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What is This?
Language delays of impoverished preschool children in relation to early academic and emotion recognition skills

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Abstract
Prevalence of delayed language vs. normative language was examined in impoverished preschool children. On the basis of vocabulary, syntax comprehension, and syntax expression, 336 4-year-olds attending Head Start preschools in the US were assigned to five language status categories. A majority of these children living in poverty demonstrated clinically significant language delays, and this held true equally for Majority (White European) and Minority (here African-American or Latino) children. Many of the children living in poverty showed delays that place them in Strong Delay or Moderate Delay status rather than Mild Delay status. Moreover, as children's language status declined from High Language to Low-Average Language to the three increasingly strong language delays, their academic and socioemotional skills decreased systematically. This conclusion holds, with large effect sizes, for emotion recognition skills, basic mathematics, print knowledge, phonological elision, and phonological blending. Given the high prevalence of language delays and the strong associations of language status levels to multiple skills considered important for school readiness, it may be advisable in intervention, education, and clinical service programs to expand the use of high-quality and high-quantity language teaching and language therapy procedures. Further, it is suggested that making more adjustments in instruction to current levels of language mastery by children in poverty might facilitate instructional effectiveness in most preschool skill domains. These recommendations are discussed in relation to dynamic systems theory and prior intervention studies.

Keywords
language delay, language teaching, poverty, preschool, school readiness

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Many clues in the literature on children’s development suggest that language delay in preschool children at ages 3–5 years can negatively impact learning in a broad variety of academic, emotional, and social domains. Yet there are many gaps in our understanding so far as to how strongly language delay is associated with difficulties in learning skills considered essential in school. In addition, most preschool samples of language-delayed children have been small and have not permitted systematic analysis of possible varied impacts of degrees of delay. Having more refined information on the actual degrees of language delay will help frame new inquiries into the origins in low-income communities of language delay. Such information also will help frame new innovative interventions to aid teachers and/or parents of preschool children in facilitating language skills of children whose risk of later low achievement in school appears very high from longitudinal studies so far conducted.

Some of the most troubling prior findings are from small to moderate samples of language-delayed preschool children followed longitudinally into adolescence. These few studies all converge in suggesting that, in comparison with children with no substantial language delay in the preschool, the early-delayed children at adolescence continue to have significantly lower oral language skills and now also show deficient literacy and overall academic achievement (Johnson et al., 1999; Records, Tomblin, & Freese, 1992; Rescorla, 2005; Snow, Porche, Tabors, & Harris, 2007; Stothard, Snowling, Bishop, Chipchase, & Kaplan, 1998). Children with language delays are likely to experience difficulties in all areas of their academic development.

For example, math achievement also has been shown to be substantially lower in adolescents identified with language delay in preschool and kindergarten. In one of the larger studies of this kind, Johnson et al. (1999) found that youth with a history of prior language delay at age 5 years averaged one standard deviation below language-typical children on measures of math achievement.

When samples of preschool children have included a fairly representative mix of socioeconomic status (SES) levels, moderately positive associations have been reported between concurrent language and academic skills at both preschool (3–5 years) and kindergarten through Grade 6 (12 years) levels. Some such studies have shown additionally that vocabulary and grammatical skills at preschool are strong predictors of later academic success or disability in reading and writing (Catts, Fey, Zhang, & Tomblin, 1999; Johnson et al., 1999; Scarborough, 1998, 2001; Snow et al., 2007; Stothard et al., 1998). Further, most observers have found that preschool children in poverty score on average at significantly lower oral language levels than preschool children outside poverty conditions (Hart & Risley, 1995; NICHD, 1998; Snow, Tabors, & Dickinson, 2001; Tomblin et al., 1997; Whitehurst & Fischel, 2000). In view of the multiple relations between preschool language skills and multiple other domains of skill, both concurrently and in longitudinal follow-ups at ages 7–17 years, there has been much stress placed upon the importance of improving the preschool language skills of children in poverty (Bishop & Adams, 1990; Catts et al., 1999; Landry, Smith, Miller-Loncar, & Swank, 1997; Landry, Swank, Smith, Assel, & Gunnewig, 2006; Scarborough, 1998; Snow, Burns, & Griffin, 1998; Whitehurst et al., 1994).

Taken as a whole, then, multiple prior studies show that for children with relatively low vs. high language skills there frequently are lower concurrent skills in cognitive and social-emotional domains at preschool and kindergarten levels as well as later cognitive
and academic achievement deficits at 7–18 years of age when follow-ups have been provided. The research also shows that the risks for low language skills are higher for children in poverty than for their wealthier peers.

Multiple authors working within dynamic systems frameworks have addressed issues of what patterns of factors may contribute to slow progress as opposed to average or high rates of progress in language acquisition at 2–5 years of age (e.g., Bornstein & Tamis-LeMonda, 1989; Nelson, 1987, 1989; Nelson, Welsh, Camarata, Heimann, & Tjus, 2001; Thelen & Smith, 1994, 2006). Dynamic systems models view language learning as the process of complex interactions between the child’s characteristics and environmental contexts, and these models highlight that language learning is a system which may be strongly affected by relatively small shifts in the details of ongoing conversational exchange and social-emotional engagement (Gogate, Walker-Andrews, & Bahrick, 2001; Nelson, Craven, Xuan, & Arkenberg, 2004; Thelen & Smith, 1994). In the case of children in poverty who on average are making slower than normative progress, there are multiple clues across studies that on average multiple components of a favorable language learning environment are less often seen when the children are in their homes or in preschools they attend as compared with the same components for children from wealthier communities. For example, children in poverty are presented with fewer language challenges, fewer interactive language exchanges between child and adult, lower sensitivity to child topic and child characteristics, and fewer adult scaffolding strategies that ease the child’s attention, processing, and learning (Evans, 2004; Hart & Risley, 1995; Huttenlocher, Haight, Bryk, Seltzer, & Lyon, 1991; Landry, Smith, Swank, Assel, & Vellet, 2001; Weizman & Snow, 2001). In addition, there is convergent evidence from varied investigators that disparate language levels dynamically interact with knowledge structures and ongoing emotional and social processes to determine how much comprehension and learning occur by the child both in informal conversational episodes and in direct teaching episodes (Baker & Nelson, 1984; Bornstein & Tamis-LeMonda, 1989; Camarata, Nelson, Gillum, & Camarata, 2009; Campione & Brown, 1987; Elman et al., 1996; Ladd, Birch, & Buhs, 1999; Nelson & Arkenberg, 2008; Nelson et al., 2004; Rogoff, Turkanis, & Bartlett, 2001; Thelen & Smith, 1994, 2006). At the same time, the literature is far from conclusive about the prevalence of language delay, the nature of the relationships of language delays to other important skills, or pathways through intervention for highly successful remediation of language delays during the preschool years. Variations on dynamic systems may prove helpful as well in framing innovative new interventions for homes and/or preschools that take into account clearly described current skill profiles for children.

One key point unanswered in the prior literature is whether increasingly greater degrees of language delay at the preschool are associated with increasingly greater difficulties in acquiring literacy, mathematics, and socioemotional skills. Another gap in the prior literature is that it has been rare to see highly differentiated specification of the language delay/advance levels of children in poverty and differentiated educational plans that are tailored to the children’s current skill levels.

What has become common in the US is the delivery of federal and state preschool programs intended to reduce the gap by school entry in early academic, social-emotional, and cognitive skills between low-income children and children whose parents
have greater wealth and higher levels of education. Recent data (2007–8) indicate that many separate programs organized by individual states served over 1 million children of ages 3–4 years, with an average expenditure per child of US$4061. Head Start by comparison is the most widely implemented single early childhood education program for children in poverty, and it served in 2007–8 about 921,000 3-year-olds and 4-year-olds across all 50 states with an average expenditure of US$7326 (Early Ed Watch, 2009). Head Start was explicitly developed to reduce socioeconomic disparities in school readiness (US Department of Health and Human Services, 2005), and it is clear from these data that very significant financial and planning resources have been directed to the program. Head Start currently includes among its goals the thorough assessment of children, the identification of any disabilities including language disabilities, and the provision of appropriate special services (such as speech and language therapy) for children with disabilities as well as the delivery of a high-quality curriculum to all children. Despite these clear goals, research indicates that the locally run Head Start centers (with federal funding and guidelines, including some 1600 specific regulations) vary considerably in their training of teachers, their quality of education and their delivery of services (e.g., Early Ed Watch, 2009; Iutcovich, Fiene, Johnson, Koppel, & Langan, 1997; Schweinhart, 2004; Schweinhart et al., 2005; Yoshikawa & Knitzer, 1997).

In the present study, a large sample of 4-year-olds was recruited that was restricted to children in poverty whose parents chose to enroll them in Head Start. Our first research question addressed for these children in poverty the prevalence of categorically different levels of language development, from normative levels to increasingly low levels. Accordingly, we first determined how many children overall fit into each of five categories of language functioning. Two groups were non-delayed in language, with either High/Normative or Low-Average Language status, while the other three were classified as mildly, moderately, or strongly delayed in language. Our second question was whether the prevalence of language delay was different for Minority children (for these communities either African-American or Latino) and White European children. Our third central question was whether early academic skills and social-emotional skills varied systematically according to differentiated language status levels. A fourth question was whether these same skills would also vary in relation to working memory levels, as implied by studies by Case on development in varied domains in the preschool period (Case, 1985, 1998). The skills examined were all skills that have received much emphasis in preschool education in the US in the last 15 years: basic math, emotion recognition, and the emergent literacy skills of print awareness, phonological blending, and phonological elision. The preschool math skills and emergent literacy skills have for many years been considered to be foundations for school-age math and literacy progress. In addition, multiple authors have recently argued that preschool achievement of adequate emotion recognition skills is also an essential component of readiness for learning within the teaching contexts provided at school when children are 5–9 years of age (Raver & Knitzer, 2002; US Department of Health and Human Services, 2001; Vaughn et al., 1992). The answers to these four central questions were expected to hold some important implications for design of educational practices with preschool children in poverty.
Method

Participants

Participants in this study were 336 children from 44 Head Start classrooms in three rural counties in Pennsylvania. At the beginning of the school year, brochures describing the study were distributed to parents of all 4-year-old children. Parents returned the brochures, providing contact information if they were interested in learning more about the study. One additional criterion for participating in our study was the expectation that the child would enter school the following year. Overall, 86% of all eligible families agreed to participate in the study.

The participating children’s mean age was 4;7 (55 months; SD = 3.80 months). Fifty-eight percent of the children were European-American, 25% were African-American, and 17% were Latino. Fifty-four percent of the children were girls. Prior attendance at a Head Start as 3-year-olds held true for 59.8% of these 4-year-olds.

All of the families met the criteria to enroll a child in a federally funded Head Start program, which meant that their income either fell below the official federal poverty limit or exceeded that limit by no more than 30%. By recent figures, this means that in contrast to the median family income in the US of $46,326, all of these families had incomes below US$28,665 and 70% or more (by requirements for Head Start enrollment) had incomes below US$22,050. A related indicator of the more limited income and educational opportunities for the families in this study is that only 69% of the mothers of the children in our sample had completed high school. This is similar to high school graduation rates for other communities with high poverty, but far below the rates achieved in wealthier communities. As just one example comparison, for the 50 wealthiest US school districts (median income US$120,000) the high school graduate rate averages a very high 96% but for the 50 poorest US school districts (median income US$19,000) the high school graduate rate averages a sharply lower 64% (Balfanz, 2009).

Procedures

Child assessments were conducted in the Head Start centers by research assistants trained at working with the diversity of children who were enrolled. Every child participated in two individual ‘pull-out’ sessions that each lasted between 30 and 45 minutes. Child assessments were not initiated until 3 weeks after the start of the school year, so that children were already acclimatized to the classroom setting, and they continued through the end of October.

For families (212) reporting on home language use (also checked for accuracy by teachers), 81% were monolingual English, and even for the remaining families (40; 39 of these used Spanish) who used more than one language, 62.5% said English was either the primary language or was used a lot along with Spanish. In addition, for 85% of families who used more than one language, English was introduced at home to the child before age 2 years, and only one family reported no English at home. Because of the use of English at home by age 4 years for nearly all the children and because all the children spoke English in their Head Start classrooms and would be entering schools in which English is the primary language, we administered all of our child assessments in English.
Measures

This study included three measures of language skills and an overall language skill measure composited from those three. These language measures and one measure of working memory and one measure of nonverbal intelligence were employed as independent variables in analyses. Four measures of emergent academic skills (print knowledge, phonological blending, phonological elision, and math skills) and one measure of emotion recognition served as dependent variables. All of these measures were collected during the two assessment sessions.

Language skills. Language skills were tapped partly through the Grammatical Understanding subtest of the Test of Language Development (TOLD; Newcomer & Hammill, 1997). In this subtest, the examiner reads a sentence aloud and asks the child to choose one of four pictures that best matches the content of the sentence. Scores are based on the number of pictures, out of 25, that a child correctly identifies.

A second measure tapped syntax production: the Sentence Imitation subtest of the TOLD (Newcomer & Hammill, 1997). In this subtest, the examiner reads a sentence aloud and asks the child to repeat it. Scores are based on how many increasingly complex sentences a child can reproduce correctly. The subtests of the TOLD are widely used and well validated with good evidence of reliability (e.g., test-retest $r = .90$; Newcomer & Hammill, 1997).

The third measure of language skill was the Expressive One-Word Picture Vocabulary Test – 2000, referred to hereafter as Vocabulary (Gardner, 2000). In this test, children are presented with a series of drawings and are asked to identify the objects depicted. Scores are based on the number of objects correctly identified. Median test-retest reliability is reported to be .90 and validity has been shown to be high as well (median correlation to 12 other expressive and receptive vocabulary tests of .79; Brownell, 2000).

Because these three measures, of syntax understanding, syntax production, and vocabulary, are very widely used, show excellent reliability, and are validated for both typically developing children and children with language delays they provide good estimates of language skills in the current study and a good basis for comparing results in the current study to the previous literature. The measures also have served as markers in preschool children of later levels of success or difficulty in reading in school years (e.g., Catts et al., 1999; Johnson et al., 1999; Storch & Whitehurst, 2002).

Substantial language impairments were defined for each of these three language measures separately and then on the basis of a composite across the three measures. Each child’s score on Grammatical Understanding, Sentence Imitation, and Vocabulary was converted to a categorical score of Strong Delay, Moderate Delay, Low-Average Language, or High Language based upon these respective cutoffs: $-1.5$ SD and lower for Strong Delay, score $= 1$; $-1.49$ SD to $-1.00$ SD for Moderate Delay, score $= 2$; $-0.99$ SD to $-0.01$ SD for Low-Average Language, score $= 3$; and mean standard score or higher for High Language, score $= 4$. Considerable prevalence of language delays was suggested by scores on each separate language measure. For the categories of Strong Delay, Moderate Delay, Low-Average Language, and High Language, respectively, the percentages of children for each measure were as follows: Syntax Production, 29%, 33%, 19%, and 19%, Syntax Understanding, 12%, 17%, 29%, and 42%, and Vocabulary, 34%, 22%, 32%, and 39%.
Five overall Language Delay/Status composite categories were formed by combining the category scores 1–4 for each of the three separate language variables, and thus the summed points could range from 3 to 12 (highest language). Overall Strong Delay was so labeled because it required across-the-board delays; this category included children with summed scores of 3–4, and thus required delay on all three language variables, with strong delay on one or two of these. Moderate Delay included children with summed scores of 5–6, and thus required delay on at least two of the three language variables. Overall Mild Delay included children with summed scores of 7–8, with delay on at least one (but no more than two) of the separate language variables. Overall Low-Average Language included children with summed scores of 9–10, some with no delays and some with no delay on two variables and delay on a third language variable. Overall High Language required low-average or high levels (thus no delays) on each of the separate language variables, and high levels on two of these three (summed scores of 11–12).

The five composite categories have the advantage of using all of the information on oral language vocabulary and syntax available on these children to yield distinct language status groups. The present groups will be compared later with previous reports that have used similar composites, from similar separate language measures, in analyses and discussions of preschool and kindergarten children with and without language impairments.

Nonverbal intelligence. Standard scores on the Block Design subtest of the Wecshler Preschool and Primary Scale of Intelligence – III (Wechsler, 2002) were used as a measure of nonverbal cognitive ability. In this subtest, children use multi-colored building blocks to reproduce two-dimensional patterns within a strict time limit. For children between 4 and 7 years old, performance on the Block Design subtest is highly related to Full-Scale IQ, with a correlation of .72 (Wechsler, 2002). The Block Design subtest alone is often used to estimate nonverbal intelligence (NVI). The most widely used cutoff in prior literature of one standard deviation or lower was also used here to determine low (below normal) NVI.

Working memory. Because prior investigators have presented conceptual arguments and empirical evidence for working memory as a distinctive subprocess (Blair, 2002; Case, 1998; Case & Okamoto, 1985; Gathercole & Baddeley, 1990, 1993; Gathercole, Hitch, Service, & Martin, 1997) particularly important to skill acquisition during preschool years, it was of interest to see if working memory would help to explain variance in other skills. Backward Word Span was employed as a test of working memory capacity. Similar tasks have been used as tests of working memory in young children (Case, 1985). In this test, children hear a list of words read aloud and are asked to repeat the words, but in reverse order. The practice list (the child was given two opportunities on this list only) and the first list each contained two words; the second and third lists each contained three words; the fourth and fifth lists each contained four words; and the sixth list contained five words. The test was discontinued when children made their first mistake. High Working Memory (n = 109; score of two words on the practice list, with some but not all children in this grouping recalling additional words from further lists) and Low Working Memory (n = 227; scores of zero or one word on the practice list) comprised the Working Memory independent variable.
Emergent academic skills. Mathematic skills comprised a first measure of emergent academic skills, as assessed with the Applied Problems subtest of the Woodcock–Johnson III: Tests of Cognitive Abilities (Woodcock, McGrew, & Mather, 2001). In this test of practical mathematical problems, children are asked to perform such tasks as showing two fingers, counting objects, and adding or subtracting small numbers. Standardized scores were employed (normative mean of 100, with SD of 15).

Print knowledge was another measure of emergent academic skills. It was assessed with the Print Knowledge subtest from the widely used Test of Preschool Early Literacy (TOPEL; Lonigan, Wagner, Torgesen, & Rashotte, 2007). In Print Knowledge, children complete tasks such as pointing out pictures that have letters or words in them, identifying specific letters from multiple options, and naming upper- or lower-case letters when presented in isolation. Standardized scores were employed (normative mean of 10, with SD of 3).

Two phonological awareness measures from the same TOPEL test battery above were included in emergent academic skills. These measures were the Blending subtest and Elision subtest. Standardized scores were employed (normative mean of 10 on each, with SD of 3). In both subtests, children need to coordinate sound components in words, syllables, and phonemes. For example, in the multiple choice part of the Blending subtest, children are asked to put together the different parts of a word, such as ‘hot’ and ‘dog’ or ‘b’ and ‘air’ and point to the correct corresponding picture. In the free response part of the Blending subtest, children are asked to simply listen to the different parts of a word and then state the full word the parts make. In the multiple choice part of the Elision subtest, children are asked to deconstruct the different parts of a word and point to the correct picture. For example, they might be asked, ‘Point to “snowshoe” without “snow”,’ and the correct picture would be one of a shoe. In the free response part of the Elision subtest, children are given items such as ‘Say “airport” without “air”.’ The correlation in the present sample between children’s performance on the Blending and Elision subtests of the TOPEL was .36 ($p < .001$).

Emotion recognition. The final dependent measure assessed emotion recognition in described social contexts. For this Emotion Recognition Questionnaire (Ribordy, Camras, Stafani, & Spacarelli, 1988), children listened to 16 very short stories describing characters in emotionally evocative contexts, and identified the characters’ feelings by pointing to pictures of happy, mad, sad, or scared faces. Examples included a friend moving away, a younger sibling interrupting, and a birthday party with games and presents. Children received a score on each story of 2 for correctly identifying the feeling and a score of 1 for correctly identifying the valence ($\alpha = .63$). Average raw scores per story were analyzed, and for each child fell between 0 and 2.

Results

Prevalence of Language Delay/No NVI Delay and Language Delay/With NVI Delay

By looking at both NVI scores and whether a child fit into one of the three language delay classification categories we could provide estimates of the prevalence of two broad types of language impairment in this sample of Head Start 4-year-olds.
Children with Language Delay/No NVI Delay are classified here as having overall language scores that indicate language delay in the absence of NVI scores that are 1 SD or more below NVI norms. All three degrees of overall language delay employed here are clinically low by usual cutoffs based upon language testing: Mild Language Delay (Language Delay 1) includes one of three language variables that is at least 1 SD below norms; Moderate Language Delay (Language Delay 2) includes two of three language variables that are at least 1 SD below norms; and Strong Language Delay (Language Delay 3) includes two of three language variables that are at least 1 SD below norms and one language variable that is at least 1.5 SD below norms. As Table 1 reveals, there were 110 of the 336 children with the classification of Language Delay/No NVI Delay. This 32.7% prevalence rate is high in comparison with many prior reports, but it is important to note that in contrast to typical prevalence calculations the present rate is exclusively for 4-year-olds in poverty who are enrolled in Head Start.

Children who met our language delay criteria and who also scored 1 SD or lower on NVI comprise those with Language Delay/With NVI Delay. The rate in the present sample was also 32.7% (110 of 336 children), as shown in Table 1.

The remaining children have no clinical level of language delay (see Table 1) and include 82 (24.5%) with Low-Average overall language levels and 34 (10.1%) with High overall language levels. Language status and NVI were modestly correlated \( r = .26, p < .001 \). Gender was not associated with either language status or with NVI levels.

In the next two sections of results we present Analyses of Variance (ANOVAS) which relate the above language (5) and NVI (2) levels as between-subject factors to children’s emergent academic skills and early emotion recognition skills. As in prior literature, the reported statistic for effect size in ANOVAS is partial eta squared.

### Table 1. Numbers and percentages of 4-year-olds with language impairments (LI) or with Low-Average or High Language status

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong Language Delay (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language Delay/With NVI Delay</td>
<td>25</td>
<td>7.4</td>
</tr>
<tr>
<td>Language Delay/No NVI Delay</td>
<td>15</td>
<td>4.5</td>
</tr>
<tr>
<td>Moderate Language Delay (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language Delay/With NVI Delay</td>
<td>42</td>
<td>12.5</td>
</tr>
<tr>
<td>Language Delay/No NVI Delay</td>
<td>36</td>
<td>10.7</td>
</tr>
<tr>
<td>Mild Language Delay (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language Delay/With NVI Delay</td>
<td>43</td>
<td>12.8</td>
</tr>
<tr>
<td>Language Delay/No NVI Delay</td>
<td>59</td>
<td>17.6</td>
</tr>
<tr>
<td>Low-Average Language status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low NVI: -1 SD</td>
<td>20</td>
<td>6.0</td>
</tr>
<tr>
<td>Average NVI</td>
<td>62</td>
<td>18.5</td>
</tr>
<tr>
<td>High Language status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low NVI: -1 SD</td>
<td>10</td>
<td>3.0</td>
</tr>
<tr>
<td>Average NVI</td>
<td>24</td>
<td>7.1</td>
</tr>
</tbody>
</table>

NVI = Nonverbal intelligence (Block Design subtest); low/delay = -1 SD.
Language as related to emergent academic abilities and emotion recognition

Each of the emergent academic abilities was significantly and systematically related to the five levels of overall language status for the children. Figure 1 displays the means for emergent math as related to the five language levels, $F(4, 326) = 23.97, p < .001$ (very large effect size, partial $\eta^2 .23$). Math skills are more than one standard deviation lower (compared to norms) at the strongest language delay (3), and then rise systematically with each level of improved language status to just above norms at the most advanced, High, language status. Print awareness, as displayed in Figure 2, similarly shows lowest scores for the strongest language delay, and then rises systematically with each level of improved language status, $F(4, 326) = 8.94, p < .001$ (large effect size, partial $\eta^2 .10$). For print awareness the contrast between a mean of 4.3 for children with Strong Language Delay and 15.53 for the High Language status group is dramatic.

The two measures of phonological processing also were related to the children’s language status. Elision was lowest in the two strongest delay categories for language and then rose with each advance from Mild Language Delay, to Low-Average Language, to High Language. Figure 3 displays this pattern, $F(4, 326) = 24.90, p < .001$ (very large effect size, partial $\eta^2 .23$). Blending, as shown in Figure 4, similarly shows lowest scores for the strongest language delay (3), and then rises systematically with each level of improved language status, $F(4, 326) = 23.97, p < .001$ (very large effect size, partial $\eta^2 .27$).

**Figure 1.** Mean math scores in relation to language status groups: Strong Language Delay (DELAY 3), Moderate Language Delay (DELAY 2), Mild Language Delay (DELAY 1), Low-Average Language, and High Language. The error bars show the upper 95% confidence level.
**Figure 2.** Mean print knowledge scores in relation to language status groups: Strong Language Delay (DELAY 3), Moderate Language Delay (DELAY 2), Mild Language Delay (DELAY 1), Low-Average Language, and High Language. The error bars show the upper 95% confidence level.

**Figure 3.** Mean phonological elision scores in relation to language status groups: Strong Language Delay (DELAY 3), Moderate Language Delay (DELAY 2), Mild Language Delay (DELAY 1), Low-Average Language, and High Language. The error bars show the upper 95% confidence level.
Emotion recognition skills on the Emotion Recognition Questionnaire (ERQ) varied systematically as well according to the children’s language skill grouping. In Figure 5, it is evident that lowest scores (barely over 1 out of 2 possible average story points) are associated with the greatest language delay and that with each advance in language status there is a corresponding increase in emotion recognition skills until at High Language status children achieve 1.65/2.00 (82.5%) correct, $F(4, 326) = 37.71, p < .001$ (very large effect size, partial $\eta^2 .32$).

**Effect sizes in comparisons of typically developing children to children at three degrees of language delay severity**

It is helpful to elaborate here on the degree to which the five levels of language status were related to substantial differences in math, emergent literacy, and emotion recognition skills. Following one procedure of Cohen (1988), effect size is here calculated on the basis of the standard deviation (SD) of the top-scoring language group and the degree of mean difference of each language-delayed group relative to that SD.

For math, the top-language group scored well at 105.5 (SD = 9.16), but the Mild Language Delay group ($n = 102$) was 1 SD lower at 96 ($d = .99$). For Moderate Language Delay ($n = 78$), math scores fell to 88, or 1.9 SD lower ($d = 1.88$). And for the Strong Language Delay group ($n = 40$), math was still lower at 84.2 and more than 2 SDs below the top group ($d = 2.32$).
Similarly, for Phonological Elision, the top-language group scored above norms at 11.56 (SD = 4.05). For Mild Language Delay children scores drop to 8.03, approaching 1 SD lower ($d = .88$). Both Moderate and Strong Language Delay groups have mean scores very close to 6.0 and which are 1.4 SD lower (Moderate, $d = 1.38$; Strong, $d = 1.37$).

The measure of Phonological Blending also demonstrated systematic decline in scores as language impairment severity increased, accompanied by large to very large effect sizes. Top-language scorers averaged 14.53 (SD = 3.27). With Mild Language Delay, the average score is 12.12 ($d = .74$). Moderate Language Delay children show a mean of 10.17, a full SD lower ($d = 1.03$). And for the most strongly language-delayed group the mean Blending score is lower still, at 8.43 ($d = 1.87$).

Print Awareness also showed striking results. Top-language scorers averaged 15.5 (SD = 11.2). With Mild Language Delay the average score is 8.3 ($d = .74$). Moderate Language Delay children drop to a mean of 5.7 and close to 1 SD lower ($d = .88$). And for the most strongly language-delayed group the average score is less than a third that of the top-language group, at just 4.3 ($d = 1.00$).

On the ERQ measure of emotion recognition in context, the High Language group averaged 1.65 out of 2 possible points per story (SD = 0.27). At 1.40, the Mild Language Delay group is 0.9 SD lower ($d = .93$). The Moderate Delay group at 1.16 is 1.8 SD lower ($d = 1.81$). Finally, for the most strongly language-delayed group, their average emotion recognition score is two full SDs lower at 1.10 ($d = 2.04$).

**Figure 5.** Mean emotion recognition scores (maximum average raw score of 2.0) in relation to language status groups: Strong Language Delay (DELAY 3), Moderate Language Delay (DELAY 2), Mild Language Delay (DELAY 1), Low-Average Language, and High Language. The error bars show the upper 95% confidence level.
Thus, looking across all the above measures in relation to language levels, there is a strikingly consistent pattern. Compared to the top language scorers, even the Mild Delay language group is 0.74 to 1.0 SD lower on each academic skill measure and on the ERQ socioemotional measure. The deficit in scores then increases systematically with each shift to a deeper level of language delay. Effect sizes were all large (here .74 to .89) or very large (here .90 to 2.32).

The consistent relations of language status levels to each of the five dependent variables did not rest on high intercorrelations between these variables. All such correlations are statistically significant but mild, ranging from an \( r \) of .29 for Emotion Recognition correlated with Blending to an \( r \) of .50 for the intercorrelation between Elision and Math.

**Language Delay/No NVI Delay vs. Language Delay/With NVI Delay**

Relationships between language levels and other skill levels are similar for those children who satisfy criteria widely used in prior literature for Language Delay/No NVI Delay (among these children there may be a subset with Specific Language Impairment, where autism, hearing impairments, and other disability conditions also are absent – but firm information on these conditions is lacking in the current study) and those children whose clinically low language scores are accompanied by low NVI scores (in prior literature, sometimes classified as Nonspecific Language Impairment). Nonverbal intelligence and language factors did not interact significantly for Emotion Recognition scores or for three of the four emergent academic measures. For this one exception, Blending (\( p < .04 \)), the interaction showed only a medium effect size (partial \( \eta^2 .03 \)) and the departure from the overall pattern of systematic skill levels as language status increased was minor – for children with NVI Delay only, the pattern for Blending means were low and equivalent for the Strong and Moderate Delay categories and then increased systematically as one moves to Mild Delay and then Low-Average Language and then High Language. Accordingly, it is of interest to look at the simple language status main effect patterns for each dependent variable. This gives a picture of the systematic relationship of preschool skills to the five levels of language both for children without low NVI scores and those with low NVI. Children with Strong, Moderate or Mild Language Delay with low NVI scores are those classified with Language Delay/With NVI Delay, whereas children with these language delays in the absence of a −1 SD NVI score fit the classification of Language Delay/No NVI Delay.

Math, Print Awareness, Phonological Elision, Phonological Blending, and Emotion Recognition (ERQ) scores for the lowest to highest language status groups with and without NVI delay are shown in Table 2. The systematic increases in each domain as language status rises are strong and highly similar for each type of language delay, Language Delay/No NVI Delay and Language Delay/With NVI Delay.

**Working memory**

Language delay status and working memory levels were modestly and significantly correlated, \( r = .29, p < .01 \). Given that these two factors were not highly interdependent in the present data and given that other investigators have presented conceptual arguments
and empirical evidence for working memory as a distinctive skill or subprocess (Case, 1998; Case & Okamoto, 1985; Gathercole & Baddeley, 1993), it was of interest to see if working memory would help to explain variance in other skills. Accordingly, ANOVAs were conducted that included both language status (five levels) and working memory status (high and low levels) as independent factors. Language effects were presented earlier and no interactions of language and memory reached statistical significance, so here only the several significant memory effects are reported.

Print Knowledge, Phonological Elision, and Phonological Blending showed significant differences by high and low working memory levels, but Math and Emotion Recognition did not. For Print Knowledge, children with low working memory scored lower, at 7.15, than children with high working memory, at 11.98, \(F(1, 326) = 11.49, p < .001\) (medium effect size, partial \(\eta^2 .03\)). In the case of Phonological Elision, children with low working memory scored lower, at 7.25, than children with high working memory, at 9.95, \(F(1, 326) = 13.40, p < .001\) (medium effect size, partial \(\eta^2 .03\)). Similarly, for Phonological Blending, children who showed low working memory scored lower, at 10.89, than children with high working memory, at 13.45, \(F(1, 326) = 10.44, p < .001\) (medium effect size, partial \(\eta^2 .04\)).

### Language delay for Minority vs. White European children

Because all children in the present study were living in poverty one would expect some language delay in both minority children and majority culture children. To examine whether the degree of delay differed according to minority status – African-American or Hispanic (146 children, 42%) vs. White European majority status (205 children) – an ANOVA was conducted with Minority/Majority status and high/low NVI as between-subject factors and Overall Language Delay as the dependent variable. The overall language status was slightly but not significantly lower for the Minority children as compared with the Majority children (on average a mild delay status for each group), \(F(1, 332) = 3.75, p < .10\) (very small effect size, partial \(\eta^2 .01\)). Nonverbal Intelligence

#### Table 2. Mean scores for preschool children with and without NVI delays at each of five language skill status levels

<table>
<thead>
<tr>
<th>Language status</th>
<th>Strong Delay</th>
<th>Moderate Delay</th>
<th>Mild Delay</th>
<th>Low-Average</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math/NVI Delay</td>
<td>82</td>
<td>85</td>
<td>96</td>
<td>101</td>
<td>102</td>
</tr>
<tr>
<td>Math/No NVI Delay</td>
<td>88</td>
<td>91</td>
<td>96</td>
<td>103</td>
<td>107</td>
</tr>
<tr>
<td>Print/NVI Delay</td>
<td>4.3</td>
<td>4.0</td>
<td>7.4</td>
<td>12.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Print/No NVI Delay</td>
<td>4.3</td>
<td>7.8</td>
<td>8.9</td>
<td>11.3</td>
<td>18.3</td>
</tr>
<tr>
<td>Elision/NVI Delay</td>
<td>6.2</td>
<td>6.1</td>
<td>8.4</td>
<td>9.4</td>
<td>10.4</td>
</tr>
<tr>
<td>Elision/No NVI Delay</td>
<td>5.7</td>
<td>5.8</td>
<td>8.4</td>
<td>9.7</td>
<td>12.0</td>
</tr>
<tr>
<td>Blend/NVI Delay</td>
<td>9.3</td>
<td>9.2</td>
<td>11.9</td>
<td>12.3</td>
<td>12.6</td>
</tr>
<tr>
<td>Blend/No NVI Delay</td>
<td>7.0</td>
<td>11.3</td>
<td>12.3</td>
<td>13.4</td>
<td>15.3</td>
</tr>
<tr>
<td>Emotion/NVI Delay</td>
<td>1.10</td>
<td>1.06</td>
<td>1.36</td>
<td>1.50</td>
<td>1.57</td>
</tr>
<tr>
<td>Emotion/No NVI Delay</td>
<td>1.11</td>
<td>1.28</td>
<td>1.42</td>
<td>1.51</td>
<td>1.68</td>
</tr>
</tbody>
</table>
did not interact with Minority/Majority status. In contrast, NVI did account for significant variance, with higher language status for children with high rather than low NVI, $F(1, 332) = 20.83, p < .001$ (medium effect size, partial $\eta^2 = .059$).

**Language delay in different language subdomains**

Language levels were defined above on the basis of overall combined delay information from all three available language measures. This approach generated the categories of Strong, Moderate, and Mild Language Delay and non-delayed categories of Low-Average and High Language. For these categories, it is interesting to examine how much children across the overall language groups differed on each individual language measure. In the case of Grammatical Understanding (comprehension), the Strong Delay children were 1.56 SDs lower vs. norms while the High Language group was 0.59 SD above norms. For Expressive Syntax (Sentence Imitation) the pattern was similar, with scores 1.71 SDs lower for the Strong Delay children and with the High Language group at 0.24 SD above norms. Vocabulary scores averaged 2.15 SDs lower for the Strong Delay children as contrasted with average scores in the High Language group just barely above norms (+0.09). In sum, when these 4-year-olds fit into a language-delayed category based on Overall Language composited scores their scores typically were delayed as well on each of the three individual language measures.

The detailed results presented earlier for overall language status have the advantage of using all the information available on the children’s vocabulary, expressive syntax, and syntax comprehension. Nevertheless, when just one language variable at a time is examined in ANOVA for language status in relation to preschool skills, each language variable performs very similarly to the results when language overall status is considered. First, Vocabulary (Expressive One-Word Picture Vocabulary Test) language status is significantly and positively related to children’s scores on math, print awareness, phonological elision, phonological blending, and emotion recognition skills, $F(3, 328)$ in each case between 6.22 and 13.66, $p < .001$. The same conclusion holds when language status is based solely on Expressive Syntax as measured in Sentence Imitation, $F(3, 328)$ in each case between 4.41 and 12.22, $p < .001$. Similarly, for Syntax Comprehension (Grammatical Understanding), language status based on this measure is significantly associated with four of the preschool skills, $F(3, 328)$ in each case between 8.23 and 10.80, $p < .001$, but it is only marginally associated with print awareness.

**Prior Head Start instruction**

The possibility arises that those children who also were enrolled in Head Start in the preceding year, as 3-year-olds, might have been in a better position as they started the program for 4-year-olds. However, ANOVAs focused on the four language variables indicated that there were no significant differences in language status or skill between those who had been (59.8%) or had not been in Head Start as 3-year-olds, $F(1, 349) = 0.12$ to 1.39, $p > .12$ to $p > .70$. Accordingly, for these low-SES children at 4 years of age there was a high risk of low language levels regardless of prior Head Start experience.
**Discussion**

Our first research question concerned the prevalence for children in poverty of categorically different levels of language development, from normative levels to increasingly low levels. The present results for a sample of 4-year-olds in Head Start show quite high prevalence overall of clinically significant language delay: 65% of the sample. Differentiated categories were as follows: Strong Delay, 11.9%; Moderate Language Delay, 23.2%; and Mild Language Delay, 30.4%. In addition, 24.4% of the children achieved Low-Average Language status and 10.1% achieved High Language status.

A second question was whether language delay differed by ethnicity. Results show only minor and insignificant difference between White European and Minority (Black or Hispanic) children.

**Early academic and socioemotional skills in relation to language status levels**

Our third central question was whether early academic skills and social-emotional skills vary systematically according to differentiated language status levels. The answer is a definite affirmative. The present study demonstrates for the first time a highly systematic relationship between degree of language delay/advance (five levels) and the academic and socioemotional skills. For each skill measure, as shown in Figures 1 to 5, there is a linear increase (with large effect sizes) in academic skills or emotion recognition skills as the children’s language status improves. Consider as one additional reference point the 34 out of 336 children who were top-scorers on language in this poverty sample. Their language scores are on a par with typical scores in middle-class samples. So, if language indeed is crucial to academic and social success, then one would expect their early academic scores and their scores on recognizing emotions in social contexts would also be on a par with those reported in the literature for middle-class children. The current study’s results for the High Language group match that expectation for all measures.

Each of the five language status levels takes into account three subdomains of language – vocabulary, expressive grammar, and grammar comprehension. If a child shows Strong Delay in one or more subdomains, it would seem valuable in planning teaching activities at school or home to provide adjustments in language of books/software and adult language. Contrasting adjustments would be appropriate to each of the other four levels of higher child language status. More specific suggestions are provided later on how such teaching adjustments to the very striking individual differences in children’s language levels could be made.

Next, additional discussion is provided on the varied preschool skills.

**Mathematics.** Simple mathematics skills were at normative levels only for the highest scoring language group. For the groups who had significant language delay the present results both replicate and extend prior research. In the present study and in reports on 4- to 5-year-olds with Specific Language Impairment (SLI – by definition with no NVI delay) by Arvedson (2002) and Fazio (1999) the children with language delays show math deficits compared to age-matched children with normative language levels. Similarly, for school-age children (9–11 years old) with SLI in Finland their numerical
skills were below that of age-matched children with normative language levels (Koponen, Mononen, Räsänen, & Ahonen, 2006). One extension provided in the current study is that the degree of deficits in numerical skills increased systematically as the degree of language deficits increased. A second extension is that for language-impaired children with cognitive delays too, that is children with Nonspecific Language Delay, in the present study these children also showed numerical skills deficits that increased steadily as the extent of language delay increased.

Emotions. Recognizing emotions in social contexts has been stressed by multiple authors as a key component of social competence that affects children’s social interaction success, their formation and maintenance of friendships, and indirectly their learning of academic domains that are instructionally embedded in social interactions (e.g., Bornstein & Tamis-LeMonda, 1989; Denham, Bouril, & Belouad, 1994; Greenberg, Kusche, & Speltz, 1991). For the 4-year-olds in the present study such emotion skills and language levels were associated strongly and positively; Emotion Recognition declined from highest scores (82.5% correct emotion recognition) in the top-language scoring group to a deficit of two SDs lower for the most strongly language-delayed group. Prior research examining in smaller samples whether preschool children with SLI differed from children with no language delay converges in indicating emotion knowledge deficits for the SLI children. For example, McCabe and Meller (2004) report that 4-year-old SLI children were less accurate than matched children with no language delay, where emotion recognition was assessed with puppet scripts. Some deficits in emotion recognition from faces or music were noted by Spackman, Fujiki, Brinton, Nelson, and Allen (2005) in older children (5–12 years) with language impairment as compared with peers with typically developing language. The lower scores on emotion recognition by the language impaired children in this and prior studies is of concern in its own right, and in prior work lower emotion knowledge has also been linked to overall lower social competence (McCabe & Marshall, 2006; McCabe & Meller, 2004). Deficits in emotion recognition and social competence at the preschool level have been argued as risk factors for later social and academic success (e.g., Denham et al., 1994; Farmer & Bierman, 2002; Greenberg et al., 1991). Further, a variety of studies link SLI status to lower social competence in terms of friendships, peer interaction skills, and social engagement at preschool and early school years (e.g., Beitchman, Hood, Rochon, & Peterson, 1989; Fujiki, Brinton, Hart, & Fitzgerald, 1999; Fujiki, Brinton, Morgan, & Hart, 1999; Liiva & Cleave, 2005; Rice, Sell, & Hadley, 1991). Although less studied for children with Language Delay/NVI Delay (those with both cognitive and language delays), available clues all point to even stronger deficits relative to children with Language Delay/No NVI Delay (as in the present results) for emotion knowledge, emotion regulation, and social competence (Baker & Cantwell, 1982; Greenberg et al., 1991).

Language skills and emotion knowledge may mutually influence developmental advances. With gains in language, more accurate encoding of emotions and their social contexts may occur along with better negotiation of misunderstandings and better sharing of feelings and other information (e.g., Fujiki, Brinton, & Todd, 1996; Hebert-Meyers, Guttentag, Swank, Smith, & Landry, 2006). But at the same time higher levels of emotion knowledge and emotion regulation may support more successful social
engagement during conversation so that more attention to and abstraction of new language structures and math structures and literacy structures occur (cf. Greenberg et al., 1991; Nelson, 2000; Nelson et al., 2001; Spira, Bracken, & Fischel, 2005). Likewise, for high success in entering peer social groups and negotiating interactions within the group a combination of understanding emotion expressions within context along with ready fluency in language should be powerful (cf. Dodge, Schlundt, Schocken, & Delugach, 1983). Within the present sample of children in poverty, it is evident that a great many children are carrying the double risk of low skill in language and low skill in emotion recognition.

**Emergent literacy skills.** Early foundations of later literacy skills have been argued to include at the preschool level skills in vocabulary, grammar, print knowledge, and phonological awareness and manipulation (Scarborough, 2001; Whitehurst & Lonigan, 1998). In congruence with these arguments, longitudinal follow-ups from age 4 or 5 years into the early school Grades 1–3 (ages 6–9 years) consistently demonstrate that indeed each of these skills at age 4–5 years are important, positive, and often unique predictors of later literacy levels (e.g., Bishop & Adams, 1990; Bryant, MacLean, Bradley & Crossland, 1990; Catts et al., 1999; Johnson et al., 1999; Catts et al., 1999; Johnson et al., 1999; Lonigan, Burgess, Anthony, & Barker, 1998; Scarborough, 2001; Wagner & Torgeson, 1987). In past reports, there have also been mild positive associations among all examined pairs of these preschool emergent literacy skills. The present study allows a more differentiated look at language delay in children of poverty, with identification of three degrees of language delay plus Low-Average or High Language status (five increasingly high language status categories). It is striking how firm the relationships are between these five distinct levels of overall language status and the remaining emergent literacy skills – print knowledge, phonological elision, and phonological blending. Because substantial skills in oral language vocabulary and syntax usually emerge between 2 and 4 years and before substantial phonological awareness or print awareness skills appear, it is reasonable to assume that for this period there is considerable influence of vocabulary and grammar status on print and phonological awareness growth. For children who enter Head Start at age 3 or 4 years of age, the present findings suggest that language status may be very powerfully linked to degree of progress on print awareness and phonological awareness. In turn, the pattern of findings raises as one possibility a strategy of intervention that would place more emphasis and resources than in most Head Start or other preschool programs on procedures to foster growth in vocabulary and grammar, with the expectation that success in directly stimulating growth in those skills will also indirectly contribute to gains as well in elision, blending, and print knowledge.

It should also be noted that elision and blending measures were systematically related to language delay/advance in the same basic pattern and with similar effect sizes as that shown for mathematics, print knowledge, and emotion recognition. This suggests that elision and blending as components of ‘phonological processing’ skills are for the present children skills that can be reasonably measured, as in prior literature, as distinct from the vocabulary and syntax skills that are used in identifying children with language delay (cf. Fey, 1986; Leonard, 1998). Teaching and intervention programs at preschool and kindergarten levels frequently target these elision and blending skills with particular teaching strategies (cf. Lonigan et al., 1998).
**Working memory contributions**

Another research question was whether, in addition to language status categories, working memory levels of children are associated with the children’s early academic and emotion skills. The present results demonstrate that when both these factors were entered into the same analysis of variance then, in addition to the large effect sizes for language for all five dependent measures, a medium effect size for working memory levels was demonstrated as well for three skills: phonological blending, phonological elision, and print awareness. In the case of early math skills, differences for high vs. low working memory levels did not reach significance, but in accord with prior reports and discussion the direction of association was higher math skills in the higher working memory group (Blair, 2002; Case & Okamoto, 1985; Espy et al., 2004). These findings on working memory are consistent with arguments that children with higher working memory levels often find it easier over time to make progress on early literacy and mathematics skills (Case, 1998; Case & Okamoto, 1985; Gathercole & Baddeley, 1993; Gathercole et al., 2005). Teaching adjustments might well consider ways to match presentation rates and patterns to children’s current working memory levels.

**Gender**

Language delay status did not differ by gender. This fairly closely matches results from recent community sample research by Tomblin and colleagues (Tomblin et al., 1997), in which there was only a small difference in SLI prevalence for boys (8%) vs. girls (6%) at age 5 years. The present results also match the highly similar early rates of language development for boys and girls in the large-sample research of Fenson and colleagues (Fenson, Dale, Reznick, Bates, & Thal, 1994). Tomblin and colleagues argue that in many contexts parents and teachers are more likely, given the same language behaviors by boys and girls, to refer the boys for assessment and treatment; this would account in many contrasting prior research reports on language delay for much more substantial reported rates for boys than for girls.

**Issues related to ethnicity**

As indicated earlier, overall language levels did not differ by Minority or Majority status of the children.

To provide a better picture of the home language environment of the children in the present study in relation to children’s language skills, data from parents (also checked for accuracy by teachers) available from 39 Latino (Spanish was the only frequent language other than English) and 173 non-Latino families were analyzed. Among the 39 Latino families, English or the combination of English with Spanish was the typical mode of communication, with just 14 families reporting Spanish as the more frequently used language with the child at home. Further, English had been used in most of these families before the child reached the age of 2 years (for 27 families by age 1 year, and for six families by age 2). Thus, for the Latino families in the present study, the typical family pattern of including English from an early age helps make sense of the finding that the Latino children’s scores on English language measures were only modestly lower as
compared with monolingual English-speaking children from the same set of Head Starts and communities. Only for Vocabulary did the mean score for Latino children (71.7) fall significantly below that of non-Latino children (84.8; small effect size, partial $\eta^2 = .13$).

The norms used as benchmarks for the three language measures in this study were all established through testing of diverse subgroups in proportion to their prevalence in the US population. Thus, African-American, Latino, White European, and low to high SES subgroups and urban/rural communities all were included in producing overall means and SDs for the three tests – TOLD, Grammatical Understanding; TOLD, Sentence Imitation; and Expressive One-Word Picture Vocabulary test. Accordingly, membership in the High Language, Low-Average Language, Mild Delay, Moderate Delay, and Strong Delay groups was based upon children’s status relative to the general norms. Although for some purposes, such as tracking relative progress by different children within very similar backgrounds, it sometimes may be valuable to rely upon norms that are computed separately for African-American children in poverty, Latino children in poverty, or White European children in poverty (e.g., Craig, Connor, & Washington, 2003; Oetting & McDonald, 2001), use of the more general population-based norms appear appropriate in the present report and in many other contexts. After all, if in any society we are hoping that children from poverty backgrounds will receive sufficient support for their development to approach or reach skill levels at societal norms both for language and for academic achievement at school between ages 5 and 18 years, then it would appear important to track their language development status before, during, and after interventions in relation to general norms for language skills.

**Language Delay/With NVI Delay vs. Language Delay/No NVI Delay**

The present study also provides new information on the prevalence of two broad types of clinically significant language delay among children living in poverty. In the sample of 336 Head Start 4-year-olds, 110 satisfied criteria for Language Delay/No NVI Delay. It is probable that some of these children would also fit under the diagnosis of SLI – this would hold true if on further research a child showed not only no NVI delay but no other disability such as hearing impairment or autism. In the present study another 110 satisfied criteria for Language Delay/With NVI Delay. The latter group showed an NVI score at least 1 SD below norms, in addition to their language delay. Thus, in total nearly two-thirds of the children in this study from families with sufficiently low incomes to qualify for Head Start evidenced clinically significant language delay according to criteria very similar to those used in treatment research studies. This finding, together with the prior literature, raises some interesting educational and treatment issues as well as theoretical process questions.

**Implications toward possible changes in the intensity and focus of language-facilitation**

Activities for preschool children. Children in poverty who display, as in the present study, language levels so low as to fit in mild to strong clinical language delay categories would appear to need educational/intervention approaches that recognize the conceptual and
practical significance of their delays. In this section, there are several aspects of the current and prior findings that point toward changes in intensity and nature of language-facilitation activities that could prove fruitful.

First, the current study shows high prevalence of substantial language delays for 4-year-olds in poverty in the US. Second, within the present sample of Head Start children those who also attended Head Start in the previous year (as 3-year-olds) showed no less delay than those who did not. These convergent findings by themselves would seem to invite consideration of possible ways to increase the intensity of language-facilitation activities for children in poverty, through changes in activities at home and/or in educational activities at preschool or in special language therapy services organized through the preschool. A possible increase in the intensity of language-facilitation activities is particularly relevant for children living in poverty, as prior studies with SES variation consistently show that the prevalence of language delay is significantly higher for children with low as compared with middle or high SES (e.g., Catts et al., 1999; Chernoff, Flanagan, McPhee, & Park, 2007; Dunbar & Barth, 2007; Duncan & Magnuson, 2005; Hart & Risley, 1995; Johnson et al., 1999; Landry et al., 2001; NICHD, 2003; Qi, Kaiser, Milan, & Hancock, 2006; Qi, Kaiser, Milan, Yzquierdo, & Hancock, 2003; Stanton-Chapman, Chapman, Bainbridge, & Scott, 2002; Whitehurst, 1997; Whitehurst & Fischel, 2000). A closer look at the findings of longitudinal studies suggests also that more intensity in language-facilitation activities at the preschool level might be a route worth considering for helping to prevent many language delays and for helping to remediate language delays when those are found.

Prior literature shows that risks of academic and social problems in the school years are increased substantially when a child shows clinically significant language delay at 4–5 years of age. For example, in a community sample of 7218 American children studied by Tomblin and colleagues (Tomblin et al., 1997) subsequent reading disabilities at Grades 1, 2, and 4 (ages 6, 7, and 10 years) occurred six to seven times more often for preschool children with rather than without language delay (Catts, Fey, Tomblin, & Zhang, 2002; Catts et al., 1999). Yet, in that predominantly middle-class sample, only 7.4% of the children at kindergarten age satisfied their language delay criteria (Tomblin et al., 1997). Another study of a large community sample, in Canada, found an overall language delay prevalence of 12.6% and an SLI prevalence rate of 10% at age 5 years, and also longitudinally compared non-delayed 5-year-olds and these SLI children at ages 12 and 19 years. These follow-up observations at 12 and 19 revealed relative deficits for the SLI children not only in language but also in reading and mathematics achievement (Johnson et al., 1999). Both of these earlier reports include small percentages of children in poverty and their findings contrast with the very high overall clinical language delay prevalence of 65% in the present poverty-only sample, despite very similar diagnostic criteria. As one additional example, Stothard and colleagues’ (Stothard et al., 1998) longitudinal follow-ups of children in the UK who at 5 years were or were not language delayed showed at age 15 years for the language-delayed group substantial deficits in both grammar ($d = 1.35$) and expressive vocabulary ($d = 2.22$). In this same study early language delay further carried substantial risk for adolescent deficits in literacy ($d = 1.81$).

Because the conceptually distinct levels of language status employed in this study can be easily mapped to past work on language disorders, we can find some clues in the past
work on treatments of language disorders to possible intensive programs for preschool children in poverty. For children with Language Delay/No NVI Delay or with Language Delay/NVI Delay (delayed also in nonverbal intelligence) past treatment research with children showing similar clinical delays to those in the present study often have shown high short-term language treatment effectiveness over a period of several months of treatment if the following three components held true for a study: (1) assessment prior to intervention clearly identified specific language structures the child had not mastered; (2) treatment provided focused conversational and other treatment activities on the identified language structures; (3) treatment intensity was at least 2–3 hours per week (e.g., Camarata, Nelson, & Camarata, 1994; Fey, Cleave, & Long, 1997; Nelson et al., 2004; Van Kleek, Vander Woude, & Hammett, 2006; Whitehurst et al., 1994). So, there is some reason to expect that language-delayed children like the many identified in the present study might be responsive to similar treatment and educational approaches. In addition, many of the past treatment studies showing effectiveness have used conversational recasting procedures that have rich ecological grounding in related naturalistic studies that document both parental use of recasts and sensitivity to such recasts by children (e.g., Bohannon & Stanowicz, 1989; Nelson, Heimann, Abuelhaija, & Wroblewski, 1989; Nelson, Welsh, Camarata, Butkovsky, & Camarata, 1995; Strapp & Frederico, 2000). However, in order to move a 3-year-old or 4-year-old very far along in language skills by age 5 and school entry it would appear likely that expansions in services for children in poverty communities would need to meet or exceed an intensity of 2–4 hours per week of focused language therapy and/or focused classroom language activities over multiple months. This does not happen very often currently. For example, in one US report of the national, broadly representative Pre-Elementary Education Longitudinal Study of 3104 children who in 2003/4 had an active Individualized Education Plan and at least one identified disability, over half (52%) had speech and language disability as their primary disability, yet on average were receiving less than 1 hour per week of therapy (Carlson et al., 2008). Some of whatever language therapy services can be organized could be done in small groups at a preschool setting, as in variations within past treatment of children with SLI (e.g., Fey et al., 1997). To achieve high effectiveness, it is likely that the language facilitation activities would need to provide different challenges in language to children with different degrees of delay. In this regard, a small group approach might be valuable, in which the widely used pattern of ‘activity tables/centers’ within a classroom could at times bring together particular small groupings of children based on similarity in their language profiles, along with teaching plans or therapy plans that give focused attention to language challenges appropriate for each small group.

Another reason for at least discussing increased intensity of preschool language-facilitation activities is that improvement in the provision of effective language treatments/interventions at the 3- to 5-year-old level can be expected to facilitate progress indirectly in other learning domains both during the child’s remaining preschool time and during the child’s school years. Evidence of a longitudinal nature that fits with these expectations has been provided by Stothard et al. (1998). They compared language-delayed 4-year-olds who remained language delayed at 5;6 years to those 4-year-olds who received treatment and improved their language levels by 5;6 years of age. The latter had higher levels of reading, math, and language abilities at 15 years of age.
Multiple, theory-based implications for teaching and clinical services

At the theoretical level, from dynamic systems models it has been argued that disparate language levels will dynamically interact with knowledge structures, information-processing capacities, and ongoing emotional and social processes to determine how much comprehension and learning occurs by the child both in informal conversational episodes and in direct teaching episodes (Bornstein & Tamis-LeMonda, 1989; Campione & Brown, 1987; Elman et al., 1996; Ladd et al., 1999; Nelson & Arkenberg, 2008; Nelson et al., 2004; Rogoff et al., 2001; Thelen & Smith, 1994, 2006). In line with such theoretical framings, the present study shows substantial positive relationships between concurrent language skills and myriad other skills. In turn, viewed from a dynamic convergence processes perspective, effective engagement and teaching of individual children in socioemotional skills, math, phonological and print awareness, reading, science, and writing would all be likely to benefit from some major, tailored adjustments of the language of teaching to the children’s disparate language levels. So far, there appear to be few such language adjustments that are designed into any widely used curricula for preschool instruction or for instruction at kindergarten to Grade 2 (age 5–7 years) levels. We would emphasize that children with any of the three degrees of clinically significant language delay identified in this article are likely to find that their limited language skills place limits on their success in typical classrooms in learning literacy, mathematics, new social and emotional skills, and any academic domain.

To sum up the multiple implications above, for preschool children in poverty circumstances there are multiple future steps that would fit with the results of the current and prior studies. Attention could be given in the preschool years to enhanced delivery of appropriate language assessments, increased availability of language therapy services whenever possible, and enhancement of preschool classroom language-facilitation activities that tailor challenges in language to small groups of children with similar levels of current language skills. Monitoring and adjustments of ongoing social-emotional processes during teaching and therapy could be employed to insure that high child engagement dynamically converges with child-appropriate learning challenges. In combination these steps have the potential to help achieve the goal that many more children, regardless of their socioeconomic circumstances, enter school with adequate oral language skills and adequate levels of the many skills that are facilitated in their acquisition through language. In future efforts to organize resources and plans to achieve some or all of these steps for particular communities, it can be expected from dynamic systems theories (e.g., Nelson & Arkenberg, 2008; Nelson et al., 2001; Thelen & Smith, 1994, 2006) and from developmental systems theories (e.g., Pianta, 2001) that effective engagement of children and their families and effective delivery of educational and therapeutic services will require multiple adjustments to local circumstances.

Conclusion

The present study concerned only 4-year-olds early in the Head Start program year. It is clear that a majority of these children in poverty demonstrated substantial, clinically significant language delays and associated low levels of emotion recognition and multiple early academic skills. Further, the present study emphasizes that as
severity of language delay increases the severity of deficits in academic and socio-emotional skills also increases. Taking together the present findings and those of prior studies with longitudinal outcomes, it is very evident that substantial levels of language delay often are associated with large effect sizes linking language status to serious deficits in literacy and math for children across the whole span of schooling from preschool to Grade 12. Despite this pattern of findings, we know of no intervention study that has provided a comprehensive enough boost in both grammar and vocabulary skills to close fully the gaps in language between language-delayed children and their typically developing peers. One future direction thus would be to design theoretically based language intervention that is high in both quality and intensity and that would aim at closing more of the gap between typically developing children and children in poverty who are at risk for language delay or who have already demonstrated language delay.

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