Prediction of Basic Reading Skills Among Young Children With Diverse Linguistic Backgrounds

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Abstract
This study was conducted to assess the relative predictive validity of phonological processing, listening comprehension, general cognitive ability, and visual-motor coordination against early reading skills within a sample of children from diverse linguistic backgrounds. Children (N = 65) were tested in Kindergarten with measures from each of the aforementioned areas, and in Grade 1 with measures of letter and word recognition. Among all predictor variables, phonological processing was the only significant predictor of Grade 1 reading. Language(s) spoken in the home added to the prediction of letter recognition. Results suggest that phonological processing may contribute to the acquisition of basic reading skills for children with varied language experiences in the same way as it does for monolingual children.

Resume
La présente étude visait à évaluer la validité prédictive du traitement phonologique, de la compréhension auditive, de la capacité cognitive générale et de la coordination visuelle et motrice par rapport aux aptitudes initiales à la lecture, dans un échantillon d’enfants issus de divers contextes linguistiques. Les enfants (N = 65) ont été testés à la maternelle au moyen de mesures portant sur chacun des aspects ci-dessus, et en première année avec des mesures de la reconnaissance des lettres et des mots. Parmi toutes les variables prédictives, le traitement phonologique était le seul important prédicteur de la lecture en première année. La(s) langue(s) parlée(s) à la maison contribua(ient) à la prédiction de la reconnaissance des lettres. Les résultats suggèrent que le traitement phonologique pourrait contribuer à l’acquisition d’aptitudes de base à la lecture chez les enfants de milieux multilingues, de la même façon que chez les enfants unilingues.

Increased understanding of the cognitive bases of reading-related problems among children has resulted in three major changes in the focus of this research area. One includes a greater emphasis on language-based processes, which is in part due to findings that deficits in visual processes and visual-motor integration are not the main cause of reading difficulties (e.g., Stanovich, 1986). Accordingly, many investigators have begun to study other, more language-based cognitive processes that may be involved in reading such as phonological processing and listening comprehension (e.g., Wagner & Torgesen, 1987). Another change in focus concerns the dissatisfaction with the use of discrepancies between general cognitive ability, as measured by IQ tests, and reading achievement scores to operationally define a “reading disability” (e.g., Shaywitz, Fletcher, Holahan, & Shaywitz, 1992; Siegel, 1988). Problems with this operational definition have led to the third change in the field, the search for an alternative assessment model (e.g., Kline, Snyder, & Castellanos, 1996; Spring & French, 1990). A brief review of the results of relevant research follows.

Many researchers have conducted longitudinal studies to examine various processes in young children that may be linked to later reading achievement (e.g., Hurford, Schauf, Bunce, Blaich, & Moore, 1994). Considerable evidence indicates that phonological processing plays an important role in reading development and has validity in predicting reading success (e.g., Wagner, Torgesen, & Rashotte, 1994; Wagner et al., 1997). Indeed, performance on measures of phonological skills assessed as early as Kindergarten can predict with reasonable accuracy later reading performance (Hurford et al., 1994; Mann, 1993). In addition, phonological-based measures are predictive of reading skills independent of general cognitive ability, and poor readers seem to have difficulties with phonological processing regardless of their IQ levels (e.g., Stanovich & Siegel, 1994).

Other language-based abilities such as listening comprehension may also be important for reading development. Listening comprehension refers to a child’s ability to understand spoken language, including unstructured, natural speech and more formal, organized oral language, such as text read aloud. Results of several
studies have indicated that listening comprehension is a moderate to a strong predictor of reading ability (e.g., Curtis, 1980; Wood, Buckhalt, & Tomlin, 1988). In addition, the relation between reading and listening comprehension appears to increase with age (Curtis, 1980; Stanovich, Cunningham, & Feeman, 1984). Also, some researchers have found that the combination of information about listening comprehension and phonological processing explains more variance in reading ability than either skill alone (e.g., Aaron, 1991; Stanovich, 1986). With development, the relation between these specific cognitive skills and reading appears to shift. That is, in the early stages of reading acquisition, children may rely more heavily on phonological skills to decode printed words. Once they have mastered basic word recognition skills and have built up a sight vocabulary, children may allocate more of their processing to text comprehension and thus apply their listening comprehension skills (e.g., Aaron, 1991).

Studies about the relation between visual-motor integration and reading ability have yielded equivocal results. In brief, some investigators have found that good perceptual-motor skills at a young age are predictive of success with early reading skills (e.g., Solan & Mozlin, 1986). Evidence also supports the predictive relation between visual-motor skills in Kindergarten and later reading achievement (e.g., Fletcher & Satz, 1982). Visual-motor integration may, however, predict reading performance in somewhat older children only to the extent that it reflects general cognitive ability (e.g., Goldstein & Britt, 1994). Overall, visual-motor skills appear to play a role in early reading development but, beyond that, the relation seems less clear.

One notable limitation of the studies cited above is their primary focus on the relation between cognitive and language-based processes to reading acquisition measured in monolingual, English-speaking samples. Many urban communities, however, have relatively large immigrant populations where these children may speak one language at home and a second (and possibly third) language at school. Therefore, it is important to evaluate the association between the development of early cognitive and language-based skills and reading for samples of children with diverse language experiences, specifically to determine whether previous findings generalize to such children. If linguistic background influences English reading skills, the relation of, say, phonological processing measured in Kindergarten to reading in Grade 1 may be different for children who speak other languages at home and English at school than for monolingual, English-speaking children. Alternatively, the effects of linguistic status on factors that predict the acquisition of early reading skills may depend on the child’s ability to reflect on the components of the primary language. That is, once a language-based skill such as phonological processing is acquired in one language, it may be more readily applied to a second language, suggesting that the linguistic backgrounds of the children may not be all that relevant (e.g., Durgunoğlu, Nagy, & Hancin-Bhatt, 1993).

The main purpose of the study is to compare the predictive power of measures of phonological processing and listening comprehension to those of general cognitive ability (IQ) and visual-motor processes assessed in Kindergarten against reading levels measured one year later within a diverse linguistic sample. In accordance with the research reviewed earlier, it is expected that visual-motor integration and IQ will correlate with reading success in Grade 1. It is believed, however, that listening comprehension and phonological skills will not only be stronger predictors of reading achievement, but will also have incremental validity even when IQ and visual-motor skills are partialled out. Regardless of IQ level and listening comprehension scores, children with poor phonological abilities in Kindergarten are expected to be at greater risk for reading-related difficulties in Grade 1.

METHOD

Participants

Parents of all Kindergarten children attending one of two schools within the same English-language school board in Quebec were sent a consent letter requesting permission for their child’s participation in the study. The overall participation rate was 75%, yielding a total of 71 children (36 boys, 35 girls; M age = 5.8 yrs, SD = 0.4 yrs, range = 5.2 to 6.4 yrs). The participants were enrolled in four different Kindergarten classrooms and were taught by one of two teachers. The English Kindergarten program in both schools consisted of half-day programs, but parents could register their child in a French Immersion program for the remaining half-day. All children participated in the English program and 42 (59%) of them attended the additional French Immersion program. Native languages of the children were mainly Italian (44%) or English (31%); other languages were less frequent and included a combination of Italian and English (3%), French (10%), Portuguese (4%), Ukrainian and English (3%), Greek (1%), Greek and Ukrainian (1%), or other languages (3%). At home, these children spoke both Italian and English (39%), English (32%), other individual languages (French, 7%; Portuguese, 1%) or combinations of languages (English and French, 6%; English, French, and Italian, 6%; English with some other language, 9%). All children were born in Canada. Two-thirds of the participants had some school experience, such as attendance in Pre-Kindergarten, prior to entering Kindergarten.

Of the 71 students, a total of 65 (92%; 31 boys, 34 girls;
The child is required to copy each figure onto the page presented in a booklet with three figures on each page. This version of the VMI consists of 15 geometric shapes to assess hand-eye coordination skills of children 3 to 8 years old. Developmental Test of Visual-Motor Integration—Third Edition (T-AVMI-3) expresses scores as age-based deviation quotients (M = 100, SD = 15). Each item is comprised of a word or sentence read aloud by the examiner and three line drawings of objects or scenes, one of which correctly depicts the meaning of the item. The child is asked to point to the correct picture. Raw scores for the overall test are converted to age-based deviation quotients (M = 100, SD = 15).

Visual-motor coordination. The Short Version of the Developmental Test of Visual-Motor Integration—Third Revision (VMI; Beery, 1989) is designed to assess the hand-eye coordination skills of children 3 to 8 years old. This version of the VMI consists of 15 geometric shapes presented in a booklet with three figures on each page. The child is required to copy each figure onto the page directly below the test stimulus with a pencil. Raw scores are converted to a standard score (M = 100, SD = 15).

General cognitive ability. Two subtests of the Kaufman Assessment Battery for Children (K-ABC; A. S. Kaufman & N. L. Kaufman, 1983) were administered to estimate general cognitive ability. Analogous to two-subtest short forms from other measures of general cognitive ability (see Sattler, 1988), the subtests that were selected represent general verbal skills and visual-spatial reasoning, and have good psychometric characteristics. One of the K-ABC subtests that was administered, Riddles, is a verbal reasoning task that requires children to guess the name of an object, animal, or concept based on three descriptors (e.g., What has four legs, whiskers, and meows?). The second subtest, Triangles, is a task of visual-spatial reasoning. The child is required to assemble rubber triangles to match abstract designs shown in a picture. Based on the normative sample of 1,500 school-age children, Riddles and Triangles are correlated moderately (r = .49). To calculate an estimate of each child’s IQ in this study, Riddles standard scores were converted to the same metric as Triangles and then summed. Next, a composite score with the metric M = 100 and SD = 15 was formed based on a procedure by Sattler (1988, p. 138) for combining standard scores from different subtests.

Listening. Three subtests from the Woodcock Reading Mastery Tests—Revised (WRMT-R; Woodcock, 1987) were administered to assess children’s reading levels in Grade 1. The Letter Identification subtest measures the child’s ability to recognize letters presented in capital or lowercase print- and cursive-forms. The Word Identification subtest requires the child to identify individual words. Word Attack, the third test, assesses the ability to apply phonic and decoding skills by requiring the child to pronounce unfamiliar words. In our sample, Letter Identification was correlated .58 with Word Identification and .44 with Word Attack. Because the correlation of Word Identification and Word Attack was so high (r = .76, p < .01), scores from these subtests were combined into a composite (labeled Word Skill) by averaging the values for each child.

Procedure
Similar procedures were followed for both Kindergarten and Grade 1 testing. Each child was tested individually outside of his or her classroom for approximately a half-hour. The two authors were involved in the Kindergarten test administration (64% of children tested by the first author; 36% by the other) which occurred in the second term of the school year; the first author administered all Grade 1 tests during January and February of the next school year. In Kindergarten, the VMI drawing test was given first to help establish rapport. The TOPA-K, TACL-R, Triangles, and Riddles tests were then administered in a
random order. Following testing, parents were interviewed by telephone about their child’s previous school experience, native language, and the language(s) spoken at home. Approximately one year later, in Grade 1, the reading tests were administered.

RESULTS

Home/School Variables

Reported in Table 1 are bivariate and multiple correlations between the home/school variables (i.e., attendance of Pre-Kindergarten, Kindergarten, and Grade 1 programs, teacher, home language, native language) and the cognitive and reading measures. The multiple correlations in Table 1 involve categorical variables represented with codes that indicate membership in three groups (Cohen & Cohen, 1983). All relations involving the Grade 1 school variables (i.e., teacher and program) and test scores were not significant. Although the magnitudes of the correlations between Kindergarten background variables and test scores were not large (about .30), several were statistically significant. Children in the classes of one Kindergarten teacher performed somewhat better on the phonological task than the other children. Also, children who attended the full-day English and French Kindergarten program scored significantly higher on the measures of phonological processing, visual-motor skills, and listening comprehension. Kindergarten teacher covaried significantly with word identification and word attack. A one-way ANOVA of the Letter Identification subtest by children’s home language was significant ($F(2, 62) = 3.40, p < .05$); children who spoke English at home ($M = 104.9, SD = 10.4$) attained higher scores than children who spoke other languages ($M = 96.1, SD = 15.5$) but did not differ from the English/Italian group ($M= 99.6, SD = 6.2$). Because the background variables of Kindergarten teacher, program, and home language were significantly correlated with one or more of the cognitive or reading measures, these variables were included as predictors in subsequent analyses.

Prediction of Reading

Presented in Table 2 are the mean scores and standard deviations of the children’s performance on the Kindergarten and Grade 1 measures and the intercorrelations between all the measures. Overall, the children achieved average scores on the Kindergarten tests of visual-motor coordination, cognitive ability, and phonological processing, but scored somewhat below average on the listening comprehension task ($M = 89.2, SD = 13.8$). In Grade 1, the children performed at age-expectations on the reading measures. The Kindergarten phonological test was the strongest individual predictor of reading, with correlations of .40 with Letter Identification and .64 with Word Skill (the composite of the Word Identification and Word Attack tasks). Both general cognitive ability ($r = .35$) and listening comprehension ($r = .30$) measured in Kindergarten correlated significantly with Word Skill. In contrast to the other Kindergarten measures, scores on the task of visual-motor coordination were not significantly related to Grade 1 reading.

In order to evaluate the relative predictive power and the incremental validity of each of the Kindergarten
predictors for the reading measures, two hierarchical multiple regressions were conducted. These results are summarized in Table 3. In the first regression, the home/school variables (i.e., home language, teacher, and English-only versus English and French Kindergarten program) at step 1 accounted for 11% of the variance of the Letter Identification task, of which only home language (English versus other languages) was a significant individual predictor. The addition of visual-motor coordination and cognitive ability scores at step 2 did not result in a significant increase in the overall $R^2$. Once phonological processing and listening comprehension were entered at step 3, a total of 22% of the variance of Letter Identification was explained, which was just short of statistical significance ($p < .07$). In the second regression, the home/school variables accounted for a nonsignificant 10% of the variance of the reading composite, Word Skill. At step 2, visual-motor coordination and general cognitive ability together explained an additional 9% of the variance, an increase that fell just short of statistical significance ($p = .054$); of the two variables, cognitive ability was the best individual predictor ($\beta = .28, t(58) = 2.28, p < .05$). A significant increase in $R^2$ of 28% resulted when listening comprehension and phonological processing were added to the equation at the third step. Altogether, the Kindergarten predictors accounted for 47% of the variance of Word Skill. At the final step, phonological processing was the only significant individual predictor of this reading composite ($\beta = .63, t(58) = 5.22, p < .01$).

Although results of regression analyses concern the predictive power of the Kindergarten measures against Grade 1 reading skill for the entire sample, these results do not yield information about the performance of discrete groups of children such as poor versus average readers. This type of distinction may be useful in identifying young children who are at risk for developing reading difficulties even prior to the beginning of formal reading instruction. Similar to other studies in the literature (e.g., Siegel, 1988), poor readers were classified as having a standard score of 90 or below (i.e., 25th percentile) on the reading composite, Word Skill. It should be noted, however, that the limited sample size of the present study precluded the use of a stricter definition of poor reading, such as test scores that fall more than two standard deviations below the mean.

A total of 11 children (17%) met the definition for being a poor reader; in contrast, 54 children (83%) were reading at least average for their ages. Reported in Table 4 are group mean scores and standard deviations, results of $t$ test comparisons, and values of standard mean differences ($d$ statistics) for each comparison. The $d$ statistic is an index of effect size and equals the ratio of the observed mean difference divided by the pooled within-group standard deviation. In considering the “typical” effect sizes reported in the social science literature, Cohen (1988) suggested that absolute $d$ values around .20 indicate a “small” group mean difference, about .50 a “medium-sized” difference, and $d$ values greater than .80 a “large” difference. As expected, poor readers scored significantly lower on the Kindergarten phonological test than average readers ($t(63) = 3.81, p < .01$), and the magnitude of this difference was relatively large ($d = 1.26$). On the listening comprehension task, poor readers attained significantly lower scores than did the readers functioning at age expectations. The magnitude of this group difference ($d = .82$) was also relatively large in size. Kindergarten cognitive ability and visual-motor coordination did not significantly differentiate poor from average readers. The approximately medium-sized difference between the groups on IQ ($d = .41$), however, would have reached significance in a larger sample. Taken together, the results of the group comparisons suggest that poor readers in Grade 1 can be
TABLE 3
Hierarchical Multiple Regressions With Kindergarten Predictors and Grade 1 Reading Measures

<table>
<thead>
<tr>
<th>Predictors</th>
<th>β²</th>
<th>Increase in β²</th>
<th>Entry</th>
<th>Last Step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter Identification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 1:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home L1</td>
<td>.11</td>
<td>-.63</td>
<td>0.37*</td>
<td>0.31*</td>
</tr>
<tr>
<td>Home L2</td>
<td>.06</td>
<td>0.16</td>
<td>0.05</td>
<td>-0.01</td>
</tr>
<tr>
<td>Teacher-K</td>
<td>.01</td>
<td>0.11</td>
<td>0.14</td>
<td>0.02</td>
</tr>
<tr>
<td>Program-K</td>
<td>.03</td>
<td>0.13</td>
<td>.02</td>
<td>.09*</td>
</tr>
<tr>
<td>Step 2:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VMI</td>
<td>.00</td>
<td>0.14</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>IQ</td>
<td>.14</td>
<td>0.37*</td>
<td>0.37*</td>
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<tr>
<td>Step 3:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TACL-R</td>
<td>.06</td>
<td>0.02</td>
<td>0.00</td>
<td>0.04</td>
</tr>
<tr>
<td>TOPA-K</td>
<td>.02</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Word Skill</td>
<td>.11</td>
<td></td>
<td>0.19*</td>
<td></td>
</tr>
<tr>
<td>Step 1:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home L1</td>
<td>.12</td>
<td>0.12</td>
<td>0.13</td>
<td>0.14</td>
</tr>
<tr>
<td>Home L2</td>
<td>.02</td>
<td>0.02</td>
<td>0.13</td>
<td>0.15</td>
</tr>
<tr>
<td>Teacher-K</td>
<td>.08</td>
<td>0.08</td>
<td>0.28*</td>
<td>0.05</td>
</tr>
<tr>
<td>Program-K</td>
<td>.01</td>
<td>0.01</td>
<td>0.01</td>
<td>-0.19</td>
</tr>
<tr>
<td>Step 2:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VMI</td>
<td>.01</td>
<td>0.01</td>
<td>0.13</td>
<td>0.14</td>
</tr>
<tr>
<td>IQ</td>
<td>.02</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
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<tr>
<td>Step 3:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TACL-R</td>
<td>.06</td>
<td>.47**</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>TOPA-K</td>
<td>.02</td>
<td>.28**</td>
<td>0.06</td>
<td>0.06</td>
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</table>

Note. N = 65; Home L1 = Home Language, English versus Other; Home L2 = Home Language, Italian and English versus Other; Teacher-K = Kindergarten teacher; Program-K = English only versus English and French Kindergarten program; VMI = Test of Visual-Motor Integration (3rd rev.); IQ = Estimated General Cognitive Ability; TACL-R = Test for Auditory Comprehension of Language-Revised; TOPA-K = Test of Phonological Awareness-Kindergarten. Word Skill = average of Word Identification and Word Attack tasks of the Woodcock Reading Mastery Test-Revised. *p < .05; **p < .01.

was especially true for the assessment of phonological processing, which itself is probably a multidimensional domain that can be measured with different types of tasks (e.g., Wagner & Torgesen, 1987; Wagner et al., 1994). A single phonological measure was used in this study, a test of phoneme isolation that was suitable for pre-literate children.

With the aforementioned caveats in mind, the results of this study were generally consistent across all analyses. The Kindergarten predictors altogether accounted for 22% to 47% of the variance of the Grade 1 reading tasks. Although some of the predictors were significant when considered individually, phonological processing measured in Kindergarten was clearly the best predictor of Grade 1 reading. This strong predictive relation between phonological skills and later reading success is consistent with results from previous studies (e.g., Hurford et al., 1994). Moreover, phonological processing was the only measure that had incremental validity beyond all the others. This result is in accordance with previous findings that phonological processing is a stronger predictor of early reading than more traditional measures of global cognitive ability and visual-motor coordination (e.g., Mann, 1993; Stanovich et al., 1984).

Two of the home/school background variables were predictive of the Grade 1 reading measures, although to a lesser extent than phonological processing. English-speaking children performed significantly better on the Letter Identification task than children speaking "other" languages at home; this result probably occurred because the former group had greater exposure to the English

Table 4
Comparisons of Poor and Average Readers Across Kindergarten Measures of Visual-Motor Coordination, Cognitive Ability, Listening Comprehension, and Phonological Processing

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>M (SD)</th>
<th>t (63)</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMI</td>
<td>Poor</td>
<td>103.1 (6.9)</td>
<td>0.75</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>98.1 (10.9)</td>
<td>1.25</td>
<td>0.41</td>
</tr>
<tr>
<td>IQ</td>
<td>Poor</td>
<td>93.9 (4.5)</td>
<td>2.48*</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>91.4 (13.3)</td>
<td>2.48*</td>
<td>0.82</td>
</tr>
<tr>
<td>TACL-R</td>
<td>Poor</td>
<td>80.7 (11.2)</td>
<td>3.81**</td>
<td>1.26</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>99.1 (9.9)</td>
<td>3.81**</td>
<td>1.26</td>
</tr>
</tbody>
</table>

Note. VMI = Test of Visual-Motor Integration (3rd rev.); IQ = Estimated General Cognitive Ability; TACL-R = Test for Auditory Comprehension of Language-Revised; TOPA-K = Test of Phonological Awareness-Kindergarten. *p < .05; **p < .01.

discriminated from average (and above average) readers based on their scores on tests of phonological processing and listening comprehension administered in Kindergarten.

**DISCUSSION**

Some limitations of the present study are considered before the implications of the findings are discussed. The sample was relatively small and linguistically heterogeneous, which posed some practical and conceptual limitations. For example, comparisons across linguistic groups could not be performed and, as such, it is uncertain whether the results found for the entire sample would be replicated for specific linguistic subgroups. That only a few select cognitive skills could be measured in this study was a second limitation; clearly other abilities such as the retention of verbal information in working memory are involved in reading. This restriction
alphabet. For the most part, however, children's linguistic status did not significantly influence their Grade 1 word reading test scores, at least not at this age. This finding suggests that the results of previous studies with monolingual English-speaking children may generalize to children from diverse linguistic backgrounds who are attending English-language schools. The teacher effect of children's performance on the Kindergarten phonological task and reading measures may be attributed to differing teaching methods or a selection factor, in which more skilled children may have happened to be placed in the same classes. Nonetheless, as evidenced in the regression analyses, Kindergarten teacher had essentially no incremental validity.

As anticipated, listening comprehension was significantly related to Grade 1 reading performance. In contrast to previous findings, however, this skill was not a better predictor of reading achievement than general cognitive ability (e.g., Stanovich et al., 1984). The listening comprehension measure also differentiated poor from average readers in the group comparisons. As expected, poor readers scored significantly lower on this task. This result is consistent with a distinction made in the literature among poor readers who have different levels of listening comprehension abilities (e.g., Aaron, 1991). That is, children with poorly developed listening and reading skills may have more global language deficits such that their ability to understand speech is affected. In contrast, poor readers with normal listening comprehension skills may have a more specific modular deficit in the phonological domain (e.g., Stanovich & Siegel, 1994). In the present study, it seems that the poor readers may have been more similar to the former group with broader language deficits rather than to the one with isolated phonological difficulties.

Three implications of the results of the present study are considered. The first concerns the finding that phonological processing is a strong predictor of basic reading skills. As such, young children who have difficulty acquiring phonological skills are likely at risk for developing reading problems. Children with weak phonological skills may require additional attention, and with early intervention such as phonological-based training, future reading problems may be prevented. Indeed, evidence indicates that young children can be successfully trained to improve their phonological processing skills and that such training is effective in increasing reading abilities (e.g., Felton, 1993). A related and second implication of the study concerns the search for an alternative assessment model to the "standard" IQ/achievement discrepancy definition of reading disabilities. The results of this study indicate that the traditional measures of general cognitive ability and visual-motor integration are relatively weak predictors of Grade 1 reading, particularly in comparison to phonological processing. An assessment model that focuses on specific skills, such as phonological processing, rather than (or at least in addition to) general cognitive ability may be more relevant for the identification of reading disabilities (e.g., Kline et al., 1996). As was evident in this study, tests of phonological awareness may be good screening measures for reading problems. The third implication of our findings relates to reading instruction. Although there has been considerable debate in both the literature and in schools regarding the best method of teaching children how to read, the results underscore the importance of incorporating lessons on phonics into early reading instruction.

This article is based on a Master's thesis conducted by the first author and supervised by the second author. This research was supported by a Master's Fellowship awarded to the first author by the Quebec Fonds pour la Formation de Chercheurs et l'Aide a la Recherche and by a research grant from Concordia University awarded to the second author. Parts of this article were presented at the 104th annual convention of the American Psychological Association, Toronto, August 1996. Correspondence should be addressed to Stephanie K. Margolese or Dr. Rex B. Kline, Department of Psychology, Concordia University, 7141 Sherbrooke Street West, Montreal, Quebec H4B 1R6, Canada (E-mail: stephkrm@vax2.concordia.ca or rbkline@vax2.concordia.ca).

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*Received March 30, 1998
Revised September 10, 1998 / February 11, 1999
Accepted February 16, 1999*