# *The Role of Oral Language Development in Reading Comprehension: Evidence from Greek Elementary School Students*

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***Abstract***
*Reading efficiency is a major accomplishment that has an enormous impact on the child's academic and personal life. The purpose of the present study was to identify the potential contribution of language skills to the development of fluent reading and comprehension. In the present study, children in grades 2-4 (representing a random sample of 587 students in 17 Greek schools) were tested on measures of phonological decoding, expressive and receptive vocabulary, reading speed, spelling, and reading comprehension. The contribution of scores on receptive and expressive vocabulary tests to systematic variability in reading comprehension was examined in a series of hierarchical multiple regression analyses. It was established that vocabulary measures accounted for a significant proportion of variance in reading comprehension (12%) above and beyond the amount of variance accounted for by reading accuracy, reading speed (for both words and pseudowords), and performance IQ. The predictive value of vocabulary measures was independent of grade and decoding ability. The results are discussed with respect to educational implications for vocabulary development in middle elementary grades.*

***Key Words:*** Reading comprehension, vocabulary, elementary school students

## Introduction

Development of reading with understanding is one of the most important goals in children's education and it takes a remarkable amount of instructional time and activity. Since reading comprehension is a complex process involving many subcomponent skills and abilities, variability in comprehension outcomes has been linked to differences that concern the reader, the text, and factors related to the activity and the level of engagement (Snow & Sweet, 2003). Reader

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differences are more often described in relation to two different levels of processing: lower level contributing primarily to word reading accuracy and speed, and higher level linguistic and cognitive abilities (such as working memory, integration of information, inferencing, and use of metacognitive strategies) (RAND, Reading Study Group, 2002; Oakhill, Cain & Bryant, 2003). Both levels of skills are considered necessary for successful reading comprehension. In addition, it seems that insufficient development of lower level skills prevents the deployment of higher level processes due to inaccurate or laborious reading (Hoover & Gough, 1990; Perfetti, 1985; Stanovich, 1991). Based on this assumption, research efforts have focused on understanding the acquisition and development of fast and accurate text decoding as the most essential prerequisite for good reading comprehension. This work has provided us with a wealth of information regarding the subcomponent processes, developmental path, and impact that fluent word identification skills have upon reading comprehension. These studies have also revealed a substantial gap between the processes of word level fluent decoding and text level comprehension. Students who fail in reading despite adequate word recognition skills are often reported in both clinical and school settings (Chall, Jacobs & Baldwin, 1990). These difficulties in understanding written material become more apparent in the upper grades, when written text becomes more complex (Biemiller, 1999; Stahl, 1999). Meichenbaum and Biemiller (1998) have succinctly described the phenomenon as the "*fourth-grade slump*" and partially attributed it to limited opportunities for oral language development during the primary grades given the instructional emphasis on word recognition. Unlike word identification problems, many students having difficulties comprehending written material are treated unevenly due to uncertainty regarding the underlying causes.

A popular theoretical model accounting for reading comprehension implicates two *independent* factors: word decoding and oral language comprehension (Gough & Tunmer, 1986). The former factor concerns access to the linguistic forms that are orthographically represented in print and is specific to written language performance at the word and subword level, whereas the latter factor concerns linguistic comprehension processes not related to print per se. The two factors included in this model have long been, both intuitively and empirically, associated with reading comprehension outcomes. It has also been proposed that their relative weight may shift during the course of development, with general language skills becoming more crucial at higher grades (when word level decoding skills have been established) (Hoover & Gough, 1990; Vellutino et al., 1991; Yovanoff, Duesbery, Alonzo, and Tindal, 2005).

However, compiled evidence also indicates that both factors -although necessary- do not suffice in explaining individual variability in reading comprehension. Recent studies suggest a possible dissociation between word level reading and understanding written text (Oakhill, Cain & Bryant, 2003; Braze, Tabor, Shankweiler, & Mencl, 2005; Megherbi and Ehrlich, 2005; Landi, 2005) which may not necessarily reflect the print-independent component of the simple two-factor model. For example, in the "*Lexical quality hypothesis*" the focus has shifted from the two component skills/factors described in the "*simple model*" (Gough & Tunmer, 1986) to a more integrated interpretation of reading skill that

is based on the quality of the mental representations of words (lexical knowledge). These representations include detailed knowledge about word form and meaning as reflected by the specificity of its orthographic, phonological, semantic and syntactic components. According to this notion, the source of variability among readers lies primarily in the quality of lexical representations (Perfetti & Hart, 2001). This approach provides a parsimonious framework that explains reading outcomes as a function of experience with words at *both oral* (Nation & Snowling, 2004) *and written levels* (Stanovich, West, & Cunningham, 1991; Stanovich, 1993). Importantly, the lexical quality approach suggests that written and oral language processes are strongly interdependent and that this relationship occurs primarily at the word level.

***Purpose of the study***

The goal of the present study was to identify the potential contribution of decoding efficiency and language skills to the development of reading comprehension in a large sample of Greek students. Written Greek, as a highly transparent orthography, poses fewer decoding challenges to novice readers, substantially reducing the initial phases of reading acquisition (Seymour, Aro & Erskine, 2003). On the other hand, the Greek language provides an interesting medium for the assessment of the independent contribution of various abilities that have been shown to be related to comprehension skill, such as semantic and verbal skills. This is because of a quite extended interweaving morphological system which could potentially enable experienced readers to make inferences about unknown words encountered in text based on their knowledge of word parts (morphological awareness) (Anglin, 1993). In the present study we do not examine the role of morphological knowledge and meta-knowledge, much as that would be a topic worth exploring. Presumably, better word knowledge would also entail better word-part knowledge, even though the converse need not hold. Thus at this stage we examine the role of verbal skills in reading comprehension as represented by measures of receptive and expressive vocabulary. The vocabulary demands in these measures bear little relation to the language included in the texts selected for assessing reading comprehension therefore these vocabulary tests are more indicative of generalized verbal facility and not so much an index of specific semantic knowledge. In addition, in this study we assessed skills which are known to be key contributors to word identification ability, namely rapid reading of high frequency words and phonetic decoding of words and non-words. It was expected that studying the processes that underlie reading comprehension in a shallow writing system will provide us with evidence that is not subjective to decoding complexities for the reader. For this purpose, we examined the contribution of these variables known for their association with reading comprehension (word reading efficiency, accuracy, and semantic knowledge) in a sample of middle elementary school children.

## Method

***Participants***

Study participants were selected from 17 Greek elementary schools. School selection followed a stratified randomized approach in an effort to represent urban (seven), rural (three) and semi-urban schools (seven). Students of the three middle grades were selected randomly from each school, but only those whose parents gave written permission for participating in the research were

included in the study. Students from all three grades were tested at each school (see Table 1). All participating students were fluent speakers of the Greek language, had never been retained in the same grade, and they attended regular education classes of their school.

***Procedures***

All children were tested individually in two 40-minute sessions with the following tasks:

*Word and pseudoword reading accuracy and text comprehension.* Subtests 5, 6, and 13 of the Test of Reading Performance (TORP) (Padeliadou & Sideridis, 2000; Sideridis & Padeliadu, 2000) were used to assess word and pseudoword reading accuracy and comprehension. Subtests 5 and 6 included lists of 40 words and 19 pseudowords, respectively, in order of ascending difficulty. TORP subtest 13 evaluated students' text comprehension skills through 18 multiple choice questions that followed each of the 6 passages that comprised the specific subtest.

*Sight word and pseudoword reading efficiency.* These tests were designed to assess efficiency of automatic recognition of high frequency words and speeded pseudoword decoding. Words were selected on the basis of their frequency of appearance and pseudowords were constructed to match phonological and/or morphological characteristics of respective high frequency words. Each student was instructed to name each word as fast as possible without making errors in 45 seconds.

*Spelling.* Single-word spelling ability was assessed using a list of 60 words selected from the basic vocabulary selection in reading textbooks used in Grades 1-6.

*Rapid automatized naming.* Ten random sequences of five digits (e.g.,1, 2, 5, 7, 9) appearing in large font on a single sheet of paper each was used to assess automatized word retrieval efficiency. Students were instructed to name each item as fast as they could without omitting any. The total time (in seconds) to name the entire set of items served as the dependent variable.

*Receptive vocabulary.* In order to assess students' receptive vocabulary skills a Greek adaptation of the Peabody Picture Vocabulary Test-Revised (PPVT-R) (Dunn & Dunn, 1981) was used as it has been reported elsewhere (Mouzaki & Sideridis, in press, Sideridis, Mouzaki, Simos & Protopapas, 2006). The adaptation of the original test was based on pilot data from 35 children and 80 adults who were tested with the original stimulus order and was made mainly to address differences in the difficulty that certain words pose in each language.

*Expressive vocabulary.* In order to assess students' expressive vocabulary and verbal abilities the Vocabulary subtest from the Greek version of Wechsler Intelligence Scales for Children III (WISC-III) was used (Georgas, Paraskevopoulos, Bezevegis, & Giannitsas, 1997).

*Block Design.* In order to assess students' visual-constructive skills and also general non-verbal abilities the Block Design subtest from the Greek version of Wechsler Intelligence Scales for Children III (WISC-III) was used (Georgas, Paraskevopoulos, Bezevegis, & Giannitsas, 1997). Combined standard scores for the Vocabulary and Block design subtests were used to provide an estimate of Full Scale IQ (Sattler, 1982).

**Results**

The final sample consisted of 558 children (270 boys and 288 girls) after excluding those with estimated total IQ < 80 (corresponding to a combined standard score for the Vocabulary and Block Design WISC-III subscales of 6 points).

**Table 1**

***Means and standard deviations for age, estimated IQ and all measures by grade level for the entire student sample.***

| | Grade 2 | Grade 3 | Grade 4 |
|---|---|---|---|
| Gender (Boys/Girls) | 101/108 | 93/99 | 89/97 |
| Age (months) | 93.6 (3.5) | 105.3 (3.5) | 117.5 (4.1) |
| TORP 5 | 71(6.77) | 74.38(6) | 76.68(3.78) |
| TORP 6 | 25.88(6.22) | 29.39(6.91) | 31.72(6.22) |
| TORP 13 | 8.99(3.60) | 10.89(3.12) | 11.98(2.74) |
| Sight Word Reading Efficiency | 42.85(11.25) | 54.47(13.09) | 62.43(12.24) |
| Pseudoword Reading Efficiency | 16.58(5.95) | 22.40(9.08) | 26.34(8.39) |
| Spelling | 23.35(6.85) | 32.84(8.94) | 39.06(10) |
| RAN time | 30.78(6.13) | 26.51(5.55) | 23.34(5.08) |
| PPVT | 105.43(16.46) | 119.22(13.74) | 126.63(12.43) |
| WISC Voc | 9.88(2.75) | 9.97(2.46) | 9.81(2.78) |
| WISC Blocks | 9.61(3.09) | 9.79(3.16) | 9.80(2.76) |
| Estimated IQ | 9.75(2.19) | 9.88(2.22) | 9.83(2.21) |

The contribution of scores on receptive and expressive vocabulary tests to systematic variability in reading comprehension was examined in a series of hierarchical multiple regression analyses. We hypothesized that predictor variables such as reading accuracy and fluency will account for most of the variance we note in reading comprehension scores. Variables reflecting familiarity with words at the lexical and sublexical level (such as spelling, decoding, and reading efficiency), were entered first and accounted jointly for a respectable 15% of the variance in text comprehension scores. WISC-III Block Design standard scores and rapid automatized naming scores were entered next, in an attempt to partial out variance attributed to non-verbal (spatial) problem solving ability, which contributed a small but significant 4% of the variance ($F[2,547] = 13.61$, $p < .0001$). Next, the two non-reading vocabulary measures were entered and jointly contributed a very substantial 14% in addition to all other variables examined in the study ($F[2,545] = 58.72$, $p < .0001$).

The complete model had an $Adj R^2$ of .33 ($F[9,554] = 31.16$, $p < .0001$). Table 2 presents beta coefficients and partial correlation values that estimate the

relative predictive power of each one of these variables when it is added in the equation controlling for all other independent variables. Variables that make significant and independent contribution to text comprehension ability are PPVT and WISC-III Vocabulary and Block Design scores and, finally, performance on the word reading accuracy task (TORP-5).

In summary, our data reveal a strong indication that receptive and expressive vocabulary measures account, jointly but independently, for a significant proportion of variance in reading comprehension in this sample of Greek students in middle elementary grades. These two vocabulary measures seem to relate to differences on reading comprehension independent of decoding skill and facility in word recognition.

**Table 2**

***Regression coefficients and partial correlations as predictors of text comprehension ability.***

| | *Beta* | *p* | Partial *r* |
|---|---|---|---|
| Word reading accuracy (TORP-5) | 0.202 | .0001 | 0.15 |
| Pseudoword reading accuracy (TORP-6) | -0.073 | .1 | -0.06 |
| Word Reading Fluency | 0.003 | .9 | 0.002 |
| Pseudoword Reading Fluency | 0.027 | .5 | 0.02 |
| Spelling | 0.073 | .2 | 0.05 |
| WISC-III Block Design | 0.082 | .03 | 0.08 |
| Rapid automatized naming (digits) | 0.02 | .7 | 0.02 |
| PPVT | 0.298 | .0001 | 0.24 |
| WISC-III Vocabulary | 0.192 | .0001 | 0.16 |

Finally we examined the concordance among three alternative classification schemes based on different abilities: (1) groups of children who would be classified as "poor" text comprehenders (scoring at or below the 10th % ile ($z < -1.3$) on TORP 13, (2) children who would be classified as reading-disabled on the basis of a widely accepted procedure in reading research (using a cutoff z score of -1.3 on a word-level reading composite score --average of standard grade-corrected scores on the word and pseudoword reading accuracy subtests of TORP, and (3) children who scored very low on a vocabulary index (average grade and age adjusted scores on PPVT and WISC-III Vocabulary). Children scoring above the mean of the respective subtests or indices comprised the more "skilled" group. Table 3 presents frequency data (concordance) for reading comprehension and vocabulary measures and Table 4 corresponding data for text comprehension and word-level reading accuracy skills. As might be expected on the basis of the results of the multiple regressions analyses, these data show that it is twice as likely for children to score high on basic reading measures and low on text comprehension (8%), than it is to score high on vocabulary measures and low on text comprehension (3.6%). The converse is also true with less than 1% of the total sample scoring low on vocabulary measures and high on text comprehension measures. This figure is substantially higher (3.5%) for children who score low on basic reading skills tests and high on text comprehension measures.

**Table 3**

***Relative frequencies (% of the total sample) of "poor" comprehenders and children who score below the 10th % ile on vocabulary measures.***

| | | Text Comprehension | |
|---|---|---|---|
| | | z < -1.3 | z > 0 |
| Vocabulary | z < -1.3 | 5 | .8 |
| | z > 0 | 3.6 | 91 |

**Table 4**

***Relative frequencies (% of the total sample) of "poor" comprehenders and children who score below the 10th % ile on basic reading skills.***

| | | Text Comprehension | |
|---|---|---|---|
| | | z < -1.3 | z > 0 |
| Basic Reading cluster | z < -1.3 | 5 | 3.5 |
| | z > 0 | 8 | 84 |

## Discussion

There is a renewed interest in the role of component skills for reading comprehension since most of the efforts that aimed to improve our understanding and subsequently our practices in achieving fast and accurate reading have not been as successful in improving reading comprehension. Current investigations provide evidence not only for the variability in comprehension that is attributable to accuracy and fluency of word reading but also to variability due to other reader characteristics as well as characteristics of the text and the activity of reading (Gaskins, 2003). Also, subcomponent skills related to language and cognitive processes have come to focus revealing very interesting findings. Specifically, higher level processes such as working memory, inferencing ability, text integration and metacognitive strategies seem to account for a major part of the observed variance in text comprehension skill (Oakhill, Cain, & Bryant, 2003). Accumulating evidence suggests a more complex relationship between word knowledge and comprehension of written text than what has been described so far. Interactionist and connectionist models implicate a framework of integrated processes to interpret these findings. In the case of reading comprehension, the central role of lexical knowledge is not limited to semantic or orthographic information for words but it also consists of phonological and syntactic features.

In this study we attempted to investigate the role of well known component skills in accounting for variance in reading comprehension of a highly transparent orthography using a large sample of general student population in middle elementary grades. Vocabulary measures accounted for a significant proportion of variance in reading comprehension (14%) above and beyond the amount of variance accounted for by reading accuracy, reading speed (for both words and pseudowords), and performance IQ. The ability to extract meaning and information from text in the context of a task that poses minimal demands for

working memory and speeded reading therefore depended less upon the children's ability to read isolated words and pseudowords apparently resting primarily on word-level general verbal ability. Reading-impaired children, who would read slowly and with difficulty, may have additional difficulties in text comprehension; this should be studied in an appropriately selected sample.

We expect that the overall predictive value of the model would be substantially increased had we included a number of other variables expected to affect text comprehension namely, general (oral) comprehension ability and direct measures of attention. Interestingly, reading fluency measures, which had been included in preliminary analyses, failed to contribute independently of un-timed measures of reading accuracy. Based on recent findings in Greek secondary education (Protopapas & Skaloumbakas, in press), we expect to be able improve the predictive value of fluency by measuring reading speed at the text-level.

***Educational implications***

As it has been shown previously, both oral and written language skills are of primary importance in comprehending written text. Familiarity with words should have a central role in the school curriculum not only for the development of fluent reading but also for strengthening the internal lexicon. However, traditional practices of providing exposure to words through flash cards or word walls, aim primarily towards developing orthographic recognition and do not extend further than simple recitations of word definitions. Such practices have not gained much support from recent work that encourages engagement with language in both forms. Instructional activities that create communication opportunities and word use in both contextualized and decontextualized applications have come to focus. Teachers are expected to lead students in such activities that emphasize learning and using words that have been selected from instructional level texts and can be easily integrated in their speech. Multiple exposures through various contextual associations and many opportunities for linking new information to existing knowledge appear to be a more productive strategy for language development (Beck, McKeown, & Kucan, 2002; Blachowicz & Fisher, 2000). Finally, incomplete or false understandings of words should be negotiated and clarified through direct teaching and open communication as well as personal encouragement for searching for meaning.

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