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Do Early Talkers Become Early Readers? Linguistic Precocity, Preschool Language, and Emergent Literacy

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Twenty-five children, selected for verbal precocity at 20 months of age, participated in a longitudinal study investigating predictors of later language and literacy skills. Although children remained verbally precocious, there was a low incidence of precocious reading. Exposure to instruction in letter names and sounds was a significant predictor of children's knowledge of print conventions, invented spelling, and phonological awareness at age 4½. Frequency of story reading in the home and child engagement in a story reading episode at age 24 months were significant predictors of children's language ability at age 2½ and 4½ and knowledge of print conventions at age 4½. It is concluded that story reading with parents as well as literacy instruction contributes to the development of emergent literacy in verbally precocious children.

What is the significance of verbal precocity? Are there implications for later related skills such as reading? Wells (1987) pointed out that literacy, like oral language, is acquired through a child's active sense making of data encountered in adult–child interaction. However, literacy, even more than oral language, seems to require specific kinds of input (e.g., books and print; McCormick & Mason, 1986; Snow, 1983). How dependent is literacy development on language skill compared with literacy exposure? The study reported here was undertaken to relate linguistically precocious children's early verbal skills, parent–child interaction patterns, and instructional experiences to their later language and literacy skills. We wondered, for example, whether early talkers would tend to become early readers, and if not, what experiences would determine who did.

Little is known regarding the phenomenon of linguistic precocity. This article is based on one of the first studies to investigate longitudinally the development of children who talked early. Previous results of this project have demonstrated that exceptional language at 20 months is maintained at 24 months and 2½ years; however, linguistic precocity does not necessarily extend to nonverbal ability at these early ages (Robinson, Dale, & Landesman, 1990). In the present study, we had the opportunity to investigate the stability of linguistic precocity across a much wider age span. Thus, our first research question involved the predictive significance of linguistic precocity at age 20 months to verbal ability at 4½ years at both the group and individual difference levels.

Linguistic precocity may manifest itself in the preschool period in a broader range of language skills than just vocabulary and syntax as the nature and function of language expand. In particular, we suspected that reading acquisition would be enhanced if children were verbally gifted. Certainly, children's verbal ability is correlated with their reading achievement, especially in the later elementary grades (Curtis, 1980). In fact, early verbal ability is a better predictor of reading achievement after Grade 4 than early reading skill for both precocious (Mills & Jackson, 1990) and nonprecocious (Curtis, 1980) readers.

Children with language difficulties tend to have difficulty learning to read, suggesting that verbal ability provides a ceiling on reading achievement (Aram & Nation, 1980). Scarborough (1990) provided interesting data regarding linguistic precursors to dyslexia. She found that early linguistic measures differentiated children who later learned to read normally from children who were later identified as dyslexic. At the other end of the ability continuum, precocious readers tend to score high on measures of verbal intelligence (Cassidy & Vukelich, 1980; Jackson, in press). The exact relationship between verbal ability and reading precocity remains unclear, however. In a recent review, Jackson (in press) concluded that high verbal ability is neither necessary nor sufficient for reading precocity.

Research on phonological awareness provides another connection between language ability and reading achievement. The ability to hear and manipulate phonemes in listening tasks is a strong predictor and correlate of reading achievement throughout the early school years (Share, Jorm, Maclean, & Matthews, 1984; Stanovich, Cunningham, & Cramer, 1984). Bradley and Bryant (1983) showed that phonological awareness can be trained and that this training makes a difference in reading acquisition. Phonological disabilities have been suggested as a causal factor in reading disability (Stanovich, 1986). This is not a simple causal relationship, however, because the very process of learning to read influences the development of these metaphonological skills (Ehri, 1979; Morais, Carey,

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Alegria, & Bertelson, 1979; Perfetti, Beck, Bell, & Hughes, 1988).

Although reading is clearly different from oral language and is not acquired as effortlessly, similar processes may be involved in the acquisition of each. For example, similar parent–child interaction patterns have been suggested as facilitators of language and reading development (Snow, 1983). The ability to form and test hypotheses about unstructured linguistic data may be essential for the development of both language and literacy (Wells, 1987). Finally, socially and culturally specified discourse patterns play a role in both language and literacy development (Heath, 1983; Wells, 1985a).

Instructional and exposure variables, as well as language skill variables, appear to influence the development of reading skill. Several studies have suggested that exposure to literate activity through parent–child story reading is related to reading achievement. Frequency of story reading in the home is correlated with later literacy (Chomsky, 1972; Wells, 1985b). Parent–child engagement in story reading is related to concurrently measured emergent literacy (Bus & Van IJzendoorn, 1988). A highly interactive story-reading style can enhance children's oral language skills (Whitehurst et al., 1988). In a study of precocious readers, parents denied teaching their children to read, but they all reported high involvement in activities such as reading and discussing stories with their children as well as identifying letter names and sounds (Clark, 1984).

There are several interpretations of the role of story reading in the development of language and literacy. Story reading with parents may provide informal instruction regarding how one interacts with a book, teaching what Snow and Ninio (1986) called "contracts of literacy." Through story interactions, children may learn how to interpret the decontextualized language they will later encounter in school settings (Snow, 1983; Wells, 1985b). A broader interpretation is that, through story reading, children learn cultural ways to take meaning from their environment (Heath, 1982). Children acquire different kinds of knowledge from stories at different ages, beginning with vocabulary knowledge (Ninio & Bruner, 1978) and syntactic structures (Snow & Goldfield, 1983) and progressing to knowledge of print conventions and story structures (Teale, 1984). The breadth of knowledge that can be gleaned from children's books helps to explain why story reading with parents might facilitate language as well as literacy development.

Story reading is only one kind of preschool activity that may promote literacy. Parents and teachers draw children's attention to print conventions and letter–sound correspondences, often in the context of writing activities or manipulation of magnetic letters (Snow, 1983), and these kinds of activities could facilitate reading acquisition. A preponderance of evidence suggests that meaningful instruction in letter–sound correspondences facilitates the acquisition of reading (Chall, 1983; Perfetti, 1985). Current theorists emphasize the importance of many types of instruction, both formal and informal, that involve young children in literate activities (Adams, 1990; Dyson, 1984). We have taken this broad perspective, looking for relationships between the development of literacy and two kinds of opportunities given children to participate in literate activities: story reading with parents and instruction (at home or school) in letter names and sounds.

Although language ability and exposure to literate activity have been clearly shown to be related to literacy, little is known of the specific connections among various ability and experiential measures. The present study explored these relationships as part of a larger longitudinal study of linguistic precocity. The availability of a large number of developmental measures for the same children allowed us to examine the specificity of observed relationships.

Little is known of the prognosis for early talkers. Do early talkers remain verbally precocious, and does this precocity extend to other domains of intelligence? Are early talkers likely to become early readers; and if not, what other factors might influence their emergent literacy? Do instructional variables make a difference in language and literacy outcomes even in verbally precocious children? To answer these questions, we used three kinds of information to predict children's language and literacy skills near kindergarten entry: early verbal ability, exposure to instruction in letter–sound correspondences, and informal exposure to literacy through story reading with parents. Children's verbal ability at age 24 months was assessed with a language sample as well as with standardized measures. Preschool exposure to instruction was assessed with a parent questionnaire administered when the children were 4½ years old. Story reading was assessed in two ways. First, opportunity to participate in story reading was assessed by asking parents (when the children were 24 months) how often they read to their children. Second, the quality of parent–child story reading was assessed at age 24 months with a behavioral coding of child engagement while the parent read a story. The coding scheme was developed independently but is similar to the one used by Bus and Van IJzendoorn (1988).

Language skills at age 2½ and 4½ and literacy at age 4½ were used as outcomes. Language outcomes were assessed using standardized measures. Four literacy outcomes that have been shown to be predictive of later literacy achievement were chosen: (a) the Reading Recognition subtest of the Peabody Individual Achievement Test (Dunn & Markwardt, 1970), a standardized test of letter knowledge and word reading; (b) Concepts of Print, a measure of print knowledge (Clay, 1972; Wells 1985b); (c) Phoneme Deletion, a commonly used measure of phoneme segmentation skill (Perfetti, Beck, Bell, & Hughes, 1988; and Rosner & Simon, 1971); and (d) a measure of invented spelling skill (Mann, Tobin, & Wilson, 1988; Read, 1986).

It seemed likely that our sample of early talkers would produce several precocious readers, or children who were well-prepared to become readers, showing high phonological awareness and knowledge of print. We defined reading precocity as reading at or above normed or comparative second-grade performance at age 4½ based on the benchmark provided by Jackson, Donaldson, and Cleland's (1988) sample of early readers who could read at or above the third-grade level when they were in kindergarten. We could not compare the prevalence of early reading in our sample with the prevalence of early reading in the general population, because it is unknown for preschool and kindergarten children (cf. Durkin, 1966).

Method

The data reported here were collected as part of a larger study (see Robinson, Dale, & Landesman, 1990), for which children were seen at the ages of 20 months, 24 months, 2½ years, and 4½ years. Selected

data from the 24 month, 2½-year, and 4½-year assessments are reported here.

Subjects

Our 25 subjects remained (after attrition) from a group of 30 children identified as linguistically precocious at 20 months.[1] They were recruited by means of advertisements in the greater Seattle, Washington area. Parents were asked to complete the Early Language Inventory (ELI) developed by Bates and colleagues (Bates, Bretherton, & Snyder, 1988; Dale, Bates, Reznick, & Morisset, 1989). Parents of 86 children responded, and 49 children were selected for an initial assessment at 20 months. Thirty of these children (10 boys, 20 girls) were selected for the longitudinal phase reported here because their performance was two standard deviations above the normed mean on one or more of the following measures: ELI Vocabulary, mean length of utterance (MLU), or Bayley Language subscale (Robinson et al., 1990). These 30 children were assessed again at 24 months, 2½ years, and 4½ years, at which point 25 of them (9 boys and 16 girls) remained in the study (Table 1).

Table 1
Description of Subjects (N = 25) for Longitudinal Sample

Measure	*n*	*M*	*SD*	%
Boys	9			36
Girls	16			64
Firstborn	20			80
Mother's education[a]		3.48	2.47	
Father's education[a]		3.70	2.38	
Mother's ethnicity				
White	22			88
Other	3			12

[a] Education codes (estimated years): 1 = some postsecondary education; 2 = Associate of Arts degree or other certificate program; 4 = bachelor's degree; 6 = master's degree; 8 = doctorate in an area such as philosophy, medicine, or law.

Measures

There were three classes of predictor variables: measures of cognitive and language ability administered at age 24 months; a measure of child engagement during story reading at age 24 months; and parental reports of child exposure to literacy collected when children were 24 months and 4½ years. There were two classes of outcome variables: language and cognitive measures at ages 2½ and 4½ and literacy measures at age 4½.

Predictors: Language and cognitive abilities at 24 months. The following tests were administered to the children at 24 months to predict language and cognitive abilities:

1. Peabody Picture Vocabulary Test-Revised (PPVT-R): This test is a standardized measure of receptive vocabulary (Dunn & Dunn, 1981).

2. MLU: MLU was computed following the procedures suggested in Miller (1981) based on a 200-utterance language sample videotaped during free play with the child's mother.

3. Stanford-Binet IV (S-B IV): This is a standardized measure of cognitive ability. Both the total test composite score (TCMP) and the verbal reasoning subscale (Verbal) are used in our analyses.

Predictors: Story-reading engagement at 24 months. Each mother was videotaped reading stories with her child during the laboratory visit at age 24 months.[2] The story used for the present analysis is *The Very Hungry Caterpillar* (Carle, 1969). The mother was asked to read and talk about the story "as she did at home." Maternal and child utterances were transcribed and coded according to function (e.g., questioning, reading, responding, simplifying). In addition, both verbal and nonverbal child behavior was coded as an index of story engagement. After each maternal utterance, the child's engagement was coded. This variable is reported as a percentage: engaged codes/total behaviors coded. Interrater agreement was .89 for nonverbal engagement and .94 for verbal engagement. Disagreements were resolved by discussion.

Predictors: Parental report of literacy exposure. Two parental reports of child literacy exposure were used as predictors:

1. Frequency of story reading (number of times per week) reported at age 24 months.

2. Preschool exposure to instruction in letter names and sounds retrospectively reported when children were 4½ years, coded as 0 (no exposure), 1 (exposure reported either at home or preschool), or 2 (exposure reported at both home and preschool).

Outcomes: Language at age 2½ years. Two tests were used to determine language skills at 2½ years:

1. PPVT-R.

2. Test of Auditory Comprehension of Language-Revised (TACL-R), Elaborated Sentences subtest, which is a standardized test of syntactic comprehension.

Outcomes: Language and cognition at age 4½ years. Four tests were used to determine language and cognitive skills at 4½ years:

1. PPVT-R.

2. TACL-R Elaborated Sentences subtest.

3. Wechsler Preschool and Primary Scales of Intelligence-Revised (WPPSI-R), Information subtest, which is a standardized measure of verbally encoded knowledge in which the child is asked questions similar to "How many legs does a dog have?"

4. WPPSI-R, Block Design subtest: This is a standardized test of visual analytic ability. This test is included to evaluate the specificity of the relationships among the predictor variables and among language and nonverbal cognitive outcomes.

Outcomes: Literacy at 4½ years. Four tests were used to determine literacy at 4½ years:

1. Peabody Individual Achievement Test (PIAT), Reading Recognition subtest, which is a measure of reading ability, including letter naming, word matching, and word naming.

2. Concepts of print: This is a 24-point scale developed by Clay (1972) to assess knowledge of print conventions. It uses a short story, *Sand,* which the experimenter reads, stopping to ask questions such as "Where should I read next?" The scores range from 0, for children who cannot find the front of the book, to 24, for children who can almost read the book.

3. Phoneme deletion: This is a 24-item aurally presented task based on work by Rosner and Simon (1971). It includes 8 syllable-deletion items, 8 initial phoneme-deletion items, and 8 final phoneme-deletion items.

4. Invented spelling: In this measure, which is based on work by Mann et al. (1988), children are asked to write eight short words and phrases (i.e., red, name, fish, boat, color, angry, thank you, dog). Responses receive from 0 to 4 points on the basis of whether sound-based relationships and knowledge of letter names are used in the spelling.

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[1] Regarding the phrase *early talkers,* we did not directly observe the children until they were 20 months old, and they were selected for the longitudinal study on the basis of laboratory and home observations at that age. However, parents reported that the children began talking at an average age of 7.2 months, which is quite early. Furthermore, parental report of age at first spoken words was correlated −.54 with total vocabulary at 20 months, suggesting some validity for this report.

[2] Only mothers brought children to the laboratory. We did not specifically exclude fathers.

The scores were derived as follows: ½ point is given for single-letter responses in which the letter represents a noninitial phoneme (e.g., "s" for fish); 1 point is given for single-letter responses in which the letter represents the initial phoneme (e.g., "f" for fish); 2 points are given for preconventional spellings that represent more than one phoneme of the word (e.g., "fs" for fish); 3 points are given for preconventional spellings that represent every phoneme of the word (e.g., "fes" for fish); 4 points are given for conventionally spelled words.

Results and Discussion

Maintenance of Verbal Precocity

The present sample of precocious talkers remained verbally precocious over the preschool period. Descriptive statistics are presented in Table 2 for the cognitive and linguistic ability measures administered at each of the three visits (at 24 months, 2½ years, and 4½ years). There was substantial variability on most of the measures, except for the S-B IV, which showed diminished variability from the normed standard deviation of 16.

Incidence of Early Reading

Contrary to our expectation, mean performance on the literacy outcome measures was not markedly precocious (Table 3). Only 1 child in the sample was reading at or above the second-grade level on the PIAT Reading Recognition subtest when assessed at age 4½, and only 3 subjects were able to read more than one word on this test. The mean PIAT performance, a grade equivalent of 1.2, reflects knowledge of letter names and good visual discrimination but little or no word reading.

Consistent with their modest mean performance at 4½ years on the PIAT, the children were not markedly precocious on the other three literacy outcome measures relative to published reports of the mean performance of broader samples of children. On Concepts of Print, our sample's mean score of 8.9 falls in the fourth stanine relative to 320 urban New Zealand children aged 5 to 7 years (Clay, 1972). On phoneme deletion, our sample's mean performance is somewhat comparable to that achieved by a sample of 49 kindergarten children (Stanovich et al., 1984). This comparison is not ideal because Stanovich et al. only administered the initial phoneme portion of the task. On the initial phoneme-deletion task, their sample's mean performance was 2.53 (SD = 3.67) of a maximum of 10. Our sample's mean performance on just the initial phoneme-deletion task was 1.4 (SD = 2.8) of a maximum of 8. Finally, on the invented spelling measure, our precocious sample's mean performance of 5.52 (SD = 8.85) of a maximum of 32 points is relatively low compared with the mean of 20 (SD = 4.22) of a maximum of 40 points achieved by a group of 29 kindergarten children (Mann et al., 1988).

Consistent with our conclusion that verbally precocious children are not likely to be early readers is correlational evidence that language and literacy are separable abilities at 4½ years in this group of children. Table 4 shows correlations among measures administered at 4½ years. The language measures are moderately intercorrelated, but they are not related to literacy measures, which show strong relationships to one another.

Exposure to Literate Activity

Because our early talkers were not, as a group, early readers, we next turned to instructional variables that might predict individual differences in literacy and language outcomes. There was a great deal of variability in the parent report of reading in the home and in preschool exposure to instruction in letter names and sounds (Table 5), even though these children were from similar backgrounds. All but 1 child had attended preschool for at least 9 months.

Beyond the number of opportunities children had to learn about literacy, we wondered if there were differences in the quality of parent–child interaction that might make a difference in language or literacy outcomes. We thus collected observational data on parent–child interaction while reading a story (see Table 5). The interactions were analyzed at the level of utterance functions (e.g., questions, reading, simplifying) and in terms of child engagement in the interaction.

Child engagement in the story-reading episode showed greater predictive validity than either proportion or frequency of specific parental utterance functions (e.g., questions, responses, simplifications) or proportion or frequency of child utterance functions (e.g., questions, statements, responses). Moreover, child engagement was not strongly related to a particular pattern of adult–child discourse. There were no significant

Table 2
Performance on 24-Month, 2½-Year, and 4½-Year Language and Cognitive Measures

Measure	24 months		2½ years		4½ years	
	M	*SD*	*M*	*SD*	*M*	*SD*
PPVT-R age equivalent (months)	36.3	4.8	45.8	5.7	73.6	11.7
TACL-R age equivalent (months)	—	—	36.4	6.9	79.2	15.1
MLU	3.2[a]	.6				
S-B IV TCMP scaled (M = 100, SD = 16)	118.5	4.8	124.8	6.5	—	—
S-B IV Verbal scaled (M = 100, SD = 16)	118.0	6.0	127.3	8.5		
WPPSI-R Information scaled (M = 10, SD = 3)	—	—	—	—	14.9	2.3
WPPSI-R Block Design scaled (M = 10, SD = 3)	—	—	—	—	10.5	2.2

Note. PPVT-R = Peabody Picture Vocabulary Test-Revised; TACL-R = Test of Auditory Comprehension of Language-Revised; MLU = mean length of utterance; S-B IV TCMP = Stanford-Binet IV Test Composite; WPPSI-R = Wechsler Preschool and Primary Scales of Intelligence-Revised.
[a] Estimated age equivalent from Miller (1981) is 36.1 months.

Table 3
Performance on 4½-Year Literacy Measures

Measure	*M*	*SD*
PIAT reading recognition grade equivalent[a]	1.2	0.60
Concepts of Print (maximum = 24)	8.9	3.20
Invented spelling (maximum = 32)	5.52	8.85
Phonological awareness (maximum = 24)	9.36	5.00

Note. PIAT = Peabody Individual Achievement Test.
[a] The grade norms on the PIAT are somewhat dated, and the achievement that used to be typical of children in first grade is now more typical of those in kindergarten. A revised version of the PIAT was published after these data were collected.

correlations between child attention and maternal utterance types, for example, questioning (r = .02), reading (r = .33), or simplifying text (r = −.04). Neither were there significant correlations between frequency or proportion of parental or child utterances types and language or literacy outcomes. Thus, child engagement seems to capture the quality of the interaction more directly than microanalysis of utterance types.

It might be argued that story engagement simply reflects children's intelligence. The intercorrelations among the ability measures and story engagement argue against this interpretation (Table 6). Story-reading engagement is, however, moderately related to frequency of story reading in the home, providing some independent validation of the parent report data. We tentatively conclude that child engagement is not simply a reflection of intelligence or exposure but is potentially an independent source of variance in literacy outcomes.

Predictive Relationships: Literacy Outcomes

Multiple regression analyses, summarized in Table 7, were used to evaluate the predictive power of the early literacy exposure variables to literacy outcomes. In each of the regressions, MLU (the 24-month language variable that generally correlated highest with the later literacy measures) was entered first into the equation, followed by instructional exposure and then by one of the story-reading variables. This strategy provides a relatively conservative test of the hypothesized predictive relationship between literacy exposure and literacy knowledge.

The analyses summarized in Table 7 demonstrate that exposure to instruction in letter–sound correspondences was a significant predictor of knowledge of print conventions (Concepts of Print) and invented spelling and a nearly significant predictor of decoding skill (PIAT) but not of phonological awareness. Phonological awareness, but none of the other literacy variables, is predicted by MLU at 24 months.

The story-reading variables (reported frequency and child engagement) were also predictive of literacy outcomes (see Table 7). Three of the four literacy outcomes were predicted significantly or nearly significantly by at least one of the two measures of story reading, entered into the regression after both language ability and exposure to reading instruction. Neither of the story-reading exposure variables was a significant predictor of the invented spelling outcome; 45% of the variance was explained just by the parent report of exposure to instruction. Spelling skill appears to be more dependent on instruction and less dependent on informal exposure to literacy through story reading than the other literacy outcomes.

The two story-reading variables predicted different aspects of literacy, suggesting that these predictors capture different aspects of exposure to literate activity. Engagement in the story-reading interaction explained a significant portion of the variance in the Concepts of Print outcome measure. Frequency of story reading in the home explained significant portions of the variance in both the PIAT and the phonological awareness outcome measure.

Predictive Relationships: Language and Cognitive Outcomes

The predictive relationships from the 24-month measures to 2½- and 4½-year language and cognitive measures are reported in Tables 8 and 9. Similar analyses (not reported in the tables) showed that exposure to instruction was not a significant predictor of any of these language outcomes. The role of instruction in letter names and sounds is limited to facilitating knowledge of literacy rather specifically.

In contrast, exposure to story reading showed significant re-

Table 4
Intercorrelations Among 4½-Year Measures

Measure	1	2	3	4	5	6	7	8
1. PPVT-R	—	.34	.46*	−.42*	−.35	−.16	−.21	−.30
2. TACL-R		—	.39	.12	.08	.16	.13	.14
3. WPPSI-R Information			—	−.04	.14	.06	.02	.14
4. WPPSI-R Block Design				—	.26	.45*	.29	.12
5. PIAT					—	.64**	.69**	.59**
6. Concepts of print						—	.79**	.48*
7. Invented spelling							—	.65**
8. Phonological awareness								—

Note. PPVT-R = Peabody Picture Vocabulary Test-Revised; TACL-R = Test of Auditory Comprehension of Language-Revised; WPPSI-R = Wechsler Preschool and Primary Scales of Intelligence-Revised; PIAT = Peabody Individual Achievement Test. Correlations are two-tailed. Each correlation coefficient is computed using the number of subjects completing the measures, ranging from n = 22 to n = 25.
* $p < .05$. ** $p < .01$.

Table 5
Parent Report at 24 Months and 4½ Years and Story Episode at 24 Months

Variable	*n*	Frequency			
		M	*SD*	Minimum	Maximum
Parent report at 24 months of story reading (per week)		16.48	8.10	1	30
Parent report at 4½ years of instruction					
No instruction	12				
Home or school	10				
Home and school	3				
Characteristics of story episode at 24 months					
Total maternal utterances		76.5	36.0	40	191
Child behaviors coded		77.6	36.7	38	192
Total child utterances		26.0	15.0	5	66
Proportion of child engagement		83%	18%	40%	100%

Note. $N = 25$.

lationships to several of our broader language and cognitive outcome measures. In each of the regressions in Tables 8 and 9, the 24-month language measure with the strongest pattern of correlation to the relevant 4½-year variable was entered first into the equation, followed by one of the story-reading variables. For the 4½-year language variables, this was the 24-month PPVT-R score; for the 4½-year cognitive variables, this was the 24-month S-B IV test composite score. Again, this strategy was followed to provide a conservative test of the predictive power of the story-reading variables.

Looking first at the 2½-year outcome measures, either story-reading frequency or story-reading engagement (but not both simultaneously) significantly predicts syntactic comprehension at 2½ years (TACL-R). The story-reading engagement variable was also a significant predictor of vocabulary development at 2½ years (PPVT-R).

At 4½ years, the relationship of story reading to outcomes is somewhat different. No longer do the story-reading variables predict either syntactic or vocabulary knowledge (tables not shown). Either, but not both, of the variables significantly predicts performance on the test of real-world knowledge (WPPSI-R Information subtest), and the story engagement measure is also a significant predictor of the test of analytic ability (WPPSI-R Block Design subtest).

Table 6
Relationship of Story-Reading Variables to Other 24-Month Measures (N = 25)

Variable	Frequency	PPVT-R at 24 months	MLU at 24 months	S-B IV TCMP at 24 months
Engagement	.37*	.16	−.13	.14
Frequency	—	.09	.10	.07

Note. PPVT-R = Peabody Picture Vocabulary Test-Revised; MLU = mean length of utterance; S-B IV TCMP = Stanford-Binet IV Test Composite. Correlations are two-tailed.
* $p < .10$.

As discussed earlier, an alternative explanation for the relationship between story engagement and the outcome measures is that story engagement is actually an ability variable related to general intelligence. This would explain the predictive relationships between engagement and the two WPPSI-R subtests at 4½ years. We return to this issue in the Conclusion section.

Conclusion

The results of this longitudinal study of linguistic precocity bear on all three of our initial research questions. The first question concerns the maintenance of verbal precocity. The mean scores on language outcomes at 4½ years, shown in Table 2, remain at a high level. There is also stability of individual differences within the sample: 24-month PPVT-R scores are correlated at $r = .47$ with 4½-year PPVT-R scores. In addition, the relative dissociation of verbal and nonverbal abilities observed at earlier ages (Robinson et al., 1990) continues to be apparent (see Table 4).

The second research question asked whether linguistic precocity extends to literacy. Although early talkers remain verbally precocious into the preschool period, they are not especially likely to read early. Only 1 of these 25 precocious children was reading at the second-grade level or above at the age of 4½. Performance on the three additional literacy measures (Concepts of Print, phonological awareness, and invented spelling) was generally at the kindergarten level, which is only modestly accelerated. In addition, measures of language and literacy at 4½ years were only weakly correlated.

At the level of individual differences, early language measures were not significant predictors of literacy outcomes. Because the children in our study were selected for verbal precocity, one might suspect restricted range and lack of variability in our predictor language variables as a potential explanation for their lack of predictive power. This does not appear to be the case. Because the PPVT-R and TACL-R were presented below the ages at which the tests are normed, age equivalents are presented for consistency in Table 2. However, scaled scores are available for the PPVT-R at 2½ years and 4½ years and for the

Table 7
Predictive Relationships: 4½-Year Literacy Outcomes (N = 25)

Predictor	PIAT		Concepts of Print		Phonological awareness		Invented spelling	
	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2
Analysis 1								
MLU at 24 months	.104	.011	−.018	.000	.539	.291***	.333	.111
Instruction at 4½ years	.398	.151*	.557	.296***	.329	.091	.690	.455***
Story frequency at 24 months	.381	.144**	.300	.089*	.357	.127*	−.115	.013
Analysis 2								
MLU at 24 months	.104	.011	−.018	.000	.539	.291***	.333	.111
Instruction at 4½ years	.398	.151*	.557	.296***	.329	.091	.690	.455***
Story engagement at 24 months	.177	.030	.397	.153**	−.064	.004	.040	.001

Note. PIAT = Peabody Individual Achievement Test; MLU = mean length of utterance.
* $p < .10$. ** $p < .05$. *** $p < .01$.

TACL-R Elaborated Sentences at 4½ years; the standard deviations for these measures are 11.1, 12.4, and 10.3, respectively. These measures of variability, like those for the WPSSI-R Information and Block Design subtests, are only modestly below published norms. Only the S-B IV measures have substantially reduced variability.

The single exception to the nonsignificant prediction of literacy outcomes by early language measures is the substantial correlation of MLU at 24 months with phonological awareness at 4½ years. In the absence of additional measures, this finding is difficult to interpret unambiguously. MLU at 24 months reflects to a great extent the mastery of inflections and function words, which requires a systematic analysis of sentences. Such an analytic approach may be an important part of metalinguistic awareness as well. Consistent with such a connection is the observation by de Villiers and de Villiers (1974) of a close relationship between MLU and the developing ability to make syntactic judgments and corrections in the preschool period.

Thus, on the whole, language and literacy do not appear to be substantially related in the present sample. Because we did not include a control group in our design, we cannot evaluate developmental differences between precocious talkers and typically developing children. To help place our findings in broader perspective, however, we can compare them with those of previous investigations of the relationship between verbal ability and literacy. Verbal ability is highly correlated with reading achievement in both language-delayed children (Aram & Nation, 1980) and typically developing children, particularly after fourth grade (Curtis, 1980). The contrast between these conclusions and the results of the present study is understandable on the plausible hypothesis that learning to read requires multiple skills, including verbal, spatial, and other nonverbal analytic skills. The initial stages in reading acquisition may be limited by the least advanced segment of the child's cognitive profile. It is also relevant that, for normally developing children, the correlations between language and literacy measures become stronger in the middle elementary grades (Curtis, 1980), as the task of reading changes from primarily word recognition to comprehension of text. We hypothesize that the reading achievement of the present precocious sample will show a stronger relationship to verbal ability in the later grades (cf. Mills & Jackson, 1990).

The third question guiding the present research is the identification of literacy exposure variables that account for variance in emergent literacy of linguistically precocious children. Two aspects of the present results contribute to this identification. First, exposure to instruction in letter names and sounds during the preschool years is positively associated with verbally

Table 8
Predictive Relationships: Language and Cognitive Outcomes at 2½ Years (N = 25)

Predictor	TACL-R		PPVT-R	
	β	ΔR^2	β	ΔR^2
Analysis 1				
PPVT-R at 24 months	−.084	.012	.417	.202*
Story frequency at 24 months	.441	.194*	.259	.066
Analysis 2				
PPVT-R at 24 months	−.103	.012	.339	.202*
Story engagement at 24 months	.428	.183*	.506	.244**

Note. TACL-R = Test of Auditory Comprehension of Language-Revised; PPVT-R = Peabody Picture Vocabulary Test-Revised.
* $p < .05$. ** $p < .01$.

Table 9
Predictive Relationships: Language and Cognitive Outcomes at 4½ Years (N = 25)

Predictor	WPPSI-R Information		WPPSI-R Block Design	
	β	ΔR^2	β	ΔR^2
Analysis 1				
S-B IV TCMP at 24 months	.304	.112	−.123	.013
Story frequency at 24 months	.464	.214*	.155	.024
Analysis 2				
S-B IV TCMP at 24 months	.270	.112	−.174	.013
Story engagement at 24 months	.453	.201*	.426	.178*

Note. WPPSI-R = Wechsler Preschool and Primary Scales of Intelligence-Revised; S-B IV TCMP = Stanford-Binet IV Test Composite.
* $p < .05$.

precocious children's performance on measures of phonological awareness, invented spelling, word decoding, and concepts of print before kindergarten entry. It has been argued that letter names and sounds are best taught in the context of meaningful literate activity (McCormick & Mason, 1986). Our questionnaire data regarding exposure to instruction do not provide sufficiently precise information about the instruction to allow us to address this issue. It should be kept in mind, however, that the kinds of preschool reading instruction that are appropriate for verbally advanced children may not be appropriate for children who are not already verbally advanced. Further research is needed to determine the most effective forms of reading instruction for preschool children of varying ability levels.

In addition, story reading with parents was found to play a role in literacy and language development beyond that played by reading instruction and early language ability. These results add to accumulating evidence that storybook reading is an important way in which parents prepare their children to become readers (e.g., Wells, 1985b). It is striking to find such a strong relationship between story-reading variables and language outcomes even within a group selected for linguistic precocity. This relationship is borne out with measures of vocabulary development, syntactic development, and the development of real-world knowledge.

These results also provide further evidence for the hypothesis that what is learned from books changes with development. At 2½ years, the child's focus is vocabulary and syntax acquisition; therefore, story-reading exposure predicts vocabulary and syntactic knowledge 6 months later. This finding is consistent with research on nonprecocious children as well (e.g., Ninio & Bruner, 1978; Snow & Goldfield, 1983; Whitehurst et al., 1988). At age 4½, these highly capable children were no longer learning labels from books; rather, they were focusing on more complex linguistic and cognitive constructs. Thus, we find high correlations with measures of more complex knowledge, such as the WPPSI-R Information and Block Design subtests. These findings suggest that story reading with parents is fueling the growth of knowledge at the "leading edge" of the child's development. This developmental framework suggests several avenues for further research into more complex kinds of knowledge, such as genre or metaphor, that may be acquired through story reading over the long term.

An important methodological implication of this research is clarification of what constitutes an "effective" story-reading interaction. With this sample of precocious children, parental style of story reading showed a great deal of variability. In some engaged dyads, a great deal of parental questioning took place; in other similarly engaged dyads, parents used few questions and read the text more or less straight through, stopping whenever their children asked questions. Whatever the outward style, parents in engaged dyads were apparently in harmony with their own children. We found that measures of child engagement proved superior at capturing the quality of the interaction over measures of parental behavior. Although interaction style is an important variable (cf. Whitehurst et al., 1988), it may not be the measure of choice on which to compare dyads, especially given the similarity of background in our sample. Furthermore, it is known that parental story-reading style varies because of the developmental level of the child (Bus & Van IJzendoorn, 1988), familiarity of the book (Yaden, 1988), as well as storytelling style of the reader (Dickinson & Keebler, 1989).

The story-engagement variable was not correlated with concurrent child ability measures but was predictive of language, cognitive, and literacy outcomes. Two explanations suggest themselves. First, story engagement may be capturing how well the child has learned to use books as a tool for acquiring knowledge or, in Heath's (1982) terms, cultural "ways of taking" from the environment. Second, story engagement may be a better measure of intelligence than early standardized assessments. It is well known that early standardized measures are not good predictors of later abilities (Robinson, in press) perhaps because of their artificial, decontextualized nature for the very young child. Consistent with this interpretation, in our data the 24-month S-B IV was not a significant predictor of performance on the 4½-year WPPSI-R subtests. On the other hand, if story reading is an early indicator of intelligence, it should predict performance on later IQ measures. Although story engagement at 24 months was predictive of the two WPPSI-R subtests at 4½ years, it did not predict S-B IV performance at 2½ years (r = .18). We tentatively have drawn the conclusion that each of these explanations is partially true. Children learn cultural ways of learning and knowing through interactions with parents during their preschool years. Engagement in story reading is one measure of how effectively children have learned how to learn. These ways of learning influence the development of the abilities that are later measured with standardized intelligence tests. Thus, engagement is highly predictive of later performance on such tests. We stress that this is but a tentative interpretation of correlational data at this point, and further empirical work is needed to determine causal relationships.

Regardless of why children become engaged in stories, our data suggest that children who have more opportunities to read stories with parents and who take advantage of such opportunities through engagement learn something from story reading about both language and literacy. This conclusion is consistent with experimental work showing that story reading can directly influence the growth of language skills (Whitehurst et al., 1988). Heath (1982) and Wells (1985b), among others, have underscored the importance of story reading in the home as a way in which parents prepare children for the world of school. Our data support this contention, suggesting that story reading with parents develops verbal skills as well as knowledge of how print works, even in verbally precocious children. Finally, our findings suggest that story reading with parents and early reading instruction contribute independently to the development of literacy. Both kinds of experiences can be part of an authentic literate environment.

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