than mediated, effect on language development.

Although child cognitive ability is an important factor in child language development, it is likely that it is only one of multiple factors. First, language and cognitive ability may be separable in part in some children with atypical development (e.g. Williams syndrome). In an older study of 1095 typically developing kindergartners in Detroit, Gaskill (1941) found no direct relationship between IQ and facility in use of language. More recently, Bornstein, Haynes and Painter (1998) examined child vocabulary competence in 131 mother–child dyads when children were 20 months old. They found that multiple factors influenced child vocabulary competence, including: child social competence, child gender (such that girls had larger vocabularies), maternal attitudes toward parenting, and maternal vocabulary. Child vocabulary was also indirectly influenced by maternal personality and knowledge of child development. In a longitudinal study of the interaction between linguistic and cognitive development, measurements of social class and quality of the home environment captured more of the difference in IQ and language skills at 8 years than that captured by developmental measurements in the first 2 years (Moore, 1968). In general it seems that home environment and social class, maternal characteristics and child gender play important roles in influencing child language skills.

Clearly, however, child language abilities correlate significantly with cognitive abilities. Studies have demonstrated that maternal IQ is one of the most significant factors influencing child cognitive outcomes. In a study of later life outcomes in low birth weight infants, maternal IQ was highly correlated with child IQ (Bacharach & Baumeister, 1998a, 1998b), more so than other variables including marital status, family income and quality of home environment. In an analysis of 80 mother–child dyads, maternal IQ contributed more towards Ravens Progressive Matrices scores and variability in receptive vocabulary (assessed with the Peabody Picture Vocabulary Test, or PPVT-R; Dunn & Dunn, 1981) than did the home environment ratings (Longstreth, 1981). In a study of high-school graduates in Chile, maternal IQ (along with child brain volume and nutritional history in the first year of a child's development) contributed the greatest weight to child IQ scores (Ivanovic, Leiva, Perez, Almagia, Toro, Urrutia, Inzunza & Bosch, 2002). Dollaghan, Campbell, Paradise, Feldman, Janosky, Pitcairn and Kurs-Lasky (1999) demonstrated a correlation between maternal educational achievement and child language abilities. Thus, there is a significant literature to attest to the influence of maternal IQ on child IQ, and reason to expect that, in the absence of child IQ measures, maternal IQ may serve as a proxy. In other words, if child language differences between groups are present with maternal IQ partialled out then it is reasonable to infer that there is an absence of effects of child IQ differences.

The current study

As reviewed above, most studies have examined syntactic development in a monolithic fashion, reporting a single and non-specific verbal measure such as the WISC Verbal IQ (Wechsler, 1991). Also, many studies have not included appropriate comparison samples. Finally, no studies have simultaneously examined child and maternal language factors in the same sample. The primary goal of the current study was to examine spontaneous language in a sample of maltreated children and well-matched comparison children, focusing specifically on the syntactic complexity of the children's utterances, to see whether the deficits observed in previous studies of maltreated toddlers extend to syntactic complexity in school-age children. Given the importance of complexity in parental input, and the impoverished nature of input in maltreating caregivers, a second goal was to examine whether maternal utterances differed qualitatively between maltreated and nonmaltreated groups, and whether any differences correlated with child syntactic development. Findings from the present study reflect on constraints on the normal process of language acquisition.

Method

Participants

Thirty-three mother–child dyads from the Harvard Child Maltreatment Project (HCMP), an investigation of the causes and sequelae of child maltreatment (Cicchetti & Rizley, 1981), participated in this study. While the study had a mixed longitudinal/cross-sectional design, the present data represent only a cross-sectional project. Nineteen of the children had experienced maltreatment as documented by Child Protective Services, and the other 14 children served as a nonmaltreated comparison sample. None of the children in the present study had participated in earlier toddler studies from the HCMP sample (i.e. at 25 months: Gersten *et al.*, 1986; or at 31 months: Beeghly & Cicchetti, 1994; Coster *et al.*, 1989).

Children in the maltreated group were randomly selected from the active or current caseloads of child protective social workers in the Massachusetts Department of Social Services (DSS). All children had been indicated as maltreated by the DSS prior to age 2 and all cases were active or open at the time of participation in the study. Hence, the children were experiencing chronic maltreatment, with an onset prior to age 2. The sample was representative of all child protective cases in the greater Boston region at the time of the study (Cicchetti & Manly, 1990). The biological mother had been named as the perpetrator or co-perpetrator in all of the cases. None of the children were residing in foster care, insuring the ongoing salience of mother–child interactions.

Maltreatment status was established based both on official social service records and on social workers' ratings on an 87-item interview checklist of maltreatment incidents (Giovannoni & Becerra, 1979). A PhD psychologist administered the checklist to the social worker of each family. In the maltreated group, 16 of 19 had experienced emotional abuse, 9 of 19 had experienced neglect alone, and 10 of 19 had experienced physical abuse. Of the 19 children, 9 had experienced both physical abuse and neglect, a rate that is consistent with the maltreatment literature (Barnett, Manly & Cicchetti, 1993; Cicchetti & Rizley, 1981). Children did differ in whether neglect was cited in the primary report or was secondary to physical abuse; however, essentially all (18 of 19) of the children had developed in a neglecting environment. Cases of sexual abuse were not included because, as was common in the 1980s, they were rarely reported to the DSS.

Participants were predominantly of low socioeconomic status (a rating of four or five, assessed with the Hollingshead Four-Factor Index, 1975). In order to

Table 1 *Demographic data for maltreated and comparison groups*

	Maltreated *M* (SD)	Comparison *M* (SD)	*p*[a]
N	19	14	
Chronological age, months	57.6 (3.5)	59.4 (1.8)	.10
Gender (M: F)	10:9	7:7	.88
Ethnicity[b]	17:2:0	9:4:1	.08
Current use of AFDC[c, d]	17/19	9/13	.15
Lifetime use of AFDC[c, d]	19/19	13/13	n.s.
Current use of food stamps[d]	16/19	13/13	.13
Highest grade attended (mother)	11.1	11.9	.14
Annual family income	$6000	$6360	.75

[a] *p*-value for chi-square comparisons or for *t*-test (Chronological Age, Family Income).
[b] Ethnicity = Caucasian: African-American: Hispanic.
[c] AFDC = Aid to Families with Dependent Children.
[d] Data were not available for one participant in the comparison group.

examine the impact of maltreatment beyond the influence of low socioeconomic status, a demographically comparable group of low-income nonmaltreating dyads was used as a comparison sample. Because a majority of the maltreating families was receiving Aid to Families with Dependent Children (AFDC), families also receiving AFDC were targeted and recruited through advertisements placed in welfare offices and stores in low-income neighborhoods. Nonmaltreatment status was verified, with families' permission, through searches of the state registry of maltreatment cases.

The mean age of children in the maltreatment group was 57 months, 20 days (range = 55 to 59 months). The mean age of comparison children was 59 months, 10 days (range = 58 to 60 months). The mean age of the maltreated group did not differ significantly from the comparison group, $t(31) = 1.72$, $p < .10$. However, as participants' ages spanned a wide range, age in months was used as a covariate in subsequent analyses. Gender and ethnicity did not differ across groups. Maltreating and comparison dyads did not differ on the following measures of socioeconomic status: Hollingshead Four-Factor Index (Hollingshead, 1975), maternal education, annual family income, AFDC use or food stamp use. Demographic information on the sample is provided in Table 1.

Procedure

At approximately their fifth birthday, children and their mothers spent 30 minutes together in a well-stocked playroom, with a standard set of age-appropriate toys (e.g. a house set, a punching doll, doll set, cook set) and a one-way mirror, through which the session was videotaped. The mother was asked to refrain from initiating any interaction with her child for the first and last 10 minutes of the session. During the intervening 10-minute period, she was asked to play with her child as she would at home. Ten-minute intervals were signaled by a knock on the one-way mirror.

The first author transcribed these sessions from videotape. All transcription and coding occurred without awareness of maltreatment status. Speech was transcribed according to standard guidelines (Brown & Hanlon, 1970). For partially unintelligible or semantically opaque utterances, a gloss was transcribed and supplemented by phonetic representations of intelligible portions. An utterance was jointly defined by intonation contour and by the presence of a discernible pause between it and surrounding utterances. Following Demuth (1996), 10% of the videotapes were transcribed for reliability by a second trained independent coder. Inter-rater reliability for transcriptions, assessed word by word, was $K = .90$. When disagreements occurred, the two transcribers reviewed the videotapes and reached consensus on transcriptions, which were the versions used in coding.

Measures

Index of Productive Syntax

In order to classify the developmental level of the language structures produced by the children, speech was assessed using the Index of Productive Syntax (IPSyn; Scarborough, 1990). The IPSyn has been used with typically developing children and those with developmental disabilities as a means of evaluating individual differences in syntactic development. Reliability and validity of the IPSyn are excellent (Scarborough, 1990). It has been shown to be sensitive to the differences between normal and language-delayed samples of preschoolers in several longitudinal studies (Rescorla & Schwartz, 1988; Scarborough & Dobrich, 1985). In addition, the IPSyn has reference norms for normal, autistic and Down syndrome populations (Scarborough, Rescorla, Tager-Flusberg, Fowler & Sudhalter, 1991). Indeed, it may be a more sensitive measure of language level than MLU at older ages (between 36 and 48 months; Scarborough *et al.*, 1991). Although reference norms extend up to age 48 months, the IPSyn can provide meaningful information about developmental delays in syntactic abilities in older children if scores provide sufficient variability below ceiling levels.

Each child's first 100 utterances were scored for the presence of specific syntactic and morphological structures, when they satisfied the following constraints (Brown, 1973): (1) only fully transcribed utterances were included; (2) compounds, proper names and ritualized;

(3) reduplications were counted as single words (*fire-truck*, *quack-quack*, *night-night*); (4) fillers like *mmm* were not included, nor were single-word routines (*yeah*, *no*, *hi*); (5) single-word requests for repetition (*what*?) were not included; and (6) word-for-word repetitions (within five utterances) of self or mother were not included. The process of scoring 100 utterances for each child presents a built-in control for between-child differences in talkativeness.

Each utterance was analyzed in turn. If an utterance met the requirements for a given grammatical structure, the child received one point. A specific utterance might meet criteria for more than one structure. For example, *an iron*? would be scored for all of the following: (1) intonational question; (2) use of a noun; and (3) two-word combination of article plus noun. Subsequent utterances were also analyzed for each structure, with a maximum of two points per structure. A structure could be scored regardless of whether it was accurate according to adult norms. Thus, a child would have been credited for producing a past tense morpheme with the utterance *We wented to the store*.

Auxiliary verbs in obligatory contexts

One common measure of child syntactic development, familiar to researchers in child language acquisition, is a child's production of auxiliary verbs in obligatory syntactic contexts. Based on the same 100 utterances used for the IPSyn, we examined the utterances in which the main verb required an auxiliary verb to make the utterance grammatical, and counted the occasions in which the child produced such auxiliary verbs. The dependent variable was the ratio of the number of required verbs produced to the required contexts.

Peabody Picture Vocabulary Test-Revised (Dunn & Dunn, 1981)

As a measure of receptive lexical development, children performed the Peabody Picture Vocabulary Test-Revised (the most recent version available at time of testing; PPVT-R), a non-verbal multiple-choice test that requires no reading ability or verbal responses. This measure was intended to complement the IPSyn as a non-syntax-based measure of linguistic development.

Maternal utterances

For both mother and child, the language produced during a 30-minute session is a cross-sectional measure of underlying language abilities. As such, it may reflect the vicissitudes of performance at one moment in time, rather than underlying competence. For the mothers, this may be accentuated by the external requirements not to initiate interactions during a portion of the play session. Although any findings must be considered in light of these limitations, any between-group differences in maternal speech could suggest potential explanations for differences in developmental complexity in child speech. The mothers' utterances during the free play sessions were examined and coded with respect to several categories that, based on research reviewed above, were predicted to be relevant for child language development. Categories included: (1) number of maternal utterances produced during the period in which the child produced 100 scorable utterances or 30 minutes, whichever was shorter; (2) Wh-questions (*What about the blue one*?) produced in that time period; (3) Yes/No questions with inverted auxiliaries (*Do you want to do the house now*?); (4) complex sentences with multiple propositions (verb plus arguments) falling within an utterance intonation contour, such as relative clauses (*That looks like the bear that I got you for Christmas*) or sentences with subordinate adverbial clauses; (5) imperatives (*Do it like that*) and (6) negative imperatives (*Don't throw it at me*). The total number of maternal utterances was controlled for time to best capture individual differences in the amount that mothers talked during the time that a child produced a standard number of utterances. The other five maternal variables were calculated as proportions of total utterances.

Maternal WAIS scores

As discussed above, maternal verbal ability has an impact on child language development, in at least two ways (Silva & Fergusson, 1980). First, mothers with superior verbal skills could pass on those abilities to their children (e.g. through genetic inheritance). Second, it may be the case that mothers with better verbal skills are better able to 'scaffold' their children's utterances. This could in turn lead to the child's producing more sophisticated structures at earlier ages. Third, because of the substantial correlations between maternal and child IQ, this measure may serve as a proxy for child cognitive abilities. To control for this possibility, mothers completed the vocabulary and comprehension subscales of the Wechsler Adult Intelligence Scales (WAIS; Wechsler, 1955). These two subtests are correlated at $r = .86$ (Sattler, 1992) and, using procedures described in Sattler (1992, p. 138) can be transformed into a Deviation Quotient Score with a mean of 100 and a standard deviation of 15. Both the PPVT (for the child) and WAIS (for the mother) were administered and scored by experimenters unaware of maltreatment status.

Results

Child language data were examined using multivariate analysis of covariance (MANCOVA) with group (maltreated vs. comparison) as the independent factor and overall IPSyn score as the dependent variable. Due to the variability in participant ages, child age in months was entered as a covariate. An alpha level of .05 was used for planned statistical comparisons. Maternal language data were examined using MANCOVA with group as the independent variable, maternal utterance categories as dependent variables and child age as a covariate. Standard scores from the PPVT and maternal WAIS were analyzed via one-way analysis of variance (ANOVA), with group (maltreated vs. comparison) as the independent variable.

Physical abuse and neglect contrast

Although 95% of the maltreated group was neglected, 53% also experienced physical abuse. The contrast between physical abuse with or without neglect, versus neglect alone, revealed no significant differences for any measures (IPSyn, PPVT, maternal utterances, maternal WAIS, all $F < 1.9$, $p > .17$). Thus, all participants experiencing maltreatment were collapsed into a single group in subsequent analyses. Although there is some evidence for a differential impact of maltreatment subtypes on development (Cicchetti & Toth, 1995; Trickett & McBride-Chang, 1995), essentially all of the children experienced the omission of attention to basic needs and supervision (i.e. neglect), which may be the primary ingredient in language differences. Indeed, research samples restricted to 'pure' subtypes may be nonrepresentative, and likely oversimplify the phenomena of maltreatment (Barnett *et al.*, 1993).

Index of Productive Syntax (IPSyn)

The syntactic complexity of children's spontaneous language was assessed with the IPSyn. Because all IPSyn scores were based on a similar number of utterances for each child, these scores were controlled for overall utterance frequency. IPSyn scores were 78.1 (8.4) for the maltreated group and 82.7 (6.7) for the comparison group, with lower scores indicating the production of less developmentally advanced structures. The maltreated and comparison group scores differed significantly with child age and maternal IQ as a covariate, $F(1, 27) = 5.33$, $p = .03$.

Based on the extensive literature supporting gender differences in rate of language development, gender was entered as a factor into the MANCOVA. Results indicated a significant main effect of gender, $F(1, 27) = 4.29$, $p = .048$, and no significant interaction, such that girls had lower scores than boys across both groups, reflecting a greater delay in syntactic development. The average IPSyn score for girls was 76.7 (8.7) and for boys was 82.7 (6.3). SES, as assessed by the Hollingshead 4-factor index, did not account for significant differences between or within groups for the IPSyn. Observed power to detect SES differences was .77. Interestingly, verbal abilities were correlated with family factors, but only for girls in the maltreatment group: child PPVT with maternal educational level, $r(8) = .77$, $p < .03$; and IPSyn score with family income, $r(8) = .75$, $p < .04$. This suggests that achievement was closely tied to maternal social risk factors for girls in a maltreating environment.

Auxiliary verbs in obligatory contexts

This analysis represents the assessment of a child's production of a single syntactic device, the production of helper verbs in obligatory contexts. Results were generally similar to those for the IPSyn. The number of auxiliaries produced in obligatory contexts was .784 (.204) for the maltreated group and .854 (.097) for the comparison group, indicating that the maltreated group was more likely to omit required verbs. There was a trend towards a significant between-group difference with maternal VIQ and child age as covariates, $F(1, 27) = 2.998$, $p < .10$. While the results from this auxiliary analysis were weaker than the IPSyn findings, they suggested that even when accounting for maternal IQ, there were differences in syntactic abilities between maltreated and comparison groups. The IPSyn assesses multiple syntactic constructions rather than a single syntactic device. As such, it may be more sensitive to group differences than an assessment of a single construction. There were no effects of gender or SES, potentially due to low power (.350 for gender and .406 for SES).

PPVT scores

Children's receptive vocabulary level was assessed with the PPVT. One child in the maltreatment group was not able to complete the PPVT due to time constraints. Performance on the PPVT indicated that scores in the maltreated group ($M = 87.9$, $SD = 14.2$) were significantly lower than the comparison group's ($M = 102.1$, $SD = 22.8$), $t(30) = 2.16$, $p < .04$. The maltreated group scores were in the low average range, indicating that mean vocabulary level in this group was lower than peers of the same age. In contrast, the comparison group scores were in the average range and thus were age-appropriate. As in the IPSyn analysis, there was an additional main

Table 2 *Characteristics of maternal utterances within maltreatment and comparison groups*

	Maltreated *M* (SD)	Comparison *M* (SD)
Number of utterances (total)*	102.7 (52.0)	151.0 (52.4)
Wh-questions	10.5 (8.3)	14.9 (8.1)
Yes/No questions*	3.3 (3.1)	7.0 (5.3)
Multi-clause utterances*	2.2 (2.5)	4.4 (3.7)
Imperatives	12.4 (12.7)	19.6 (14.5)
Negative imperatives	1.6 (1.7)	1.6 (2.2)

* $p < .05$.

effect of gender such that girls in both groups scored lower, $F(1, 27) = 4.95$, $p = .035$), with no significant group-by-gender interaction.

Maternal utterances

The characteristics of maternal utterances were examined and compared across groups. Because the length of the session analyzed differed across maternal participants in a child-dependent fashion (i.e. the length of time required for the child to produce 100 scorable utterances), time in minutes was entered as a covariate. Findings indicated that mothers in the maltreating group produced a smaller number of overall utterances, $F(1, 30) = 5.58$, $p = .025$. In addition, mothers in the maltreating group produced significantly fewer of two categories of utterance (again, calculated as a proportion of total number of maternal utterances): Yes/No questions, $F(1, 30) = 4.50$, $p = .04$, and Complex multi-clause utterances, $F(1, 30) = 4.86$, $p = .04$. Thus, results indicated that during the time that a child produced 100 utterances, the mothers in the maltreating group spoke less frequently, and specifically, produced fewer of specific types of utterances. Results are presented in Table 2.

Several maternal language variables were correlated with child language scores. Child production of auxiliary verbs in obligatory contexts was correlated with Multi-clause utterances, $r(33) = .35$, $p = .045$, and with Wh-Questions, $r(33) = -.41$, $p = .017$. Child PPVT scores were negatively correlated with maternal production of commands, $r(33) = -.36$, $p = .04$, such that the more commands a mother produced, the lower the child's PPVT score was likely to be. PPVT scores also exhibited near-correlations with Multi-clause utterances, $r(33) = .31$, $p = .08$. The data thus indicate that not only are there between-group differences in both child language abilities and maternal talkativeness, but that there are specific correlations between these measures. In addition, data showed that maternal expansions and repetitions of child utterances were highly inversely correlated with child age in the comparison group, $r = -.77$, $p < .001$, but not in the maltreated group, $r = .005$, *n.s.*, indicating that non-maltreating mothers may be more responsive to child-specific factors.

WAIS scores

To determine whether child language variables were influenced by differences in maternal verbal ability, maternal performance on verbal subtests of the WAIS was examined. Two mothers in the maltreatment group did not complete testing due to time constraints. Verbal IQ scores for mothers in the maltreating ($M = 96.7$) and comparison groups ($M = 102.1$) did not differ significantly, $t(27) = 1.7$, $p = .10$. Between-group differences in quantities of maternal utterances did not change when maternal verbal IQ scores were added to a repeated measures MANCOVA with child age, verbal IQ and session length as covariates, $F(1, 26) = 2.61$, $p = .11$. Furthermore, none of the variables capturing characteristics of maternal utterances were correlated with verbal IQ.

Maternal verbal IQ scores were found to correlate significantly with child PPVT scores, $r(31) = .41$, $p = .02$, and with child IPSyn score, $r(31) = .38$, $p = .04$. When examined separately within groups, correlations with maternal verbal IQ did not reach significance (all $p > .15$), but a similar pattern obtained: for the maltreated group, child PPVT, $r(17) = .37$ and IPSyn, $r(17) = .37$; for the comparison group, child PPVT, $r(14) = .39$, and IPSyn, $r(14) = .25$. The results indicated that, as expected, there was a significant relationship between maternal and child verbal ability. The finding that between-group differences in language measures held true with maternal verbal skills as a covariate thus emphasizes the negative impact of maltreatment on both maternal language productions and rate of child language development, regardless of the underlying cognitive abilities of the mother (and, perhaps, of the child as well).

Discussion

The current study was designed as a detailed investigation of syntactic abilities in a group of maltreated children and a group of children comparable on age, gender, ethnicity, socioeconomic status and maternal IQ. The study investigated whether maternal maltreatment correlated with delays in language development, and whether such delays may be accounted for by differences in maternal input. Findings supported the prediction that maltreated children would exhibit syntactic delays even at the age of 5 years, producing less complex language and with a less advanced knowledge of vocabulary.

Furthermore, findings indicated that maltreating mothers directed fewer utterances towards their children, and produced fewer of specific types of utterances predicted to correlate with child language abilities. The mothers in the maltreating group were less talkative with their children, regardless of their underlying verbal abilities. Importantly, findings indicated significant relationships between maternal talkativeness (and types of utterances that mothers produced) and several child language variables.

Neither the comparison nor the maltreated children were at age-expected levels for syntactic abilities, assessed with the IPSyn. The mean IPSyn score of the 57-month-old maltreated group was that of a normally developing 41-month-old child. Mean IPSyn in the 59-month-old comparison group was at a 46-month level. Thus, the comparison and maltreated children exhibited overall syntactic delays of 13 and 16 months, respectively, a finding likely attributable to their impoverished environments. Furthermore, the maltreatment group exhibited significantly greater delays relative to the comparison group, potentially reflecting the impact of the maltreating environment. Although the between-group differences are relatively small, the finding of a 3-month delay over and above an already significant delay of 13 months in a low-SES school-age sample is quite striking, and indicates that maltreatment status exacerbated pre-existing syntactic delays.

Syntactic delays were somewhat evident in a further syntactic analysis of the production of auxiliary verbs in obligatory contexts. There was a trend for children in the maltreated group to be less likely to produce this particular grammatical structure, indicative of a relative delay in syntactic development. It should be noted that this finding is not likely to reflect ethnicity-related differences in dialect, as the groups were balanced in terms of race. In fact, the maltreated group included numerically fewer African-Americans, whose dialect would be more likely to reflect omitted auxiliary verbs.

The maltreated group exhibited vocabulary skills, assessed with the PPVT, in the low average range, a significant difference from the comparison group, which was in the average range. This finding suggests that maltreatment may lead to a failure of development across multiple areas of language development. Interestingly, these vocabulary differences (at 60 months) were not found in a very similar sample at age 31 months (Coster *et al.*, 1989). While speculations must be tempered by the fact that the investigations did not assess the same children, there is some data that may reflect on this developmental difference. Huttenlocher *et al.* (1991) found that in a sample of typically developing children, there were significant effects of gender that decreased over time, and that the effect of environment and speech input became *more* significant over time. The present pattern of findings fits well with this prediction – namely, that the effects of a maltreating environment (in which the caregiver's speech may be quantitatively and qualitatively different) on a child's vocabulary will become intensified over time.

Importantly, maternal verbal IQ was assessed, and findings indicated a strong relationship between maternal verbal IQ and child language abilities (both PPVT and IPSyn). In the context of these strong correlations, there were strong differences between maltreated and comparison groups, when maternal verbal abilities (and perhaps, by extension, child verbal abilities, as discussed in the Introduction) were held constant. This demonstrates that maltreatment makes a unique contribution to the variance in child language abilities, independent of maternal verbal abilities.

There was an interesting and counter-intuitive effect of gender on language abilities in the present study. Specifically, in addition to the main effect of maltreatment, there was a main effect of gender (with no interaction) indicating that girls across both groups had lower scores for both the IPSyn and the PPVT. This is the reverse of the typical finding that girls score better than boys on language measures for which there are gender differences (Bornstein *et al.*, 1998; Hopman-Rock, Gerritsen & Talsma, 1988; Huttenlocher *et al.*, 1991; Maccoby & Jacklin, 1984), although some have argued that sex differences are so small as to be relatively meaningless (Hyde & Linn, 1988). For this reason, the data were entered into a MANCOVA to analyze the simple effects within groups. This analysis indicated that gender differences in the PPVT and IPSyn were present in the maltreatment but not the comparison samples, when these samples were considered separately. Analyses of maternal utterances failed to uncover any gender-related differences; that is, mothers did not appear to be more talkative, or to direct more or less of any category of utterance, towards their male children. Similarly, mothers of boys did not have higher overall verbal IQs, higher social class demographics or any other characteristics that, in the present study, were related to child outcomes.

The standard female advantage may be short-lived; one report indicates that, in the interval between the 16–20-month period and the 20–24-month period, such gender effects are already attenuated in the domain of vocabulary development (Huttenlocher *et al.*, 1991). While these results could help to explain a failure to find gender differences at this age, they cannot explain why females in a low-SES sample might be more delayed than males in vocabulary skills. One possible explanation may be found in a study of gender differences in

high-social-risk families, which demonstrated a significant advantage for girls on measures of language production at 20 and 30 months (Morisset, Barnard & Booth, 1995). Although mothers were not found to interact differently with girls than with boys, there were strong correlations between 'family risk' and verbal ability for girls only. Morisset *et al.* suggested that this gender difference might reflect the fact that boys may be more psychologically distant from their parents, and spend more time out of the house in play. Cicchetti and Rogosch (1997) found that self-reliance and self-confidence, in concert with interpersonal reserve, predicted resilient adaptation in maltreated children, whereas positive relationships with adults (i.e. mothers and camp counselors) predicted resilient functioning in nonmaltreated children.

If boys interact less with their mothers and more with other children and adults, they may be exposed to more varied types of linguistic input, allowing them to experience a small selective advantage in language development. In the present study, findings demonstrated correlations between family risk variables and child language abilities, indicating that the girls in the maltreatment group were the only subjects for whom verbal abilities were correlated with family factors (PPVT with Maternal educational level, and IPSyn score with family income). This suggests that, as in the Morisset *et al.* data, girls' achievement was more closely tied to maternal social risk factors, in the maltreatment group. Although the present findings must be interpreted with caution due to the relatively small sample size, they suggest that girls may be uniquely vulnerable to aspects of the maltreating environment that may influence language development. Clearly, this interesting finding highlights the need for attention to gender differences in outcomes for maltreated populations, and indicates a direction for future research, with larger sample sizes.

In typical mother–child dyads, structures found to have the greatest impact on child learning of verb phrases, questions and negations include sentence types that provide salient examples of the manipulation of verbal auxiliaries. While the data must be interpreted with caution, given the limitations of the play session format, mothers in the maltreating group produced fewer utterances overall, along with a smaller proportion of yes-no questions and multi-clause utterances, both of which provide examples of movements of verbal auxiliaries. This held true when maternal verbal IQ scores were held constant; furthermore, none of the maternal language variables were correlated with verbal IQ. Thus, the present study found differences in maternal speech to maltreated children, and also found language delays in the same group of maltreated children. Although correlational data cannot be used to infer causality, there is reason (as discussed in the Introduction) to believe that significant correlations between child language level and maternal talkativeness may reflect a causal effect of the amount of exposure if effects continue to be significant when maternal variability in verbal skills is held constant.

Previous research has demonstrated the qualitatively and quantitatively impoverished nature of maltreating maternal language (Crittenden, 1988; Westerman & Haustead, 1982). In the present study, we examined the issue of whether individual child language delays were directly correlated with maternal language differences and found that several maternal language variables were correlated with child language outcomes (auxiliary verb production with maternal multi-clause utterances and Wh-questions; PPVT scores with maternal commands and a trend towards correlation with multi-clause utterances). The data indicate that not only are there between-group differences in both child language abilities and maternal talkativeness, but that there are specific correlations between these measures. In support of this finding, the present data offered a suggestion that nonmaltreating mothers in the comparison group were more responsive to child-specific factors. In particular, maternal expansions and repetitions of child utterances were highly inversely correlated with child age for the comparison group, but not for the maltreated group. Repetitions and expansions, or 'recasts', of a child's utterances have been shown to affect a child's acquisition of the recasted elements (Farrar, 1990). The present results also support earlier findings that maltreating mothers were less likely to regulate their interactions in relation to the child's developmental level (Pianta *et al.*, 1989).

The present finding that child maltreatment was associated with syntactic delays supports and extends past research showing deficits in language production and comprehension in younger maltreated children (Beeghly & Cicchetti, 1994). The syntactic deficits found in this study contrast with the deficits in internal state language and self talk found in prior analyses of language in maltreated populations, 'content-focused' deficits which may be more related to the social and emotional development delays also characteristic of maltreated populations. Thus, the current work shows that child maltreatment is correlated with deficits in language form, deficits that are based in cognitive processing.

Although the current study does not propose or support the notion that language delays in maltreated children will necessarily lead to language deficits when they become adults, the findings indicate that language delays are persistent until at least 5 years of age. These language delays could lead in turn to later emotional, social or cognitive delays, or exacerbate existing problems the

children have, as has been observed in a variety of studies (see Trickett & McBride-Chang, 1995, for a review). Thus, social and emotional deficits later in life may not simply be directly due to maltreatment, but may be mediated or exacerbated by the observed language and communicative deficits.

One limitation of the present study should be noted because it provides an important direction for future research. The current cross-sectional study investigated language in children who experienced persistent and chronic maltreatment that was also of early onset (identified by 2 years of age). The first 2 years of life are a major sensitive period for language development, and it is likely that differences in language development might emerge depending on both the timing and the duration of maltreatment. Future research is required to disentangle the distinctions between age of onset of maltreatment versus chronicity of maltreatment in a longitudinal design, by exploring syntactic development and production in children who experience maltreatment at older ages.

A second limitation due to the cross-sectional study design is that mother–child dyads were observed in a single context (the playroom). Previous research indicates that multiple contexts are necessary to fully characterize relations between maternal styles and children's language and narrative development (Haden & Fivush, 1996). Future investigations are needed to examine mother–child interactions across several settings, in part to determine whether caregivers function more effectively in some settings than others.

Finally, the present study examines syntactic knowledge only through a measure of production. Research indicates that production measures may underestimate some aspects of early language development, such that children comprehend more than they may produce (Goldfield, 2000; Harris, Yeeles, Chasin & Oakley, 1995). There is, however, no reason to suspect that maltreated and comparison samples would be differentially susceptible to this factor, and thus the present findings may indicate important group differences.

In conclusion, the current investigation provides a quantitative description of the impact of a maltreating environment on children's syntactic development. Findings revealed delays in language acquisition in children maltreated early in development, and indicate the need for speech-language evaluations for children identified as experiencing maltreatment (Hammond, Nebel-Gould & Brooks, 1989). Results also indicated differences in the quantity and types of utterances directed at children by mothers in the maltreatment group, and demonstrated correlations between maternal speech characteristics and child language outcomes. These differences are precisely those found to be important to child language learning in longitudinal studies of maternal input in normal language acquisition. The present results thus highlight the utility of examining cases of disordered development to shed light on normal developmental processes.

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References

Allen, R., & Wasserman, G.A. (1985). Origins of language delay in abused children. *Child Abuse and Neglect*, **9** (3), 335–340.

Allen, R.E., & Oliver, J.M. (1982). The effects of child maltreatment on language development. *Child Abuse and Neglect*, **6**, 299–305.

Augoustinos, M. (1987). Developmental effects of child abuse: recent findings. *Child Abuse and Neglect*, **11**, 15–27.

Bacharach, V.R., & Baumeister, A.A. (1998a). Direct and indirect effects of maternal intelligence, maternal age, income, and home environment on intelligence of preterm, low-birthweight children. *Journal of Applied Developmental Psychology*, **19** (3), 361–375.

Bacharach, V.R., & Baumeister, A.A. (1998b). Effects of maternal intelligence, marital status, income, and home environment on cognitive development of low birthweight infants. *Journal of Pediatric Psychology*, **23** (3), 197–205.

Barnett, D., Manly, J.T., & Cicchetti, D. (1993). Defining child maltreatment: the interface between policy and research. In D. Cicchetti & S.L. Toth (Eds.), *Child abuse, child development, and social policy* (pp. 7–74). Norwood, NJ: Ablex.

Bee, H.L., Barnard, K.E., Eyres, S.J., Gray, C.A., Hammond, M.A., Spietz, A.L., Snyder, C., & Clark, B. (1982). Prediction of IQ and language skill from perinatal status, child performance, family characteristics, and mother–infant interaction. *Child Development*, **53** (5), 1134–1156.

Beeghly, M., & Cicchetti, D. (1994). Child maltreatment, attachment, and the self system: emergence of an internal state lexicon in toddlers at high social risk. *Development and Psychopathology*, **6**, 5–30.

Bornstein, M.H., Haynes, M.O., & Painter, K.M. (1998). Sources of child vocabulary competence: a multivariate model. *Journal of Child Language*, **25**, 367–393.

Breznitz, Z., & Sherman, T. (1987). Speech patterning of natural discourse of well and depressed mothers and their young children. *Child Development*, **58**, 395–400.

Broen, P.A. (1972). The verbal environment of the language learning child. *Monographs of the American Speech and Hearing Association*, **17**, 1–103.

Brown, R. (1973). *A first language: The early stages*. Cambridge, MA: Harvard University Press.

Brown, R., & Hanlon, C. (1970). Derivational complexity and the order of acquisition in child speech. In J.R. Hayes (Ed.), *Cognition and the development of language* (pp. 11–53). New York: Wiley.

Chomsky, N. (1981). *Lectures on government and binding*. Dordrecht, Netherlands: Foris.

Christopoulos, C., Bonvillian, J.D., & Crittenden, P.M. (1988). Maternal language input and child maltreatment. *Infant Mental Health*, **9**, 272–286.

Church, A.T., & Katigbak, M.S. (1991). Home environment, nutritional status, and maternal intelligence as determinants of intellectual development in rural Philippine preschool children. *Intelligence*, **15** (1), 49–78.

Cicchetti, D. (1984). The emergence of developmental psychopathology. *Child Development*, **55**, 1–7.

Cicchetti, D. (1993). Developmental psychopathology: reactions, reflections, projections. *Developmental Review*, **13**, 471–502.

Cicchetti, D., & Manly, J.T. (1990). A personal perspective on conducting research with maltreating families: problems and solutions, *Family research journeys* (Vol. 2: *Families at risk*, pp. 87–133). Hillsdale, NJ: Erlbaum.

Cicchetti, D., & Rizley, R. (1981). Developmental perspectives on the etiology, inter-generational transmission, and sequelae of child maltreatment. *New Directions for Child Development*, **11**, 31–55.

Cicchetti, D., & Rogosch, F. (1996). Equifinality and multifinality in developmental psychopathology. *Development and Psychopathology*, **8** (4), 597–600.

Cicchetti, D., & Rogosch, F. (1997). The role of self-organization in the promotion of resilience in maltreated children. *Development and Psychopathology*, **9** (4), 797–815.

Cicchetti, D., Rogosch, F., & Toth, S.L. (2000). The efficacy of toddler–parent psychotherapy for fostering cognitive development in offspring of depressed mothers. *Journal of Abnormal Child Psychology*, **28** (2), 135–148.

Cicchetti, D., & Toth, S.L. (1995). A developmental psychopathology perspective on child abuse and neglect. *Journal of the American Academy of Child and Adolescent Psychiatry*, **34**, 541–565.

Cohen, S.E., & Beckwith, L. (1976). Maternal language in infancy. *Developmental Psychology Monograph*, **12** (4), 371–372.

Cohler, B., Gallant, D., Grunebaum, H., Weiss, J., & Gamer, E. (1977). Attention, dysfunction, and child-care attitudes among mentally ill and well mothers and their young children. In J.C. Glidewell (Ed.), *The social context of learning and development* (pp. 133–162). New York: Gardner-Wiley.

Coster, W.J., & Cicchetti, D. (1993). Research on the communicative development of maltreated children: clinical implications. *Topics in Language Disorders*, **13** (4), 25–38.

Coster, W.J., Gersten, M.S., Beeghly, M., & Cicchetti, D. (1989). Communicative functioning in maltreated toddlers. *Developmental Psychopathology*, **25** (6), 1020–1029.

Crittenden, P.M. (1981). Abusing, neglecting, problematic, and adequate dyads: differentiating by patterns of interaction. *Merrill-Palmer Quarterly*, **27**, 201–208.

Crittenden, P.M. (1988). Relationships at risk. In J. Belsky & T. Nezwarski (Eds.), *Clinical implications of attachment* (pp. 136–174). Hillsdale, NJ: Erlbaum.

Culp, R.E., Watkins, R.V., Lawrence, H., Letts, D., Kelly, D.J., & Rice, M.L. (1991). Maltreated children's language and speech development: abused, neglected, and abused and neglected. *First Language*, **11** (33), 377–389.

Demuth, K. (1996). Collecting spontaneous production data. In D. McDaniel, C. McKee & H. Smith Cairns (Eds.), *Methods for assessing children's syntax* (pp. 3–22). Cambridge, MA: MIT Press.

Dollaghan, C., Campbell, T., Paradise, J., Feldman, H., Janosky, J., Pitcairn, D., & Kurs-Lasky, M. (1999). Maternal education and measures of early speech and language. *Journal of Speech, Language, & Hearing Research*, **42** (6), 1432–1443.

Dunn, L.M., & Dunn, L.M. (1981). *Peabody Picture Vocabulary Test-Revised*. Circle Pines, MN: American Guidance Service.

Egeland, B., & Sroufe, A. (1981). A: Developmental sequelae of maltreatment in infancy. In R. Rizley & D. Cicchetti (Eds.), *New directions for child development: Developmental perspectives on child maltreatment* (pp. 77–92). San Francisco: Jossey-Bass.

Elmer, E. (1981). Traumatized children, chronic illness, and poverty. In L. Pelton (Ed.), *The social context of child abuse and neglect* (pp. 185–219). New York: Human Sciences Press.

Farrar, M. (1990). Discourse and the acquisition of grammatical morphemes. *Journal of Child Language*, **17** (3), 607–624.

Finkelhor, D., & Kendall-Tackett, K. (1997). A developmental perspective on the childhood impact of crime, abuse, and violent victimization. In D. Cicchetti & S.L. Toth (Eds.), *Rochester symposium on developmental psychopathology* (Vol. VIII: *Trauma: Perspectives on theory, research, and intervention*, pp. 1–32). Rochester, NY: University of Rochester Press.

Fox, L., Long, S.H., & Anglois, A. (1988). Patterns of language comprehension deficit in abused and neglected children. *Journal of Speech and Hearing Disorders*, **53**, 239–244.

Gaskill, H.V. (1941). Language responses and intelligence: I. Verbalization and intelligence. *Journal of Genetic Psychology*, **58**, 407–417.

Gathercole, S.E., Hitch, G.J., Service, E., & Martin, A.J. (1997). Phonological short-term memory and new word learning in children. *Developmental Psychology*, **33** (6), 966–979.

Gersten, M., Coster, W., Schneider-Rosen, K., Carlson, V., & Cicchetti, D. (1986). The socio-emotional basis of communicative functioning: quality of attachment, language development, and early maltreatment. In M.E. Lamb, A.L. Brown & B. Rogoff (Eds.), *Advances in developmental psychology* (Vol. 4, pp. 105–151). Hillsdale, NJ: Erlbaum.

Giovannoni, J., & Becerra, R.M. (1979). *Defining child abuse*. New York: Free Press.

Gleitman, L.R. (1981). Maturational determinants of language growth. *Cognition*, **10**, 103–114.

Gleitman, L.R., Newport, E.L., & Gleitman, H. (1984). The current status of the motherese hypothesis. *Journal of Child Language*, **11**, 43–79.

Goldfield, B. (2000). Nouns before verbs in comprehension vs. production: the view from pragmatics. *Journal of Child Language*, **27** (3), 501–520.

Haden, C.A., & Fivush, R. (1996). Contextual variation in maternal conversational styles. *Merrill-Palmer Quarterly*, **42** (2), 200–227.

Hammond, J., Nebel-Gould, A., & Brooks, J. (1989). The value of speech-language assessment in the diagnosis of child abuse. *Journal of Trauma-Injury Infection and Critical Care*, **29** (9), 1258–1260.

Harris, M., Yeeles, C., Chasin, J., & Oakley, Y. (1995). Symmetries and asymmetries in early lexical comprehension and production. *Journal of Child Language*, **22** (1), 1–18.

Hart, B., & Risley, T.R. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore, MD: Paul H. Brookes.

Hoff-Ginsberg, E. (1991). Mother–child conversation in different social classes and communicative settings. *Child Development*, **62** (4), 782–796.

Hoff-Ginsberg, E. (1998). The relation of birth order and socioeconomic status to children's language experience and language development. *Applied Psycholinguistics*, **19** (4), 603–629.

Hoff-Ginsberg, E., & Shatz, M. (1982). Linguistic input and the child's acquisition of language. *Psychological Bulletin*, **92**, 3–26.

Hollingshead, A.B. (1975). *Four factor index of social status*. New Haven, CT: Yale University Department of Sociology.

Hopman-Rock, M., Gerritsen, F.M., & Talsma, P. (1988). Socioeconomic status and gender differences in language development of children aged 3 to 6 years. *Pedagogische Studien*, **65** (11), 437–450.

Huttenlocher, J., Haight, W., Bryk, A., Selyzer, M., & Lyons, T. (1991). Early vocabulary growth: relation to language input and gender. *Developmental Psychology*, **27**, 236–248.

Huttenlocher, J., Levine, S., & Vevea, J. (1998). Environmental input and cognitive growth: a study using time-period comparisons. *Child Development*, **69** (4), 1012–1029.

Hyde, J.S., & Linn, M.C. (1988). Gender differences in verbal ability: a meta-analysis. *Psychological Bulletin*, **104**, 53–69.

Ivanovic, D.M., Leiva, B.P., Perez, H.T., Almagia, A.F., Toro, T.D., Urrutia, M., Inzunza, N.B., & Bosch, E.O. (2002). Nutritional status, brain development and scholastic achievement of Chilean high-school graduates from high and low intellectual quotient and socio-economic status. *British Journal of Nutrition*, **87** (1), 81–92.

Kelly, J.F., Morisset, C.E., Barnard, K.E., Hammond, M.A., & Booth, C.L. (1996). The influence of early mother–child interaction on preschool cognitive/linguistic outcomes in a high-social-risk group. *Infant Mental Health Journal*, **17** (4), 310–321.

Kempe, C.H., Silverman, F.M., Steele, B.B., Droegemuller, W., & Silver, H.C. (1962). The battered child syndrome. *Journal of the American Medical Association*, **181**, 17–24.

Lieven, E.V.M. (1994). Crosslinguistic and crosscultural aspects of language addressed to children. In C. Gallaway & B.J. Richards (Eds.), *Input and interaction in language acquisition* (pp. 56–72). New York: Cambridge University Press.

Longstreth, L.E. (1981). Separation of home intellectual environment and maternal IQ as determinants of child IQ. *Developmental Psychology*, **17** (5), 532–541.

Luster, T., & Dubow, E. (1992). Home environment and maternal intelligence as predictors of verbal intelligence: a comparison of preschool and school-age children. *Merrill-Palmer Quarterly*, **38** (2), 151–175.

Lynch, M.A., & Roberts, J. (1982). *Consequences of child abuse*. London: Academic Press.

Maccoby, E.E., & Jacklin, C.N. (1984). *The psychology of sex differences*. Stanford, CA: Stanford University Press.

McFadyen, R.G., & Kitson, W.J.H. (1996). Language comprehension and expression among adolescents who have experienced childhood physical abuse. *Journal of Child Psychology, Psychiatry & Allied Disciplines*, **37** (5), 551–562.

Moore, T. (1968). Language and intelligence: a longitudinal study of the first eight years. *Human Development*, **11** (1), 88–106.

Morisset, C.E., Barnard, K.E., & Booth, C.L. (1995). Toddlers' language development: sex differences within social risk. *Developmental Psychology*, **31** (5), 851–865.

Moss, H.A. (1967). Sex, age, and state as determinants of mother–infant interaction. *Merrill-Palmer Quarterly*, **13**, 19–36.

Murray, L., Fiori-Cowley, A., Hooper, R., & Cooper, P. (1996). The impact of postnatal depression and associated adversity on early mother–infant interactions and later infant outcome. *Child Development*, **67**, 2512–2526.

National Research Council (1993). *Understanding child abuse and neglect*. Washington, DC: National Academy Press.

Nelson, K., & Bonvillian, J. (1973). Concepts and words in the 18-month-old: acquiring concept names under controlled conditions. *Cognition*, **2**, 435–450.

Newport, E.L., Gleitman, H., & Gleitman, L.R. (1979). Mother, I'd rather do it myself: some effects and non-effects of maternal speech style. In C.E. Snow & C.A. Ferguson (Eds.), *Talking to children* (pp. 109–149). Cambridge: Cambridge University Press.

Phillips, J. (1973). Syntax and vocabulary of mothers' speech to young children: age and sex comparisons. *Child Development*, **44**, 182–185.

Pianta, R., Egeland, B., & Erickson, M.F. (1989). The antecedents of child maltreatment: results of the mother–child interaction research project. In D. Cicchetti & V. Carlson (Eds.), *Child maltreatment: Theory and research on the causes and consequences of child abuse and neglect* (pp. 203–253). New York: Cambridge University Press.

Pye, C. (1986). Quiche Mayan speech to children. *Journal of Child Language*, **13**, 85–100.

Rescorla, L., & Schwartz, E. (1988). Outcome of specific expressive language delay. Paper presented at the International Conference on Infant Studies, Washington, DC, April.

Rogosch, F., Cicchetti, D., Shields, A., & Toth, S.L. (1995). Parenting dysfunction in child maltreatment. In M.H. Bornstein

(Ed.), *Handbook of parenting* (Vol. 4, pp. 127–159). Hillsdale, NJ: Erlbaum.

Saffran, J.R., Aslin, R.N., & Newport, E.L. (1996). Statistical learning by 8-month-old infants. *Science*, **274**, 1926–1928.

Sattler, J.M. (1992). *Assessment of children: Revised and updated third edition*. San Diego, CA: Jerome M. Sattler, Inc.

Scarborough, H. (1990). Index of Productive Syntax. *Applied Psycholinguistics*, **11**, 1–22.

Scarborough, H.S., & Dobrich, W. (1985). Illusory recovery from early language delay. Paper presented at the Wisconsin Symposium on Research in Child Language Disorders, Madison, WI.

Scarborough, H.S., Rescorla, L., Tager-Flusberg, H., Fowler, A.E., & Sudhalter, V. (1991). Relation of utterance length to grammatical complexity in normal or language-disordered groups. *Applied Psycholinguistics*, **12**, 23–45.

Shatz, M., Hoff-Ginsberg, E., & Maciver, D. (1989). Induction and the acquisition of English auxiliaries: the effects of differentially enriched input. *Journal of Child Language*, **16** (1), 121–140.

Silva, P.A., & Fergusson, D. (1980). Some factors contributing to language development in three year old children: a report from the Dunedin Multidisciplinary Child Development Study. *British Journal of Disorders of Communication*, **15** (3), 205–214.

Smolak, L., & Weinraub, M. (1983). Maternal speech: strategy or response? *Journal of Child Language*, **10**, 369–380.

Sokolov, J.L., & Snow, C.E. (1994). The changing role of negative evidence in theories of language development. In C. Gallaway & B.J. Richards (Eds.), *Input and interaction in language acquisition* (pp. 38–53). New York: Cambridge University Press.

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.

Tomasello, M., & Farrar, M. (1986). Joint attention and early language. *Child Development*, **57** (7), 1454–1463.

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

Trickett, P., & McBride-Chang, C. (1995). The developmental impact of different types of abuse and neglect. *Developmental Review*, **15**, 311–337.

Wechsler, D. (1955). *Manual for the Wechsler Adult Intelligence Scale* (1st edn.). New York: Psychological Corporation.

Wechsler, D. (1991). *Manual of the Wechsler Intelligence Scale for Children – Third edition*. New York: Psychological Corporation.

Wells, G.C. (1985). *Language development in the pre-school years*. Cambridge: Cambridge University Press.

Westerman, M., & Haustead, L.F. (1982). A pattern-oriented model of caretaker–child interaction, psychopathology and control. In K. Nelson (Ed.), *Children's language* (Vol. 3, pp. 204–246). Hillsdale, NJ: Erlbaum.

Wexler, K., & Culicover, P. (1980). *Formal principles of language acquisition*. Cambridge, MA: MIT Press.

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