Other Impairment Associated With Developmental Language Delay in Preschool-Aged Children

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Abstract
The aim of this study was to investigate developmental impairment in several domains that might be associated with developmental language delay. The records of 56 preschool children with developmental language delay and 31 nonimpaired children were reviewed. Children with language delay were more likely than those in the nonimpaired group to have cognitive developmental delay (Mental Development Index < 70) (P < .001) and gross and fine motor delay (gross: 28 [50%] versus 5 [16%], P = .002; fine: 34 [62%] versus 11 [35%], P = .02). Children with language delay were significantly more likely to have impairment than were nonimpaired children in gross motor, fine motor, comprehension-conceptual and personal-social (P = .01, P = .02, P = .01, P = .02, respectively) functional domains. Our findings indicate that preschool children with language delay have wide-ranging difficulties in development and function.

Keywords
language delay, cognitive development, motor development, preschool, gross motor, fine motor, personal-social

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Language delay is the most common developmental problem encountered in preschoolers. The prevalence of developmental language delay in preschool children has been estimated at 7.6%,1 while Rescorla2 reported a prevalence of 18% using criteria based on parental report of less than 50 words and no word combinations at 2 years of age. Approximately 7.4% of kindergarten-aged children are thought to have a language development disorder unrelated to mental retardation.3 Longitudinal research shows that many preschool children with language impairment continue to have persistently poor language skills up to 7 years later.4,5 Delayed language development in young children is associated with a range of ongoing social difficulties, psychiatric disorders, behavioral problems, and poor academic achievement.4,6-8 Many children identified as having developmental language impairment also have impairment in other developmental domains. For example, a high rate of associated cognitive impairment has been found in several studies.1,9,10 Cognitive impairment is an important comorbidity at school-age follow-up in children with a preschool diagnosis of developmental language delay.11 Another similar study found that impairment of developmental and functional skills persisted into school age and were not limited to language.12 There is increasing evidence that motor impairment is a common comorbidity in children with developmental language delay.13-15 Webster et al reassessed fine and gross motor function in 43 school-age children diagnosed with developmental language delay at preschool age and found that nearly half the children had delays in gross and fine motor domains at the time of school entry.14 To better understand the clinical spectrum of developmental language delay, Webster’s group further evaluated developmental profiles, comparing 11 school-age children with developmental language delay with 12 control subjects.16

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Motor impairment was present in 8 of the children with language delay compared with only 1 of the normal controls.

However, most investigations of developmental impairment in children with development language delay have assessed them at school age. We designed this study to evaluate the developmental profiles of preschool children with suspected developmental language delay across language, motor, and cognitive domains to identify the comorbidities associated with language delay at a younger age.

Materials and Methods

Subjects

We retrospectively reviewed records of preschool-aged children referred to the Mackay Memorial Hospital for initial assessment of developmental delay between January 1, 2006, and December 31, 2008. Eligible children were those who were under the age of 3.6 years at the time of the assessment. During this period, 131 children were referred because the parents suspected a delay in language development. Evaluations were performed for every child within 1 month by a multidisciplinary team, including a pediatric neuropsychologist, pediatric psychiatrist, pediatric physiatrist, otolaryngologist, physical therapist, occupational therapist, speech therapist, and clinical psychologist. The charts were reviewed and the following information extracted for each assessment: sex, age at assessment, and the scores on the assessment instruments described below. In the absence of a gold standard definition, we diagnosed language delay if scores on the standardized Preschool Language Scale-Chinese Version language test fell below a -1.25 standard deviation cutoff (10th percentile or less on the receptive and/or expressive scales). Based on this definition, the sample was divided into 2 groups. Children below the cutoff were included in the language delay group and those above the cutoff in the nonimpaired group. Children were excluded from the study if they had hearing impairment, pre-existing neurologic or genetic disorders, or autistic spectrum disorder. Approval was obtained from the hospital’s institutional review board before commencing the study.

Clinical Assessment and Measures Used

Language was assessed by using the Preschool Language Scale-Chinese Version, a translation for use in Taiwan of the Preschool Language Scale that assesses language ability of preschool children from 2 to 5.11 years of age. The Preschool Language Scale-Chinese Version was standardized using a sample of 363 children in Taiwan. The test–retest reliability was 0.95. It contains 2 subtests: Auditory Comprehension and Verbal Ability. Motor function was measured by using Peabody Developmental Motor Scales - 2nd edition, Early Intervention Developmental Profile, and Pediatric Evaluation of Disability. Cognitive function was measured by using the Mental Developmental Inventory has been demonstrated to have acceptable reliability and validity for evaluation of normal children. Its validity is further supported by a high degree of correlation with Bayley Scales of Infant Development - II.

Statistical Analysis

Descriptive statistics were used to describe the characteristics of the groups and the range of scores from the measures used. Comparisons between children with and without language delay were performed by using t tests for normally distributed data and chi-square tests (or Fisher exact test) for data that were not normally distributed. Statistical significance was accepted at the level of P < .05.

Results

Demographic Characteristics

The total sample consisted of 87 children between 17 and 42 months of age (mean, 32.1 months; standard deviation, 6.2) of whom 56 had language delay and 31 were nonimpaired. There were no significant age or gender differences between the language delay and nonimpaired groups (Table 1).

Cognitive and Motor Development

Based on Bayley Scales of Infant Development - II scores, a subnormal Mental Development Index score was significantly more frequent in the language delay than in the nonimpaired group (43/51 versus 9/28; P < .001). Children with language delay were thus significantly more likely to have cognitive developmental delay than children in nonimpaired group. Similarly both gross and fine motor delay were significantly more common in the language delay group (Table 1).

Chinese Child Developmental Inventory Scores

The Chinese Child Developmental Inventory was completed for 35 children in the language delay group and 24 in the nonimpaired group. Children with language delay were significantly more likely to have impairment than were nonimpaired children in the gross motor, fine motor, comprehension-conceptual, and personal-social functional domains (Table 2).

Discussion

This study demonstrated that preschool children with language delay frequently exhibited concomitant delays in other developmental domains. Children with language delay were much more likely to have impairment of cognition and of gross motor and fine motor development than were nonimpaired children.

The frequency of gross and fine motor impairment accompanying language delay is consistent with the findings of other investigators. Hill conducted a comprehensive literature

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review of studies evaluating motor development in children with language impairment. Fine or gross motor difficulties were found in 40% to 90% of the children studied. In a meta-analysis of the relationship between motor impairment and specific language impairment, Rechetkin and Maitra found that language impairment was associated with motor impairment indicated by the 3 composite measures of motor error, motor score, and motor time. In a cohort study of preschool children with developmental language delay, significant motor impairment was also present at school entry. Our study demonstrated that impaired motor development was already measurable during the preschool age at the same time language delay was diagnosed.

Many children identified as having developmental language delay also have cognitive impairment. An extensive diagnostic work-up of 2-year-old children with language delay demonstrated that 6 of 100 had deficits in nonverbal cognitive abilities. Our study found a higher rate of cognitive impairment in children in both language delay and nonimpaired groups than previously reported. We used the Bayley Scales of Infant Development - II to measure cognitive function, but the general Mental Development Index portion of the Bayley Scales of Infant Development - II is not a pure test of nonverbal cognitive ability. The language required is likely to disadvantage children with language delay and lower their mean scores. However, even children in the nonimpaired group scored relatively poorly. Of the 31 nonimpaired children, 18 had results of the language test falling between 11th and 15th percentile. Ten of the 18 children had Mental Development Index score falling below 70. Our study sample was drawn from children referred for clinical assessment of language delay are likely to have delay in other development domains. These delays can be demonstrated at the same time the language delay is diagnosed. Our study of course was not designed to evaluate intervention. However, since these developmental problems can be diagnosed in the preschool age, it is important to determine which ones, like language delay, are amenable to therapy. If early intervention is shown to be effective, then it behooves us to make the diagnosis and provide the intervention. We do not need to wait until a child with language delay is of school age before searching for other specific developmental impairment.

Table 1. Mean Value for Cognitive Measure and Motor Function for Language Delay and Nonimpaired Groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>Language Delay (n = 56)</th>
<th>Nonimpaired (n = 31)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at assessment, mean (standard deviation) months</td>
<td>32.4 (6.4)</td>
<td>31.5 (5.9)</td>
<td>.51</td>
</tr>
<tr>
<td>Mean (standard deviation) Mental Development Index</td>
<td>57.1 (11.6)</td>
<td>75.2 (17.6)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Subjects with score of &lt; 70, n (%)</td>
<td>48 (86)</td>
<td>10 (32)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Gross motor delay, n (%)</td>
<td>28 (50)</td>
<td>5 (16)</td>
<td>.002</td>
</tr>
<tr>
<td>Fine motor delay, n (%)</td>
<td>34 (61)</td>
<td>11 (35)</td>
<td>.02</td>
</tr>
</tbody>
</table>

Table 2. Functional Morbidity of Children in Language Delay and Nonimpaired Groups for Chinese Child Developmental Inventory Scores

<table>
<thead>
<tr>
<th>Functional Domain</th>
<th>Language Delay (n = 35)</th>
<th>Nonimpaired (n = 24)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross motor</td>
<td>17 (49)</td>
<td>4 (17)</td>
<td>.01</td>
</tr>
<tr>
<td>Fine motor</td>
<td>11 (31)</td>
<td>1 (4)</td>
<td>.02</td>
</tr>
<tr>
<td>Comprehension-</td>
<td>25 (71)</td>
<td>9 (38)</td>
<td>.01</td>
</tr>
<tr>
<td>conceptual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Situation comprehension</td>
<td>18 (51)</td>
<td>8 (33)</td>
<td>.17</td>
</tr>
<tr>
<td>Self-help</td>
<td>19 (54)</td>
<td>11 (46)</td>
<td>.52</td>
</tr>
<tr>
<td>Personal-social</td>
<td>24 (69)</td>
<td>9 (38)</td>
<td>.02</td>
</tr>
</tbody>
</table>

Data expressed as n (%).

In conclusion, this study illustrates that preschool children referred for clinical assessment of language delay are likely to have delay in other development domains. These delays can be demonstrated at the same time the language delay is diagnosed. Our study of course was not designed to evaluate intervention. However, since these developmental problems can be diagnosed in the preschool age, it is important to determine which ones, like language delay, are amenable to therapy. If early intervention is shown to be effective, then it behooves us to make the diagnosis and provide the intervention. We do not need to wait until a child with language delay is of school age before searching for other specific developmental impairment.

Author Contributions

Y-CC conceived of the study, and participated in its design and drafted the manuscript. C-YH participated in the collection of data and
performed the statistical analysis. S-PL, R-FT, and C-CY participated in the design and acquisition of data. N-CC participated in design of the study and helped to draft the manuscript. All authors read and approved the final manuscript.

Declaration of Conflicting Interests
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Ethical Approval
Ethical approval was obtained from the Mackay Memorial Hospital Institutional Review Board before commencing the study.

References