# A LONGITUDINAL STUDY OF THE ROLE OF PHONOLOGICAL AWARENESS IN EARLY READING DEVELOPMENT IN ENGLISH SPEAKING (L1) AND ENGLISH AS A SECOND LANGUAGE SPEAKING (ESL)STUDENTS 

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#### Abstract

This study examined the role phonological processing (PP) skills play in identifying English as a Second language (ESL) students at risk of early reading failure compared to native English speaking (L1) students at risk of early reading failure. This study also examined whether early PP skills continue to be good predictors of reading ability for L1 and ESL learners over time. This 4 year longitudinal study began in 1996 with three grades of participants Junior Kindergarteners, Senior Kindergarteners, and Grade 1 students. There were 156 ESL students and 195 L1 students in 1996, and among the ESL participants, the two most predominant languages were Punjabi and Chinese. Students were further classified as either reading disabled (RD) or normal achieving readers (NA) based on their scores on a reading measure. All students were given tasks to assess their word reading, phonological awareness, syntactic awareness, spelling and working memory skills in English over the years, although in some years certain groups of participants were administered additional and different tasks depending on their grade level. For example, math tasks were administered only to grade 3 and 4 children in 1999. Although there were a few observable differences on some of the measures between the two language groups, this study found no significant differences in early reading development between L1 and ESL learners overall. In addition, this study found evidence of a positive and stable relationship between PP skills and reading ability in ESL and L1 students.


## TABLE OF CONTENTS

Abstract ..... ii
Table of Contents ..... iii
List of Tables ..... iv
Acknowledgements ..... v
Dedication. ..... vi
Introduction. ..... 1
Method ..... 12
Results. ..... 24
Discussion ..... 43
References. ..... 48
Appendix A . ..... 51
Appendix B ..... 55
Appendix C ..... 69
Appendix D ..... 98

## LIST OF TABLES

Table 1 Number of RD and NA Participants for each Grade in each Year by Language Category13
Table 2 List of Phonological Processing Skills Measures Administered to each Grade over the Years ..... 14
Table 3b Mean SK Scores on Reading and Phonological Processing Skills Measures for NA and RD students ..... 24
Table 3c Grade 1 Mean Scores on Reading and Phonological Processing Skills Measures for NA Students ..... 25
Table 4 Mean Scores on Reading and Phonological Processing Skills Measures ..... 27
Table 5 Mean Scores Merged by Grade over the Four Years ..... 28
Table 6 F-values of the Significantly Different Mean Scores found between ESL and L1 Students ..... 31
Table 7 Mean Scores and F values for Significantly Different Mean Scores between ESL and L1 Students by Grade ..... 32
Table 8 F-values for Time Factor for Measures Employed in ANOVA Procedure ..... 35
Table 9 Significant Correlations for JK group of Participants across the Four Years ..... 37
Table 10 Significant Correlations for SK group of Participants across the Four Years ..... 39
Table 11 Significant Correlations for Grade 1 Participants across the Four Years ..... 40
Table 12 Number of Positive Significant Correlations by Grade over the Four Years ..... 42

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## DEDICATION

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In Canada, many children begin school in the public education school system at the age of 5 and many of those Canadian born or new immigrants speak languages other than English at home (ESL students). For most of these young students, it will be the first time they will be immersed in an English speaking learning environment. For some of these students complementary pull-out ESL assistance will be provided during their later elementary schooling years, but excluding this language assistance, ESL students will receive the same instruction as their native English speaking peers (L1 students). That is, all subjects in their curriculum will be taught in English including instruction in reading and writing (language arts). The general aim in this study is to gain a better understanding of the reading development of ESL learners who are receiving the same literacy instruction program as their native English speaking peers. Underlying the practice of integrating ESL students with native English speakers and providing ESL students with the same reading program that native English (L1) students receive is the assumption that ESL and L1 children's language develops similarly. This study will attempt to address this theoretical assumption by investigating the reading development of L1 and ESL students.

Assuming that the development of reading skills in L1 and ESL children is the same, one may still question whether the exposure to the English language provided in the school will be sufficient to allow ESL children to succeed in learning English? Will it be possible for ESL students to equal their L1 peers in English or will their English skills always be below those of L1 students? In answering these questions it is important to note that ESL students, Canadian or new immigrants, entering the Canadian public school system at the start of elementary education, Kindergarten or Junior Kindergarten, may come from environments where the English language was rarely spoken or heard. Many ESL students may never have been read to in English or have listened to songs and rhymes in English. Speaking in English may have been limited to some basic interactions between parent or child and another Canadian speaker in an institutional or public setting (bus, bank, grocery store). Still others may have had no exposure to English at all such as some new immigrants. This lack of exposure in the second language early in a child's life may be a disadvantage for second language (L2) learners.

Some of the predictors of reading are letter knowledge, phonological awareness, and phonemic awareness. Letter name knowledge, as the name suggests, is the ability to identify the letters of the alphabet and name them. Phonological awareness is the awareness of the sounds of the language and is prerequisite to the ability to use this knowledge to manipulate
these sounds as in phoneme deletion or blending tasks. These tasks are specifically defined as phonological processing tasks (Wagner \& Torgesen, 1993) because in addition to the awareness of and access to the sound structure of a language (phonological awareness) they involve the use of this knowledge. Phoneme or phonemic awareness is the awareness of the smallest meaningful individual sounds that make up a word in speech. For example in the English word, "cat" there are three phonemes: /k/, $æ /$, and /t/, and the removal of any one of these phonemes will change the word. A child with phonemic awareness is able to examine the language and manipulate its sounds, for example, using knowledge of the letter-sound correspondences of an alphabetic language to read and spell words. There are many levels of phoneme awareness and they are defined by the tasks used to operationalize them. A task such as phoneme recognition, for example, represents an easier and lower level of phoneme awareness than phoneme substitution tasks (an oral measure of deleting a phoneme from a word and substituting it with another to form a different word).

The positive relationship between these phonological processing skills and successful reading development is well documented in the literature (e.g. Ball \& Blachman, 1991; Bradley \& Bryant, 1983; Castle, Riach \& Nicholson, 1994; Griffith \& Olson, 1992; Juel, Griffith \& Gough, 1986; Liberman \& Shanweiler, 1985; Lie, 1991; Siegel, 1993; Stahl \& Murray, 1994).

For example, Juel, Griffith and Gough (1986) tested a model of early literacy acquisition by studying the relationships proposed in the model between various characteristics (ethnicity, oral vocabulary, and IQ) and school developed skills (spelling, word recognition) on literacy growth. Some components of their model of literacy acquisition included phonemic awareness, exposure to print, cipher knowledge (the orthographic cipher which included the set of spelling sound correspondence rules of the language) and lexical knowledge (knowledge about which rules do or do not apply to specific items in the lexicon). Decoding was also called word recognition in this study and defined as the ability to translate print into linguistic form. The model assumed that decoding and spelling share a common denominator: cipher knowledge and lexical knowledge. The cipher is composed of phonemic awareness, oral language, ethnicity, and IQ-three characteristics that were hypothesized to have an effect on phonemic awareness. This was interesting because research has shown that IQ is an irrelevant factor in diagnosing individuals as reading disabled (Share, Jorm, Maclean \& Matthews, 1984; Siegel, 1993; Stanovich, 1993-1994). Juel et. al. (1986) found that phonemic awareness appeared to be correlated with year end performance in word recognition in grade 1 and to a lesser degree in grade 2.

Training studies provide further additional empirical support for the importance of phonological processing knowledge (Ball \& Blachman, 1991; Bradley \& Bryant, 1983; Castle, Riach \& Nicholson, 1994; Lie, 1991; Stahl \& Murray, 1994). For example, the purpose of Ball and Blachman's (1991) study was to explore 1. the effects of segmentation training in kindergarten on early reading and spelling ability and 2 . the effects of letter name and letter sound training on segmentation skills and early reading and spelling ability. Students were assigned to one of three groups: 1. A Phoneme Awareness training group (this group also received letter sound and letter name instruction) 2. a Language Activities group (letter-name and letter sound instruction but no phoneme training) 3. A Control group in which there was no intervention. Pretests and posttests on phoneme, letter name and sounds and word reading measures were administered. Using only the post test scores of nonreaders identified in kindergarten (defined as those who read 1, 2 or 3 words on the Woodcock word identification subtest), the number and percentage of readers and nonreaders were calculated. The post test scores for each group was as follows: 1. phoneme awareness group $34.5 \%$ readers 2 . Language activities group 13.3\% readers 3 . Control group 6.7\% readers. In addition, differences between the three treatment groups in the number of readers after training were significant, $\chi^{2}(2)=8.4, p<.05$. A second reading measure used in the post test measures called the phonetically regular word list reading measure further supported differences in favor of the phoneme awareness group.

Similar results in favor of phonological processing skills as a good predictor of early reading ability were found in the other training studies (e.g., Bradley \& Bryant, 1983; Castle, Riach \& Nicholson, 1994; Lie, 1991; Stahl \& Murray, 1994;) and also in correlational studies of reading acquisition in other languages (Bruck, Genessee, Caravolas, 1997; So \& Siegel, 1997). Castle et.al. provided phonemic awareness instruction in a whole language program. They found that although the phonemic awareness training group did not perform significantly better on the word reading measures (Burt word reading, Clay word reading) compared to the other two groups, they did perform significantly better on the pseudoword reading measure (Bryant pseudoword test).

Furthermore there is a great deal of evidence that these phonological processing skills are good predictors and components of successful reading development in English (Ball \& Blachman, 1991; Bradley \& Bryant, 1983; Castle, Riach \& Nicholson, 1994; Lie, 1991; Stahl \& Murray, 1994) and other languages (Bruck, Genessee, Caravolas, 1997; So \& Siegel, 1997). This line of research implies that ESL students who do not have an awareness of the English alphabet, sounds, phonemes and graphemes when they enter the education system will likely
demonstrate poor early reading performance in English. The possibility of this implied disadvantage for ESL learners is only one prospect; however it raises an empirical question relevant to this research: Can ESL students become as successful English readers as their L1 peers, given their lack of experience with the English language prior to starting school, and the possible interference from their native language? Research related to this question is addressed in cross-linguistic comparison studies (Durgunoglu, Nagy, Hancin-Bhatt, 1993; Verhoeven, 1990), and other investigations on first language (L1) and second language (L2) early reading development (Cisero \& Royer, 1995; Da Fontoura \& Siegel, 1995; Chiappe \& Siegel, 1999; Geva \& Siegel, 2000). Some of these studies have addressed the possibility of L2 reading performance difficulties by incorporating and or discussing theories that either predict L2 difficulty, as in the Script Dependent Hypothesis or predict similarity between L2 and L1 reading performance as in the Linguistic Interdependence Hypothesis \& Central Processing Hypothesis.

According to the Script Dependent Hypothesis, reading problems are related to the orthographic features of the language (Da Fontoura \& Siegel, 1995). Alternatively The Linguistic Interdependence Hypothesis and Central Processing Hypothesis present an argument for similarity between L1 and L2 performance. Cummins (1979) proposed the Linguistic Interdependence Hypothesis, which is a blend of the Developmental Interdependence and Threshold Hypotheses. The Developmental Interdependence Hypothesis states that the level of second language competence achieved will be dependent on the level of competence developed in ones native language at the time that intensive instruction in the L2 begins. The Threshold Hypothesis proposes that there may be threshold levels of linguistic competence that second language learners must attain in order to avoid cognitive disadvantages and allow for the potential benefits of bilingualism to occur. In relation to L2 development and the influence of native language, the linguistic interdependent hypothesis suggests that there are underlying mechanisms in reading ability that cross languages and consequently an interdependent relationship between children's skills in acquiring a native language and a second language. Therefore, only those children experiencing difficulty in native language acquisition will experience difficulty in second language acquisition. The proposed underlying mechanisms in reading ability in all languages suggested by the Linguistic Interdependent Hypothesis relate to the Central Processing Hypothesis.

The Central Processing hypothesis posits that acquisition of reading skills in native language or second language depends on the development of underlying cognitive and linguistic skills not on the orthography of the language being acquired. Underlying cognitive and linguistic skills include verbal short-term memory, serial naming skills (digits and letters) and
phonological skills. The central processing hypothesis would predict that only those individuals with deficient cognitive and linguistic skills should experience difficulties in acquiring basic reading skills. Furthermore, according to the hypothesis these difficulties are not dependent on the orthographic and phonological system of the language. Given both of these hypotheses L1 learners with deficient cognitive and linguistic skills are equally likely to experience reading difficulties as L2 learners irrespective of the complexity of the language's orthographic and phonological systems.

The question of whether ESL students can become as successful English readers as their L1 peers given the lack of early English experience with English and the possible interference from their native language development has been addressed in the research on cross-language transfer and the research comparing first language and second language reading development.

## Cross-Language Transfer Research

Studies in cross language transfer of phonological awareness skills in young children (Durgunoğlu, Nagy, Hancin-Bhatt (1993); Cisero \& Royer (1995) have found support in favor of transfer of phonological awareness skills between native and second language. For example, Durgunoğlu et.al. (1993) investigated cross-language transfer in bilingual grade 1 readers. Participants spoke Spanish and English and were given tests in both languages for phonological awareness word recognition and pseudoword reading. In this study phonological awareness and word recognition measures in both languages were of interest as independent variables in predicting Spanish and English word reading and pseudoword reading performance. The results of their study demonstrated a positive relationship between Spanish phonological awareness and English word and pseudoword reading performance. Spanish phonological awareness skills were a significant predictor of performance of English word recognition and English pseudo word reading. Additionally Spanish word reading performance predicted English word reading, but it is important to note that "a child who has some Spanish word recognition skills but low phonological awareness tends to perform poorly on English transfer tests" (p463). This suggests support for the Central Processing Hypothesis and Linguistic Interdependent Hypothesis in that the underlying cognitive and linguistic skills in L1, which in this case is phonological awareness, was found to be predictive of L1 \& L2 reading performance (Durgunoğlu et.al., 1993). Research by Cisero \& Royer (1995) provide similar support for the cross language transfer of skills but in this study transfer was between L1 phonological awareness tasks to L2 phonological awareness tasks.

Cisero \& Royer (1995) studied cross-language transfer in English speaking children and Spanish speaking children attending a Transitional Bilingual Education (TBE) school. TBE children were taught all subjects in Spanish and taught English as a separate subject. Cisero \& Royer examined phonological transfer of rhyme awareness, initial phoneme and final phoneme deletion tasks separately, and found evidence to support cross language transfer, but the significance of cross language transfer was only found in initial phoneme deletion task. The authors state that the reason for this was due to the low correlations found in the TBE group for initial and final phoneme deletion between L1 time 1 performance and L2 time 2 performance. As a consequence of this finding the authors noted that cross-language transfer of phonological awareness is dependent on how developed a skill is at the point in the development process of skill acquisition. This finding suggests support for Cummins's Linguistic Interdependence theory.

Together these two studies confirm that cross language transfer does occur and, most importantly, Durgunoglu et.al.'s (1993) study confirms that phonological awareness in ones native language can predict $L 2$ reading and phonological performance. Evidence from these two studies support the Central Processing Hypothesis and Linguistic Interdependent Hypothesis and suggest that ESL students will not experience interference in their L2 development from their L1 skills. Rather L1 phonological awareness skills will contribute positively to L2 reading performance. However if L1 phonological awareness skills are low, ESL children will experience difficulties in their L2 development. Empirical evidence to support this suggestion is evident in the research comparing L1 and ESL learners.

## Research comparing L1 and ESL early reading development.

The role of phonological processing skills has also been of interest to researchers comparing early reading development in L1 and ESL/L2 learners (Chiappe \& Siegel, 1999; Chiappe, Siegel, \& Gottardo, 1999; Da Fontoura \& Siegel, 1995; Geva \& Siegel, 2000; Lesaux, 2001) and the finding that phonological processing skills are a significant component in successful early reading development was replicated for ESL learners.

## Cross-Sectional studies comparing ESL \& L1

Researchers studying the early reading development of L1 and ESL students (Chiappe \& Siegel, 1999; Chiappe, Siegel, \& Gottardo, 1999; Da Fontoura \& Siegel, 1995) have found converging evidence to support the importance of phonological processing skills as the best
predictor of reading in comparison to other reading components such as syntactic awareness and verbal memory. For example Chiappe \& Siegel (1999) conducted a comparison study of English (L1) and Punjabi-speaking (ESL) Canadian children in grade 1. The purpose of their study was to examine the roles of phonological processing and syntactic awareness in reading acquisition for L1 and ESL speakers of English in the first grade. For each language group (L1 \& ESL), participants were categorized as poor readers or normal readers based on their performance on the Wide Range Achievement Test-3 Reading subtest. No significant differences between the language groups were found for word reading and phonological measures suggesting that a child's native language does not predict early reading ability. Although phonological processing skills (phonological awareness \& phonological recoding) did not discriminate between the 2 language groups it did discriminate between groups of children based on reading skill. That is, L1 and ESL poor readers performed significantly differently from L1 and ESL average readers, but there were no significant differences between ESL and L1 children on their phonological processing scores. In contrast to the phonological processing results however, syntactic sensitivity measures discriminated between the two language groups for good and poor readers. An interesting component of this research that was not included in other investigations comparing ESL and L1 reading development (Chiappe, Siegel, \& Gottardo, 1999; Da Fontoura \& Siegel, 1995; Geva \& Siegel, 2000; Lesaux, 2001) was the study of error types on word reading.

Chiappe \& Siegel (1999) studied error types, some of which indicated competence in the use of grapheme-phoneme correspondence. The study of error types allowed the researchers to examine the performance profile of ESL and L1 students in word reading, with regard to their phonological skills/strategies. Three main types of error were measured: 1. Overgeneralizing a phoneme-grapheme rule. For example overgeneralization of the English rule "ea" is pronounced "long e" and pronouncing the word "head" as "heed". 2 Deleting or inserting a phoneme in the pronunciation of a word, such as reading "heard as "her" or "four" as "floor". Both of these error types were categorized as -1errors because there was an error in reading one phoneme. They were further categorized as -1 vowel, -1 consonant, -1 deletion, and -1 insertion error types. The -1 vowel errors were errors in reading a vowel phoneme (e.g. "hat" and "hit") and -1 consonant errors were errors in reading a consonant phoneme (eg. "rat" and "ran") 3. Wild errors such as reading "bunny" for the word "rabbit" (semantic wild errors), reading "jar" for "jump" (wild first letters), and reading "kite" for the word "like" (other wild). The analysis of the error types demonstrated that both the ESL and English-speaking average readers relied on grapheme-phoneme correspondences when reading unfamiliar words to a greater extent than poor readers. The similar performance profiles of the ESL poor readers were indistinguishable
from the performance profiles of native English poor readers. Consequently the researchers found evidence that "ESL children with reading difficulties [could] be identified for reading remediation based on the same characteristics as poor readers who are native speakers of English" (p.27).

Da Fontoura \& Siegel (1995) examined the reading, phonological, syntactic and working memory skills in bilingual gr. 4,5 , and 6 (ESL) Portuguese speakers in their native language and in English. They also studied the relationships between reading problems in English and reading problems in Portuguese by comparing ESL bilingual Portuguese speakers with monolingual English speakers. Pseudoword reading was used to measure phonological processing skills or more specifically phonological recoding. Statistically significant correlations were found between the English and Portuguese tasks measuring the same process. (English and Portuguese word reading $=.52 p<.001$; English \& Portuguese pseudoword reading $=.64$, $\mathrm{p}<.0001$; English \& Portuguese oral cloze = .63, p<.01; English \& Portuguese working memory $=.48, p<.001$ ) . Significant robust correlations were also found for phonological processing as measured by pseudoword reading with word recognition skills across and within languages. For example, English word reading \& English pseudoword reading $=.68, \mathrm{p}<.0001$; English word reading \& Portuguese pseudo word reading $=.51, p<.001$; Portuguese word reading \& Portuguese pseudoword reading $=.63, p<.001$; Portuguese word reading \& English pseudoword reading $=.53, p<.001$ These results suggest evidence in support of cross language transfer of phonological processing skills as well as evidence that phonological processing is a strong predictor of word reading compared to syntactic awareness, as measured by an oral cloze task, and working memory. Furthermore comparing disabled readers with normal readers as measured by either English or Portuguese word reading measure revealed the same deficit in phonological processing for individuals with an English reading difficulty as for individuals with a Portuguese reading difficulty. This provided further evidence that reading difficulties were not language dependent.

There was also a deficit in working memory and syntactic skills for reading disabled Portuguese students. An interesting result to note regarding the developmental relationship among phonological processing, syntax, and memory skills is that when defining normal and reading disabled readers using the English reading measure, the Portuguese working memory task rather than the English working memory task discriminated between the two groups. However the English syntactic skills but not Portuguese syntactic skills differentiated between the two reading groups. Thus, we may hypothesize that poor ESL readers compared to normal ESL readers will exhibit significantly lower syntax scores and phonological processing skills, but
that working memory scores will not be significantly different between the reading disabled (RD) and normal achieving (NA) reading groups. The authors note that working memory may be a measure of individual difference variables. This may suggest that working memory indirectly affects L2 reading performance through the phonological processing and syntax skills or that L2 readers may be using more than one route in word reading, a route in which context clues are used. In contrast, when performing tasks in one's native language one may rely exclusively/more on the phonological route. Consequently L1 working memory performance appears to independently discriminate L2 reading ability performance because of its link with phonological processing. Lastly, this study found that the reading disabled Portuguese bilingual (ESL-RD) children performed significantly higher on the English pseudoword reading and spelling tasks than reading disabled English children (L1-RD) possibly as a reflection of the positive transfer from a more shallow orthographic language to a deeper orthographic language. Therefore this may suggest that ESL-RD children will outperform L1-RD children in phonological recoding skills if their native language has a more shallow orthography in comparison to English.

In addition to finding support for phonological processing skills as a good predictor of reading performance regardless of language, Chiappe, Siegel \& Gottardo (1999) found that of all the specific phonological processing skills, phoneme awareness was one of the best predictors of reading performance for both ESL and L1 children. In their comparison study of Kindergarten children, they also found growth in the relationship between phonemic awareness and literacy for ESL children. There was no correlation between these constructs in the Fall but without special instruction or phonemic training, phonemic awareness measures correlated with the literacy measures in May.

In summary, the research provides evidence in favor of phonological processing skills as the best indicator of reading ability independent of language background. Phonological deficits as measured by phoneme skills and pseudoword reading are found to be a characteristic of reading disabled ESL and L1 children.

## Longitudinal Research Comparing L2 and L1 learners

Longitudinal studies (Lesaux, 2001; Verhoven, 1990) provide research with the data to examine the development of phonological processing over time and this may clarify the role phonological processing skills plays in reading development for both L1 and L2 learners. However the number of longitudinal studies comparing L1 and L2 reading development is small
particularly when we define the L2 learners as a minority language group acquiring a majority language. The definition is an important one according to Cummins (1979) because the success of bilingual education for the L2 learner will be a reflection of the interactions between . child input factors and educational programs. Phonological processing skills is only one example of child input factors, others include motivational and cognitive characteristics. Cummins recognized the external influence that significant others placed upon the second language and the native language of the $L 2$ learner. A child's internal conceptions about learning the second language and his feelings about his own language will influence the L2 learner's academic performance overall. Cummins distinguished between submersion programs and immersion programs. Submersion programs were programs where the L2 was the majority language and the learners were the minority. This created a different dynamic between the L2 learner and their L1 peers and teacher compared to Immersion programs where the L2 was the minority language and the students spoke the majority language. In French Immersion programs for example, the status of the L2 learner is very different from the status of the ESL learner. Clearly then, French Immersion research should be not included as a parallel of L2 development for ESL students. Although phonological processing skills is an important predictor of reading ability in both English and French, the development of phonological skills and reading will differ for the L2 student. This limits the research to one longitudinal study comparing L1 and L2 learners of English. (Lesaux, 2001)

Lesaux (2001) studied the reading development of ESL and L1 kindergartens for 3 years. Two of the research questions were 1 . Whether similar patterns of reading development existed between the two language groups in each reading category (reading disabled \& average) and 2 . Which skills at the beginning of kindergarten best identify grade 2 reading failure in ESL and L1 children. Lesaux found that despite the differences found in Kindergarten, by grade 2 differences by language group had disappeared and 2 groups of normal and disabled readers had emerged. Furthermore, Lesaux found the number of ESL children that develop strong phonological processing skills and read at an average level was comparable to the number of L1 average readers with strong phonological skills. However, in this study phonological awareness and explicit phonics instruction was provided for reading disabled students identified in Kindergarten and if needed the phonological awareness intervention continued in grade 1. Consequently we have to limit our generalization of the ESL findings. Of all the Kindergarten tasks, phonological processing skills, in particular phoneme deletion, was the best predictor of reading ability in grade 2 similar to the findings of Chiappe \& Siegel (1999), Chiappe, Siegel, \& Gottardo (1999), Da Fontoura \& Siegel (1995), and Gottardo, Stanovich, \& Siegel (1996). Additionally the significantly lower performance in syntactic skills among normal

ESL readers compared to L1 normal readers found in Da Fontoura \& Siegel (1995) and Chiappe \& Siegel (1999) was replicated in Lesaux's research.

In summary, the importance of phonological processing skills is evident in the research on L1 reading development in English. Phonological processing training studies have established phonological processing skills as a strong predictor of reading ability. Cross language transfer studies and L1 ESL comparison research that have included reading ability in their design allowing for a separate study of poor and average readers in each language group have confirmed that phonological processing skill and not language background is the important factor in predicting reading ability. However the number of longitudinal studies comparing L1 and L2 speakers is limited (Lesaux, 2001; Verhoeven, 1990) and if we focus on the ESL population, the number of studies is further limited (Lesaux, 2001) More longitudinal research is needed to provide a fuller understanding of ESL \& L1 reading development and the role phonological processing skills play in predicting reading ability. Following the line of research in both longitudinal and cross-sectional research investigations on early reading development in L1 and ESL children, inclusion of other components such as syntax and verbal working memory will provide some perspective on the role phonological processing skills play with respect to other components in the development of reading in L1 and ESL students (Chiappe \& Siegel, 1999; Chiappe, Siegel, \& Gottardo, 1999). As well as to gain a better understanding of phonological development, it may be useful to conduct a separate analysis for each phonological processing skill task and analyze their effect on word reading over the years separately.

## Problem Statement

The purpose of this study then will be to examine the role phonological processing skills play in identifying ESL children at risk of early reading failure, and whether early phonological processing skills continue to be good predictors of reading ability over time, and which specific phonological processing skills are good predictors of reading ability for L1 and ESL learners. ESL children will be compared to native speakers and their performance over four years will be analyzed. This study will also attempt to address how phonological processing skills develop with respect to the syntactical and working memory components of reading in ESL and L1 poor readers and good readers.

## Main Research Questions

1. Are their differences in the reading and phonological processing skills development between L1 and ESL learners who are average readers (NA) or who are experiencing reading difficulty (RD)?
2. What is the relationship between the phonological processing skills and reading ability of ESL and native speakers?

## Method

## Design

Participants in this study attended one of two suburban elementary schools in Toronto Canada. These children spoke a variety of languages as their first language, but the three predominant first languages in this group were Punjabi, Cantonese or English as their first language. In 1996 a total of 359 children participated in the study. One hundred and twenty were in Junior Kindergarten, 128 were in Senior Kindergarten, and 111 were in grade 1. In 1997 there was a total of 413 participants: 139 Senior Kindergarteners, 146 grade 1 students, and 128 grade 2 students. In 1998 the total number of participants was 350: 108 in grade 1, 131 in grade 2, and 111 in grade 3, and in 1999 there was a total of 315 participants. Sixty-eight of the participants were in grade 2, 151 were in grade 3 and 96 were in grade 4. All students were given tasks to assess their reading, phonological awareness, syntactic awareness, spelling and working memory skills in English. Children were individually tested one or two times a year for a period of four years. However group testing was used to assess spelling, reading comprehension and math skills. Testing was conducted by trained graduate students and lasted for thirty to forty minutes.

Children were categorized by native language and reading ability. ESL children were defined as children whose first and primary language spoken at home was not English. In 1996, 156 ESL children were participants in this study and 195 children were native English speakers. ESL children varied not only by their first language but also by length of time they lived in Canada and the amount of written and spoken English exposure they had experienced.

Classification of participants by reading ability began in Junior Kindergarten if children were 5 years old or older. Based on their word reading score on the reading subtest of the Wide Range Achievement Test-3 (WRAT-3; Wilkinson, 1995) children were categorized as an "at-risk reader" or an "average reader". A child with a WRAT-3 reading percentile score of 25 or less was defined as an "at risk reader" and a child with a WRAT-3 reading percentile score of 30 or
higher was defined as an "average reader". In 1996, thirty-three children were identified as "at -risk readers" and 223 children were identified as "average readers". (Please see Table 1 in Appendix A for a description of the participants in each grade over the four years). Table 1 below shows the number of RD and NA children in each language category over the four years of this longitudinal study.

Table 1 Number of RD and NA Participants for each Grade in each Year by Language Category

| Grade/Year | L1 | (RD, NA) | ESL | (RD, NA) |
| :---: | :---: | :---: | :---: | :---: |
| 1996 |  |  |  |  |
| JK | 70 | $(5,6)^{*}$ | 50 | (2, 8).* |
| SK | 74 | $(9,58) *$ | 54 | $(8,44)^{*}$ |
| G1 | 59 | $(4,53) *$ | 52 | $(5,47)$ |
| 1997 |  |  |  |  |
| SK | 88 | $(10,78)$ | 51 | $(5,46)$ |
| G1 | 91 | $(8,83)$ | 55 | $(4,51)$ |
| G2 | 69 | $(8,61)$ | 59 | $(9,50)$ |
| 1998 |  |  |  |  |
| G1 | 58 | $(6,52)$ | 50 | $(4,46)$ |
| G2 | 71 | $(13,57)$ | 60 | $(8,50)^{*}$ |
| G3 | 56 | $(4,50)^{*}$ | 55 | $(5,48) *$ |
| 1999 |  |  |  |  |
| G2 | 43 | (7, 24)* | 21 | $(3,17)^{*}$ |
| G3 | 100 | $(7,52)^{*}$ | 23 | $(5,17)^{*}$ |
| G4 | 58 | $(8,44)^{*}$ | 25 | $(3,21)^{*}$ |

[^0]In this longitudinal study a variety of tasks were used. Not all participants received the same task depending on what grade they were in. Tasks also differed over the years so the grade 2 tasks were not all the same for all the grade two participants in this study. For example grade 2 participants in 1997 and grade 2 participants in 1998 were administered the Rosner Auditory Analysis task but grade 2 participants in 1999 were not. Table 2 below lists the phonological processing skills measures administered to each grade in 1996, 1997, 1998 and 1999. Please see Table 2 in Appendix A for a complete list of the tasks administered to each grade over the years.

Table 2 List of Phonological Processing Skills Measures Administered to each Grade over the

## Years

| Totals | Tasks | $\begin{aligned} & \text { JK } \\ & 96 \end{aligned}$ | $\begin{aligned} & \hline \text { SK } \\ & 96 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline \text { G1 } \\ & 96 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline \text { SK } \\ & 97 \\ & \hline \end{aligned}$ | G1 | G2 97 | G1 | G2 | $\begin{aligned} & \text { G3 } \\ & 98 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline \text { G2 } \\ & 99 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline \text { G3 } \\ & 99 \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { G4 } \\ & 99 \\ & \hline \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| PHONOLOGICAL PROCESSING SKILLS MEASURES |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 112 | Phoneme |  |  | * $\checkmark$ |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
| 140* | Recognition |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Phoneme |  |  | * |  |  |  |  |  |  |  |  |  |
| 118 | Recognition \& |  |  | $\checkmark$ |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
| 154* | Location |  |  |  |  |  |  |  |  |  |  |  |  |
| 16 | Phoneme Deletion | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |  |
| 18 | Phoneme Deletion |  |  |  |  |  |  |  |  |  |  |  |  |
|  | \&Substitution |  |  | $\checkmark$ |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
| 40 | Rosner Auditory |  |  |  |  |  | $\checkmark$ |  | $\checkmark$ | $\checkmark$ |  | $\checkmark$ | $\checkmark$ |
|  | Analysis |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Rapid Automized |  |  |  |  |  |  |  |  |  |  |  |  |
| (seconds) | Naming RAN | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
| 16 | Phoneme \& Syllable Identification | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |  |
|  | GFW Sound Mimicry |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 | Subtest | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |  |
| 32 | Pseudoword |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ | $\checkmark$ |
|  | Repetition |  |  |  |  |  |  |  |  |  |  |  |  |
| 45 | Woodcock Word |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |
|  | Attack |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 | Pseudoword |  |  | $\checkmark$ |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
|  | Reading |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Coltheart Nonword |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 | Reading |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |
|  | Rhyme Production | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |  |
| 10 | Rhyme Detection | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |  |
| 20 | Real word Spelling |  |  | $\checkmark$ |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
| 10 | Pseudoword |  |  | $\checkmark$ |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
|  | Spelling |  |  |  |  |  |  |  |  |  |  |  |  |
| 21 | Word Spelling |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |
| 15 | Nonword Spelling |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |
| 55 | WRAT-3 Spelling |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |
| 26 | Letter Identification | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |  |

In total the measures included 5 main categories: phonological processing, word reading, working memory, and syntactic awareness, and spelling. Additionally, in 1999 reading comprehension and computational math skills were assessed. A description of each of the measures follows in the section below.

## Measures

## Phonological Processing Skills Measures

Phoneme Recognition Task (PRT) See Appendix B
In this task the ability to recognize a target phoneme in a word was tested. Children had to judge whether a target phoneme was present in a given word (Vandervelden \& Siegel, 1995). The presence of the target phoneme was always in the initial position of the word. There were three practice trials for one practice phoneme and the child had to reply with a yes or no. For example, "Listen for/s/. /sock/. Does /sock/ have /s/?" (yes). "Listen for/s/. Ifat/. Does /fat/ have /s/?" (no) "Listen for/s/. /soup/. Does /soup/ have /s/?" (yes) During the practice trials, feedback was provided for the child's incorrect responses. There were three target phonemes and four words for each phoneme for a total of 12 words altogether. The phoneme occurred in 2 of the 4 words. For example the target phoneme, $/ \mathrm{m} /$ was tested in the words milk, map, paint, and cake. Before each word, the target phoneme was presented as in the practice trials. Children scored one point for each correct response. All items were administered and the maximum attainable score for this task was 12. However participants in 1996 received the longer version of this task which consisted of 40 items.

Phoneme recognition and Location task. See Appendix B.
This task, developed by Vandervelden \& Siegel (1995), measured the child's ability to judge the position of a target phoneme within a given word. There were three possible responses: initial position, final position or not in the word at all. There were four practice trials; two words for one phoneme and two words for another phoneme. For example "Listen for $/ \mathrm{s} /$ and tell me if it is the first sound in the word, the last sound in the word or if it is not in the word at all. /s/. Isnake/. First, last or no." (first) In the practice trials, examiners explained the task and gave feedback. The total number of test items contained three phonemes and 6 words for each phoneme making the total number of words 18. All items were administered and the maximum score attainable was 18, except for the participants in 1996. They received a longer version of this task which consisted of 54 items.

## Phoneme Deletion

This task measured the ability to delete a phoneme from a word and orally provide the new word without the deleted phoneme. There were 16 items in this task, divided into two sets. The first set contained 8 items that tested initial phoneme deletion. For example, "Bus without the lb , says __" (us). The second set contained 8 items that tested final phoneme deletion. For example, "foot without the It , says __" (foo). There was a total of 8 practice trials, 4 before the 8 initial-phoneme deletion test trials and 4 before the 8 final-phoneme deletion test trials. Feedback was provided for the practice items and if needed on the first 4 test items in each set. Incorrect responses were recorded and each correct response received one mark. The maximum attainable score for this task was 16.

Phoneme Deletion and Substitution (PDS)) See Appendix B.
This task contained two practice items and 18 test items (Rosner, 1973) The 18 items were evenly distributed into three parts: 6 initial phoneme deletion or substitution items, 6 final phoneme deletion or substitution items, and 6 consonant cluster phoneme deletion or substitution items. Nine word items required phoneme deletion, word initially or finally with three word items comprising a consonant cluster. The other nine word items required phoneme substitution, word initially or finally with three items comprising a consonant cluster. The examiner said a word and the child had to repeat the word and then say the word as it would sound if either a target phoneme was deleted or substituted by another phoneme. For example, "Say fill. (fill) Now say it again but don't say /f/ (ill). Now say fill again but instead of /f/say /b/ (bill)." Both Phoneme deletion and substitution was practiced during the two practice items and feedback was given. Each test item was given one point if correctly answered and incorrect
responses were recorded. The examiner discontinued testing after 6 consecutive incorrect responses were made. The maximum score for this task was 18.

Phoneme deletion was further investigated by the Rosner Auditory Analysis test (AAT)
This phoneme and syllable deletion task required the child to repeat 40 individual words read by the examiner, and then remove a specific single phoneme or syllable indicated by the examiner and say the new shorter word/sound. For example, "Say cowboy. Now say cowboy again but without the boy sound" (cow)or "Say sat. Now say sat again but without the $/ \mathrm{s} /$ sound" (at). There were 3 trial items during which instruction and explanatory feedback for incorrect responses was given to teach the students the task and the correct answer. The examiner demonstrated the first trial item and the remaining two trial items are done by the child. If the child incorrectly responded to either of the 2 practice items, the item was re-presented to the child after feedback and an explanation of the correct response. If the child failed the second time to answer the practice item correctly, the test was discontinued and the child scored a zero for the test. Children who correctly responded to the practice items on the first or second attempt proceeded with the test items. There were 40 test items and the maximum score attainable for this test was 40 . If a child made 5 consecutive incorrect responses, the test was discontinued. The examiner recorded incorrect responses next to each item.

## Lexical access a.k.a. Phonological Recoding

## Rapid Automized Naming (RAN)

The RAN task provided a measure of phonological recoding in lexical access or word retrieval (Chiappe \& Siegel, 1999). The task consisted of an $8 \times 5$ matrix of 5 images randomly repeated 8 times in a line making the total number of pictorial stimuli 40 items. The images were line drawings of a bird, house, pear, tree, or chair. Children had to identify these objects by saying aloud their monosyllabic names as quickly as possible. Prior to presenting the matrix of the 40 items, the examiner presented the child with a practice chart of the 5 objects to ensure the child knew the names of the target items. The score for this task was the child's naming speed in seconds and the number of uncorrected naming errors made. Self-corrected errors were counted as correct.

## Phoneme Identification

This task is similar to the Syllable Identification task. Phoneme Identification measured the ability to segment the names of pictures into their constituent phonemes. There were 2 practice items and 8 test items. The names of all of the picture objects were monosyllabic. The examiner would say the target word while presenting a picture of the word to the child, and then provide only the first phoneme of the target word. The child's task was to provide the last phoneme. For example, "This is a picture of a cat. I'll say the first part of the word, you finish it off. Here is a ca__" (t). Instruction and feedback was supplied on the 2 practice items and the first 2 test items if needed. All 8 test items were administered. Each correct response scored 1 point and incorrect responses were recorded. The maximum score on this task was 8.

## Syllable Identification

This oral language measure tested the ability to segment a word into syllables. (Muter et al., 1997) There were 2 practice trials and 8 test trials. The names of all of the picture objects were disyllabic. The examiner would say the target word, while presenting the child with the picture of the target word, and then provide only the initial syllable of the target word. The child's task was to provide the final syllable of the target word. For example, "This is a table. Ta__" (ble). Instruction and feedback was supplied for the 2 practice trials and the first 2 test items if needed. All 8 test items were administered. Each correct response received 1 point and incorrect responses were recorded. This task had a maximum score of 8.

Sound Mimicry Subtest of the Goldman, Fristoe, Woodcock (GFW) Sound-Symbol Test (1974) This oral language task measured pseudoword repetition ability. There were 55 items in this task ranging from short monosyllabic to longer disyllabic and trisyllabic nonwords. For example, "ab, quibbest and depnonief". Prior to administering the test items, three demonstration items were given. One point was assigned to each correct response and accent and articulation variability was not penalized. Testing was discontinued after 5 consecutive incorrect responses. The maximum score on this task was 55. A raw score and a percentile was calculated for this test.

Pseudoword Repetition (This task was administered to participants in 1999 only) This oral measure involved listening to a nonword read aloud by the examiner and orally repeating the word back to the examiner. If the child made an incorrect repetition of the nonword presented, the child's response was recorded by syllable on the scoring sheet. Each correct repetition answer received one point. There were 32 test items and thus the maximum score attainable was 32 . The initial test items consisted of monosyllabic short nonwords, such as "sep". These increased in difficulty to longer polysyllabic nonwords such as "commerine" and "penneriful". This task was discontinued once the child made 5 consecutive errors. An error consisted of mispronouncing any or all syllables of the nonwords.

The Woodcock Word Attack Subtest from the Woodcock Reading Mastery tests-Revised (1987) measured the ability to apply phonic skills in pronouncing nonsense words. There were 45 items and each correctly pronounced item received one point. Incorrect pronunciations were recorded on the scoring sheet. Participants were not penalized for mispronunciations due to speech defects or dialect. All items were administered and the task was discontinued after 6 consecutive items were failed.

## Pseudoword Reading

The Pseudoword Reading measure (Chiappe \& Siegel, 1999) consisted of 15 monosyllable pseudowords composed of invariant consonants. The first 10 items were consonant/vowel/consonant (CVC) combinations (bav, dut, lod, tid, pov, mul, sep, lin, kef, hap). The last 5 items were CVC plus final "e" (CVC+e) combinations (beve, nade, lope, mude, tibe) All items were administered and children's pronunciation of the words was recorded. This task had a maximum score of 15 .

Coltheart Nonword Reading. See Appendix B for a list of all the items.
Students were given two practice words before the test items. The test consisted of 30 items. Children had to read aloud the words the way they felt it was best to read. Their pronunciations were recorded according to the possible responses provided on the examiner's sheet. If a pronunciation did not fit the possible responses on the sheet, the examiner would note the pronunciation on the lines provided. This task had a maximum score of 30 .

Rhyme Detection. See Appendix B for a list of all the items.
The Rhyme Detection test is an oral language measure of the ability to match 2 rhyming words (Muter, Hulme, Snowling, 1997). The examiner read aloud a word followed by three other words. Pictures accompanied the test word and the three possible word responses. Students had to choose the word that rhymed with the test item. The rhyming words had different onsets but the same rhyme. For example, "What rhymes with cat? Fish, sun, or hat? There were three practice trials and 10 test items. During the practice trials, the examiner gave feedback providing and explaining the correct responses as needed. All 10 items were administered. If necessary the examiner could give instructions on the first 4 test items. This test had a maximum score of 10.

## Rhyme Production

The Rhyme Production task measured rhyming ability (Muter et al., 1997) This task consisted of 2 items. The examiner orally provided the test word and also gave one possible example rhyming word. For example the examiner would say, "Let's take the word day. Another word that rhymes with day is say, Day-say. Can you tell me some others?" Each legitimate rhyme produced by the student including the example rhyme provided by the examiner was recorded and given 1 mark. Legitimate rhyming words did not have to be real words; They could include pseudowords such as day-tay. Duplicate responses were not counted in this task, and children were given a time limit. They had 30 seconds to produce as many rhyming words as possible.

## Orthographic Choice

The Orthographic Choice task required children to choose from a pair of pseudowords the one that best resembled the spelling of a real word. In contrast to the oral measures of phonological awareness, this task involved choosing between two sets of graphemes combined to create a pseudoword. Each item contained two pseudowords and children were asked to point to the one whose spelling they felt best approximated a real word. This task contained 17 items and had a maximum possible score of 17.

Strip Initial Consonant (Grade 2 participants in 1999 and some Grade 1 participants in 1996 were administered this task)
This phoneme deletion task required the child to delete the initial phoneme of a word and say the new shorter word created (Stanovich, Cunningham, \& Freeman, 1984). For example, "Listen to the word pink. If you take away the $/ p /$ sound, what word is left?" (ink). There were ten test items (pink, told, man, nice, win, bus, pitch, car, hit, pout) and one practice item (task). The practice item was repeated if incorrect and additional examples were permitted if necessary before starting the test items. During the test trial, the examiner explained that removing the first sound from the word would create a different and shorter word. The examiner recorded incorrect responses and discontinued testing after three consecutive errors were made. The maximum score for this task was 10.

## Spelling

Real Word Spelling. See Appendix B
The spelling words in this task were 20 monosyllabic high-frequency words of 3 to 5 letters such as food, year, and stove (Wade-Woolley \& Siegel, 1997). The examiner administered the spelling words in the context of a sentence. Eleven of the words had a consonant vowel consonant (CVC) structure, for example, top. The remaining 9 words contained word-initial or final consonant clusters such as plane and wild. All items were administered. Each correct word scored one point making the maximum total score 20.

## Pseudoword Spelling See Appendix B

In this task children had to spell 10 monosyllable pseudowords such as nad, ves and meeve (Wade-Woolley \& Siegel, 1997). The ten spelling items were equally divided into one of two category types: lax vowels items and tense vowel items. Both categories contained the basic CVC syllable structure. The 5 items in the lax vowel category included short vowels such as $[æ]$ in the word hat , and therefore could only be spelled using a one-to-one graphemephoneme relationship. The other 5 tense vowel items included diphthongs and long vowels such as the long e sound, in the word meet. These phonemes could have a many to one grapheme-phoneme relationship; consequently they could be spelled using a combination of vowels such as "oa", "ea" or by word-final silent "e". Correct spellings followed regular spelling rules, e.g. meeve or mieve was acceptable. All items were administered and the maximum score for this task was 10.

Word Spelling
This spelling task consisted of 21 words (blame, bear, shoe, child, puff, yacht, dive, debt, swear, ghost, tiff, paid, cove, walk, sword, broad, aisle, smoke, shove, rhyme, press). All words were dictated to the students, and each correctly spelled word received one point.

Nonword Spelling
There were 15 items in this task (stull, vood, vind, fump pold, tralf, pask, hane, bove, drack, slear, bould, hile, drace, trome. The examiner dictated each word and the child had to spell the word on a piece of paper. Spellings were correct if they followed the spelling patterns of real English words, for example, tralf could also be spelled traff, or traph. Correct spellings were given one point. All items were administered.

WRAT-3 (TAN) Spelling, 1993
In this task students were dictated words to spell on paper. Each test word was read aloud once followed by a sentence with the test word and another read aloud of the test word. Each correctly spelled word scored one point. The first 15 items were letter spelling items and the remaining 40 items were word items. The letter spelling items were only administered to students 7 years or younger, or to children 8 years and older who did not get at least 5 correctly spelled items on the word spelling section. Students automatically received credit for the letter spelling portion of the test if 5 or more words are spelled correctly. Each correct spelling scored one point. Letter reversals and plural spellings for singulars were scored as incorrect. Students were not penalized for undotted "i's" and uncrossed "t's". The test was discontinued after 10 consecutive mistakes.

## Letter Identification /Letter Knowledge

This task measured basic letter naming ability. Students were shown in random order the 26 capital letters of the alphabet and asked to name them. The maximum score attainable for this task was 26. All items were administered.

## Working Memory Measures

Stanford Binet (Thorndike, Hage, \& Sattler, 1986) Memory for Sentences Subtest This task was administered to JK and SK participants only. There were 42 items in this task. Each item could score one point, making the total maximum score possible 42. In this task children heard a sentence read aloud by the examiner and had to repeat the sentence. The sentences increased in length and syntactic complexity as the test progressed. There were three practice items prior to testing. Testing was discontinued after the child made 5 consecutive mistakes. The examiner made a record of the incorrect responses on the scoring sheet.

## Working Memory: Words

In this task, children heard sets of sentences (2-5), each missing the final word to make them complete. Children had to complete the sentences by supplying each with an appropriate word, and then repeating the words they had provided to complete the sentences (Siegel \& Ryan, 1989). For example, "In a baseball game, the pitcher throws the ____" (ball). "On my two hands, I have ten __" (fingers). (ball, fingers). There were 4 levels in this task (levels $2,3,4, \& 5$ ). Each level contained 3 sets of sentences (e.g. 2a, 2b, 2c; 3a, 3b, 3c,etc.) but the number in the set of sentences varied by level. In level 2 there were 2 sentences in each set. Children had to provide 2 words to complete the set of sentences and also had to remember the two words and repeat them in the same order as they were submitted. In level 3 there were 3 sentences in each set and children had to provide 3 words to complete the set of sentences. In
level 4 there were 4 sentences and so on. Prior to testing, the examiner administered a level 2 practice set of sentences. Testing was discontinued if all 3 sets of sentences in a level were incorrect. Children scored one point for recalling words in the correct order as provided. If the right words were recalled but in the wrong order a child received scored zero. The maximum attainable score for this task was 12.

## Syntactic Measures

## Syntactic Error Judgement. See Appendix B.

All participants were administered the Syntactic Error Judgement task, but all 1996 participants (JK, SK and G1) and grade 3 and 41999 participants received a longer version of this task with 15 more items. However the first 20 items were identical to the total items in the task administered to the JK, SK, Gr.1, and Gr. 2 children in 1997 and 1998 and 1999. The examiner read aloud sentences and the child had to choose whether the sentence sounded right or wrong. For example, "To school go I. Is I right or wrong" (wrong) "Yes. To school go I. is wrong." If a child attempted to correct the sentence, the examiner reminded the child that only a right or wrong response was required. If needed or requested the examiner could repeat the sentence twice. The number of times a sentence was repeated was recorded on the score sheet. Each correct response scored one point and incorrect responses were not penalized. There were three practice items prior to testing during which instruction and feedback were given. At this time the examiner gave an explanation of what was meant by labelling a sentence right or wrong in this task, and made the distinction between true and false sentences and right or wrong sentences. There was a total of 20 items in the JK, SK Gr. 1 and Gr. 2 test forms and the maximum score attainable was 20. In the 1996 and Gr. 3 and Gr. 41999 test forms there were 35 items and consequently the maximum score was 35 .

Oral Cloze (Administered to Grade 11996 participants and Grade 21999 participants only) See Appendix B
In this oral task, the children heard 12 incomplete sentences read aloud by the examiner, and had to fill in the missing word to make the sentence complete (Siegel and Ryan, 1989) The examiner said "blank" where the word was missing from the sentence. For example, "The blank little pigs ate corn." (three, pink, hungry) The missing word required to complete the sentence covered different parts of speech, such as nouns, verb, adjectives, prepositions or conjunctions. A correct response had to make grammatical and semantic sense to score one point. There were three practice trials and the examiner gave instruction and corrective feedback at this time. All 12 items were administered. The test was discontinued when the child failed the practice items and or the first three task items. The maximum score for this task was 12.

## Syntactic Error Correction. See Appendix B

This task was administered to grade 3 and 4 students only. There were 25 test items, making the maximum score for this test 25 . Each item consisted of a sentence that contained an error and was therefore wrong. There were 5 types of errors and each sentence contained one type of error. The 5 types of errors included 1. Function word error (eg. They went at school) 2. Copula verb error (eg. The flock of geese are on the lake.) 3. Lack of subject-predicate agreement (eg. The boy run quickly.), 4. Incorrect phrase order within sentence (eg. Clapped his hands Mark.) and 5. Incorrect word order (eg. The bear brown growled). The test contained 5 examples of each type of error. In this task, the examiner read aloud each sentence and the child had to fix the sentence and tell it to the examiner. For example, "Clapped his hands Mark. Can you fix it?" (Mark clapped his hands.) Responses were recorded on the score sheet. If the child said the sentence was okay, the examiner encouraged the child to make a correction to the sentence by asking the child to say the sentence in a different way. The examiner could repeat the sentences a maximum of three times. Two practice items were administered prior to
testing and during this time the examiner would provide instruction and a correct response if the child did not correct the sentence. All test items were administered.

## Reading Measures

## WRAT-3 Reading Subtest

All students from Junior Kindergarten (JK) and Senior Kindergarten (SK) to grade four were administered the Wide Range Achievement Test-3 (WRAT-3) Reading subtest. The WRAT-3 provided a standardized measure of word reading and letter identification skill. Fifteen letters in capital format were randomly presented to test letter identification, followed by a list of 42 words to test word reading. Students read aloud the words which increased in difficulty. Some of the first and easier words to read were monosyllabic 2-4 letter words such as in, cat, book and tree. Some of the more difficult words at the end of the test were heinous, egregious, omniscient and assuage. If students made 10 consecutive incorrect responses or non-responses, the test was discontinued.

## Bridge Word Reading

The Bridge Words Reading measure consisted of 69 high frequency words. These words increased in difficulty from simple monosyllabic words such as a and on to more difficult polysyllabic words such as giraffe and writing. The examiner recorded participants' pronunciation of each word. The Bridge Words reading measure had a maximum score of 69.

## Linda Experimental Words

The Linda Experimental Words test measured word reading. It consisted of 40 experimental words that varied in regularity and consistency. Words were classified into one of three categories. There were 9 regular-consistent words (came, set, when, soon, game, like, deep, best, and feet) and 14 regular-inconsistent words (five, now, but, gave, beard, days, home, food, moth, paid, that, lost, goes, and seen). Both categories of words follow a regular English rule, however the English rule indicating the pronunciations of the regular-inconsistent words does not always apply. For example the words "five" and "live". The pronunciation of the word "five" follows the CVC+e rule where the vowel is pronounced as a long vowel; however this rule does not always apply to all English words such as in the word "live". The third category of words were comprised of 17 exception words (have, most, come, full, both, heard, shown, says, head, what, said, put, move, good, give, and four). Pronunciation of the words was recorded. The maximum attainable score on this task was 40.

## British Ability Scales (BAS) Reading Subtest

The British Ability Scales (BAS) Reading Subtest measures word reading. Students in grades SK, 1 and 2 were presented with 90 real words to read. The first few words were short high frequency words. Words gradually increased in length and difficulty. Testing was discontinued after 10 consecutive incorrect responses.

## Woodcock Word Identification

The Word Identification Subtest from the Woodcock Reading Mastery tests-Revised (1987) consisted of 106 items. Each item consisted of a word that the participants read aloud. The starting item for each participant depended on their grade level. Correctly pronounced words received one point. Incorrect pronunciations were recorded on the score sheet. The test was discontinued after 6 consecutive incorrect responses.

Coltheart Words. See Appendix B for a list of al the items.
This word reading measure consisted of 48 items. Participants read aloud words and scored one point for every correct pronunciation. Incorrect pronunciations were recorded on the scoring sheet.

## Stanford Reading Comprehension

This measure assessed reading comprehension and consisted of 8 scenarios. Each scenario was composed of a short reading passage followed by four multiple choice cloze questions. The maximum score for this test was 48 . There was one practice trial.

## One Minute Reading-WRAT (TAN)

The WRAT-3 tan form was administered to Grade 3 and 4 participants. Students had to read as many words as possible within a one minute time limit. They were told to skip a word if they did not know it and go onto the next one. The examiner recorded student pronunciations and the number of words the child read correctly. The maximum score for this task was 42.

## Speech Rate

## Speech Rate

This task measured speech rate and required children to repeat the word "buttercup" 10 times, as quickly as possible. There were 3 test trials and one practice trial. During the practice trial, the child repeated his/her name 10 times. The speed for this practice trial was then recorded by the examiner. In the three test trials, the examiner similarly recorded the time to complete each test trial but the total score for this task was the mean speech rate based on the three trials.

## Math Measures

## WRAT-3 (TAN) Math

In addition to the measurement of linguistic skills such as phonology, memory and syntax, Grade 3 and 4 students were also administered a Math task. A variety of skills were assessed including computational skills such as multiplication, addition, subtraction and division, and other math skills such as converting the number of hours into minutes, changing a fraction into a percent and judging which fraction was more. The total number of items in this task was 55. The first 15 items were oral items; the remaining 40 items were written items. The written items started with easy computation questions such as $2+1=$ $\qquad$ , and progressed to more difficult questions such as 3 digit by 1 digit multiplication and the multiplication of three fractions. Students had 15 minutes to complete all of the questions. Each question received one point for each correct answer. If a child correctly answered 5 or more of the written items, then 15 points for the oral sections was automatically given even though the oral items were not administered.

To examine whether there were differences in the reading and phonological processing skills between ESL and L1 learners, the means for each task were calculated. The participants in 1996 were from one of 3 grades, junior kindergarten, senior kindergarten and grade 1 and were further categorized as either ESL or L1. Additionally participants were grouped into one of two reading categories according to their percentile score on the WRAT-3 Reading Subtest. A participant with a percentile score of 25 or below was labeled as Reading Disabled (RD); whereas a participant with a percentile score of 30 or above was labeled as a Normal Achieving Reader (NA). Participants with a score between 27 and 30 were not given a reading category. Consequently, in 1996 a total of 12 different means were calculated, four means for each grade. For example means were calculated for JK L1 NA, JK L1 RD, JK ESL NA, JK ESL RD participants. Thus, there are 3 tables displaying the means for each variable longitudinally from 1996-1999: one for the Junior Kindergarten participants, one for the Senior Kindergarten participants, and one for the grade one participants in 1996. Tables 3a, 3b, and $3 c$ in Appendix $C$ show the complete mean reading and phonological processing skills scores for each grade in 1996 longitudinally, and the mean scores are calculated separately for the normal achieving and reading disabled readers. See tables $3 b$ and $3 c$ below for a shortened version of Tables $3 b$ and $3 c$ in Appendix C. Only the means for the NA group of readers are included in table 3c below because the number of participants in the RD group was too small.

Table 3b Mean SK Scores on Reading and Phonological Processing Skills Measures For NA and RD students

| SK <br> Measure | NA |  |  |  | RD |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 |  | ESL |  | L1 |  | ESL |  |
|  | M | SD | M | SD | M | SD | M | SD |
| Phoneme Deletion |  |  |  |  |  |  |  |  |
| 96 | 6.17 | 5.48 | 4.16 | 5.28 | 2.67 | 3.24 | . 00 | . 00 |
| 97 | 13.08 | 3.93 | 12.88 | 4.15 | 8.57 | 5.19 | 9.00 | 6.71 |
| 98 | 15.62 | 1.01 | 15.61 | 1.28 | 13.50 | 3.51 | 13.57 | 2.23 |
| Phoneme Deletion \& Substitution |  |  |  |  |  |  |  |  |
| 97 | 10.10 | 4.43 | 8.76 | 4.48 | 5.71 | 3.77 | 6.14 | 5.61 |
| 98 | 13.79 | 3.43 | 14.40 | 3.15 | 10.67 | 3.72 | 11.57 | 4.31 |
| RAN |  |  |  |  |  |  |  |  |
| 96 | 60.34 | 15.73 | 59.58 | 15.87 | 60.23 | 25.20 | 73.40 | 14.11 |
| 97 | 50.16 | 12.96 | 49.40 | 11.94 | 65.57 | 10.42 | 50.43 | 10.66 |
| 98 | 42.49 | 8.36 | 39.99 | 8.22 | 57.29 | 15.90 | 46.43 | 8.48 |
| Phoneme \& Syllable Identification |  |  |  |  |  |  |  |  |
| 96 | 9.69 | 4.04 | 9.30 | 3.73 | 5.11 | 5.04 | 6.38 | 3.42 |
| 97 | 13.40 | 1.88 | 13.19 | 1.55 | 11.00 | 3.11 | 12.86 | . 90 |
| 98 | 14.79 | 1.05 | 14.77 | 1.23 | 14.33 | 1.51 | 14.43 | 1.27 |


| SK <br> Measure | NA |  |  |  | RD |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 |  | ESL |  | L1 |  | ESL |  |
|  | M | SD | M | SD | M | SD | M | SD |
| GFW Sound Mimicry Subtest (\%ile score) |  |  |  |  |  |  |  |  |
| 96 | 63.21 | 24.40 | 61.49 | 23.14 | 28.78 | 29.50 | 48.38 | 32.61 |
| 97 | 76.76 | 21.20 | 76.90 | 19.59 | 62.43 | 32.45 | 67.14 | 32.43 |
| 98 | 74.79 | 20.41 | 48.67 | 22.43 | 65.90 | 23.50 | 53.57 | 23.64 |
| Pseudoword Reading |  |  |  |  |  |  |  |  |
| 97 | 7.27 | 4.32 | 6.29 | 4.29 | 5.00 | 3.56 | 4.43 | 3.87 |
| 98 | 10.70 | 3.05 | 10.47 | 3.30 | 8.20 | 4.97 | 7.71 | 3.20 |
| Rhyme Production |  |  |  |  |  |  |  |  |
| 96 | 4.97 | 3.75 | 3.35 | 3.37 | 1.78 | 2.54 | . 38 | . 74 |
| 97 | 10.58 | 4.51 | 10.69 | 4.84 | 5.57 | 4.86 | 5.29 | 5.06 |
| 98 | 13.83 | 4.02 | 14.48 | 3.58 | 11.00 | 2.45 | 9.71 | 2.69 |
| Rhyme Detection |  |  |  |  |  |  |  |  |
| 96 | 6.66 | 3.07 | 4.65 | 3.63 | 4.89 | 4.31 | 2.50 | 2.51 |
| 97 | 9.00 | 1.58 | 7.93 | 2.19 | 5.71 | 3.86 | 4.29 | 2.81 |
| 98 | 9.64 | 1.46 | 9.88 | . 40 | 9.00 | 2.00 | 8.57 | . 98 |
| Real word Spelling |  |  |  |  |  |  |  |  |
| 97 | 9.00 | 5.28 | 8.10 | 5.52 | 2.86 | 2.48 | 3.86 | 3.13 |
| 98 | 15.81 | 3.37 | 16.28 | 4.27 | 10.50 | 5.13 | 13.14 | 5.27 |
| Pseudoword Spelling |  |  |  |  |  |  |  |  |
| 97 | 3.44 | 2.06 | 3.31 | 2.51 | 1.86 | 1.95 | 2.43 | 1.27 |
| 98 | 5.26 | 2.37 | 4.83 | 2.77 | 3.80 | 1.79 | 3.17 | 1.60 |
| Letter Identification |  |  |  |  |  |  |  |  |
| 96 | 21.31 | 4.55 | 21.23 | 4.22 | 11.11 | 7.03 | 6.38 | 2.67 |
| 97 | 24.94 | 1.58 | 25.29 | 1.04 | 21.29 | 6.65 | 25.29 | . 49 |
| 98 | 25.86 | . 35 | 25.85 | . 48 | 25.83 | . 41 | 25.71 | . 49 |
| Working Memory |  |  |  |  |  |  |  |  |
| 97 | 2.33 | 1.42 | 1.79 | 1.26 | 2.29 | 2.21 | 1.29 | 1.25 |
| 98 | 3.83 | 1.19 | 3.65 | 1.37 | 3.00 | 2.00 | 3.14 | 1.57 |
| 99 | 4.61 | 1.58 | 4.31 | 1.47 | 5.20 | 1.64 | 5.00 | 1.83 |
| Syntactic Error Judgment (\% score) |  |  |  |  |  |  |  |  |
| 96 | 51.33 | 19.06 | 42.19 | 16.79 | 39.05 | 22.13 | 38.57 | 18.33 |
| 97 | 70.90 | 14.59 | 61.43 | 11.96 | 62.86 | 11.85 | 57.14 | 14.96 |
| 98 | 80.71 | 11.56 | 77.63 | 9.20 | 72.50 | 18.10 | 67.14 | 14.68 |
| 99 | 77.33 | 10.61 | 74.05 | 8.25 | 72.00 | 7.11 | 62.86 | 12.99 |
| WRAT Reading Subtest (Raw score) |  |  |  |  |  |  |  |  |
| 96 | 14.98 | 3.35 | 14.73 | 2.36 | 5.33 | 3.00 | 6.50 | 2.62 |
| 97 | 24.02 | 5.22 | 22.69 | 4.94 | 16.57 | 6.65 | 19.14 | 2.54 |
| 98 | 28.74 | 3.86 | 28.24 | 4.69 | 23.00 | 3.74 | 24.86 | 2.73 |
| 99 | 32.03 | 3.07 | 32.27 | 4.31 | 26.80 | 2.05 | 25.75 | 2.87 |

Table 3c Grade 1 Mean Scores on Reading and Phonological Processing Skills Measures For NA Students

| Grade 1 Measure | L1 |  | ESL |  |
| :---: | :---: | :---: | :---: | :---: |
|  | M | SD | M | SD |
| Phoneme Recognition and Location (\%score) |  |  |  |  |
| 96 | 93.85 | 14.35 | 93.26 | 15.38 |
| 97 | 96.38 | 7.23 | 98.61 | 4.30 |
| 98 | 99.54 | 1.56 | 99.70 | 1.27 |
| Phoneme Deletion |  |  |  |  |
| 96 | 12.58 | 4.79 | 12.04 | 4.97 |


| Table 3c Continued..... |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Grade 1 Measure | L1 |  | ESL |  |
|  | M | SD | M | SD |
| Phoneme Deletion |  |  |  |  |
| 97 | 15.15 | 1.76 | 15.21 | 1.34 |
| 98 | 15.67 | . 99 | 15.86 | . 35 |
| Phoneme Deletion and Substitution |  |  |  |  |
| 96 | 10.87 | 5.42 | 9.40 | 4.88 |
| 97 | 13.32 | 4.12 | 12.73 | 3.74 |
| 98 | 15.75 | 2.94 | 16.05 | 1.87 |
| Rosner Auditory Analysis |  |  |  |  |
| 97 | 24.29 | 9.38 | 26.06 | 9.22 |
| 98 | 30.92 | 8.42 | 30.86 | 7.38 |
| 99 | 32.71 | 7.94 | 31.74 | 7.16 |
| RAN |  |  |  |  |
| 96 | 50.43 | 12.18 | 46.87 | 9.69 |
| 97 | 42.98 | 8.91 | 40.00 | 8.39 |
| 98 | 38.29 | 8.03 | 36.23 | 7.52 |
| Pseudoword Reading |  |  |  |  |
| 96 | 8.02 | 4.29 | 7.17 | 4.02 |
| 97 | 10.51 | 3.37 | 9.59 | 3.45 |
| 98 | 12.14 | 2.84 | 12.00 | 2.92 |
| Rhyme Production |  |  |  |  |
| 96 | 9.06 | 4.81 | 6.60 | 4.03 |
| 97 | 11.28 | 5.63 | 11.15 | 5.25 |
| 98 | 16.25 | 4.93 | 15.35 | 5.42 |
| Rhyme Detection |  |  |  |  |
| 96 | 8.53 | 2.64 | 7.51 | 2.85 |
| 97 | 9.55 | . 83 | 9.44 | 1.23 |
| 98 | 9.92 | . 37 | 9.97 | . 16 |
| Real word spelling |  |  |  |  |
| 96 | 12.47 | 4.07 | 11.00 | 5.77 |
| 97 | 16.60 | 3.70 | 16.62 | 3.12 |
| 98 | 19.00 | 1.59 | 18.70 | 2.22 |
| Pseudoword spelling |  |  |  |  |
| 96 | 4.40 | 2.10 | 4.25 | 2.06 |
| 97 | 4.85 | 2.44 | 3.92 | 2.01 |
| 98 | 5.61 | 1.42 | 5.57 | 2.21 |
| Working Memory: Words |  |  |  |  |
| 96 | 2.04 | 1.54 | 1.78 | 1.33 |
| 97 | 3.53 | 1.65 | 3.26 | 1.46 |
| 98 | 5.58 | 1.66 | 4.76 | 1.71 |
| 99 | 6.81 | 5.72 | 5.68 | 1.89 |
| Syntactic Error Judgement (\%score) |  |  |  |  |
| 96 | 58.06 | 16.39 | 54.16 | 11.73 |
| 97 | 75.64 | 12.32 | 71.41 | 12.19 |
| 98 | 84.31 | 9.11 | 85.16 | 8.54 |
| 99 | 77.42 | 7.11 | 76.99 | 8.60 |
| WRAT Reading Subtest (Raw score) |  |  |  |  |
| 96 | 25.43 | 4.76 | 24.04 | 3.86 |
| 97 | 29.91 | 4.35 | 28.87 | 3.58 |
| 98 | 34.68 | 5.68 | 33.11 | 4.64 |
| 99 | 37.48 | 5.23 | 35.37 | 3.22 |
| Bridge Words |  |  |  |  |
| 96 | 54.23 | 15.31 | 50.40 | 15.01 |
| 97 | 66.26 | 5.11 | 66.15 | 5.14 |
| 98 | 68.86 | . 49 | 68.86 | . 67 |

Table 3c Continued.....

| Grade 1 |  |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Measure | L1 |  | ESL |  |  |
|  | $\mathrm{M}^{2}$ |  | SD | $\mathrm{M}^{2}$ |  |
| Linda Experimental Words |  |  |  |  |  |
| 96 | 29.02 | 10.86 | 26.77 | 9.44 |  |
| 97 | 35.81 | 6.30 | 34.72 | 7.29 |  |
| 98 | 39.14 | 1.36 | 39.03 | 1.86 |  |
| BAS |  |  |  |  |  |
| 96 | 41.30 | 19.19 | 34.68 | 16.74 |  |
| 97 | 65.26 | 15.62 | 59.72 | 14.33 |  |
| 98 | 77.11 | 8.18 | 74.68 | 9.53 |  |

Due to the small number of reading disabled and normal readers classified in Junior Kindergarten, another longitudinal table of means was calculated without categorizing participants into reading groups. See table 4 in Appendix C. A shortened version of the means scores is shown in table 4 below. Grouping both the NA and RD students increased the $N$ in the cells and allowed for statistical tests to be done comparing the means between the ESL and L1 groups. It also made more sense not to categorize the JK participants into reading groups because they were very young and most likely unable to read at this stage of development.

Table 4 Mean Scores on Reading and Phonological Processing Skills Measures

| Grade JK Measure | L1 |  | ESL |  |
| :--- | :---: | :---: | :---: | :---: |
|  | M | SD | M | SD |
| Phoneme deletion |  |  |  |  |
| 96 | 1.93 | 3.72 | 1.70 | 3.22 |
| 97 | 6.51 | 4.91 | 5.63 | 5.21 |
| 98 | 13.67 | 4.01 | 11.19 | 6.50 |
| Phoneme deletion and substitution |  |  |  |  |
| 98 | 10.26 | 4.13 | 8.22 | 5.41 |
| 99 | 12.65 | 3.57 | 10.94 | 3.51 |
| RAN |  |  |  |  |
| 96 | 73.92 | 22.23 | 76.61 | 27.28 |
| 97 | 63.97 | 18.55 | 67.88 | 18.88 |
| 98 | 49.48 | 22.36 | 50.16 | 14.99 |
| 99 | 43.05 | 9.48 | 41.76 | 7.38 |
| Phoneme \& syllable identification |  |  |  |  |
| 96 | 5.68 | 4.59 | 5.30 | 4.95 |
| 97 | 10.20 | 3.61 | 9.07 | 4.43 |
| 98 | 13.93 | 2.31 | 13.59 | 2.70 |
| GFW Sound Mimicry |  |  |  |  |
| 96 | 38.45 | 10.21 | 36.88 | 11.55 |
| 97 | 47.24 | 6.18 | 43.81 | 9.20 |
| 98 | 48.60 | 5.14 | 47.70 | 4.71 |

Table 4 continued.....

| Grade JK Measure | L1 |  | ESL |  |
| :---: | :---: | :---: | :---: | :---: |
|  | M | SD | M | SD |
| Pseudoword Repetition 99 | 26.26 | 5.97 | 25.84 | 4.84 |
| Pseudoword Reading |  |  |  |  |
| 98 | 6.81 | 3.97 | 5.81 | 3.78 |
| 99 | 9.12 | 2.85 | 7.76 | 3.33 |
| Rhyme Production |  |  |  |  |
| 96 | 2.61 | 3.08 | 2.32 | 3.50 |
| 97 | 5.78 | 4.15 | 7.02 | 5.16 |
| 98 | 11.19 | 7.21 | 11.05 | 4.96 |
| Rhyme Detection |  |  |  |  |
| 96 | 4.57 | 3.13 | 3.52 | 2.95 |
| 97 | 6.47 | 2.61 | 5.63 | 2.92 |
| 98 | 9.33 | 1.30 | 8.62 | 1.77 |
| Real word spelling |  |  |  |  |
| 98 | 8.81 | 5.41 | 8.95 | 5.44 |
| 99 | 15.06 | 4.08 | 14.59 | 3.47 |
| Pseudoword Spelling |  |  |  |  |
| 98 | 3.08 | 2.36 | 2.66 | 2.27 |
| 99 | 4.18 | 2.13 | 3.24 | 1.71 |
| Letter identification |  |  |  |  |
| 96 | 11.94 | 7.77 | 11.20 | 8.94 |
| 97 | 19.96 | 6.74 | 20.45 | 6.24 |
| 98 | 25.36 | . 88 | 25.30 | 1.00 |
| Stanford Sentence Repetition |  |  |  |  |
| 96 | 13.83 | 4.04 | 10.48 | 3.90 |
| 97 | 15.19 | 3.74 | 13.12 | 3.28 |
| Working Memory |  |  |  |  |
| 98 | 2.95 | 2.07 | 2.16 | 1.46 |
| 99 | 3.74 | 1.37 | 3.58 | 1.74 |
| Syntactic Error Judgment \% score |  |  |  |  |
| 96 | 42.6087 | 18.46 | 34.46 | 22.51 |
| 97 | 56.73 | 16.25 | 52.52 | 15.21 |
| 98 | 70.48 | 13.43 | 66.22 | 14.36 |
| 99 | 85.00 | 19.86 | 82.89 | 20.16 |
| Oral Cloze |  |  |  |  |
| 99 | 8.29 | 2.28 | 6.29 | 2.23 |
| WRAT Reading Raw |  |  |  |  |
| 96 | 8.80 | 5.25 | 8.34 | 5.67 |
| 97 | 15.11 | 4.52 | 14.72 | 4.22 |
| 98 | 23.17 | 4.61 | 22.84 | 4.56 |
| 99 | 29.00 | 4.37 | 27.11 | 3.41 |
| Bridge |  |  |  |  |
| 98 | 45.55 | 19.60 | 45.92 | 19.14 |
| 99 | 65.53 | 5.69 | 63.06 | 6.49 |
| Linda words |  |  |  |  |
| 98 | 24.33 | 12.13 | 23.03 | 12.15 |
| 99 | 36.24 | 4.27 | 35.06 | 3.83 |
| BAS |  |  |  |  |
| 97 | 5.05 | 13.40 | 2.95 | 5.68 |
| 98 | 31.71 | 19.78 | 31.24 | 19.73 |

A final table of means was calculated for the participants in this study by grouping participants into their grade levels. For example, the scores of all grade 1 participants regardless of what year they were in grade 1 were pooled together and their means on the various tasks were calculated. See table 5 below for the means used in this study. (Table 5 in Appendix C shows a complete table of the means of all the variables.)

Table 5 Mean scores merged by Grade over the Four Years


Table 5 continued......

| G1 Measures | NA |  |  | RD |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | M | SD | N | M | SD | N |
| RAN |  |  |  |  |  |  |
| L1 | 51.75 | 14.59 | 188 | 60.11 | 22.41 | 18 |
| ESL | 46.94 | 10.64 | 144 | 57.54 | 18.89 | 13 |
| Pseudoword Reading |  |  |  |  |  |  |
| L1 | 7.07 | 3.99 | 188 | 3.22 | 3.46 | 18 |
| ESL | 6.70 | 3.94 | 144 | 1.69 | 2.36 | 13 |
| Syntactic Error Judgement (\% score) |  |  |  |  |  |  |
| L1 | 65.60 | 15.46 | 188 | 57.46 | 14.95 | 18 |
| ESL | 61.01 | 13.71 | 144 | 60.71 | 9.06 | 13 |
| Wrat Reading |  |  |  |  |  |  |
| L1 | 23.88 | 4.44 | 188 | 15.00 | 4.27 | 18 |
| ESL | 23.65 | 4.22 | 144 | 17.62 | 1.45 | 13 |
| Bridge Words |  |  |  |  |  |  |
| L1 | 47.91 | 17.12 | 188 | 17.39 | 13.84 | 18 |
| ESL | 48.21 | 17.92 | 144 | 20.25 | 10.39 | 12 |

## G2 Measures

Rosner Auditory Analysis

| L1 | 23.84 | 9.14 | 112 | 14.20 | 5.68 | 20 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| ESL | 26.72 | 8.52 | 93 | 12.53 | 6.64 | 17 |
| RAN |  |  |  |  |  |  |
| $\quad$ L1 | 43.93 | 10.28 | 142 | 50.58 | 14.73 | 28 |
| ESL | 39.45 | 8.09 | 117 | 49.46 | 12.84 | 20 |
| GFW Sound Mimicry |  |  |  |  |  |  |
| L1 | 51.76 | 2.70 | 117 | 48.43 | 3.96 | 21 |
| ESL | 50.54 | 2.81 | 99 | 47.59 | 4.91 | 17 |

Syntactic Error Judgement (\% score)

L1 ESL
Oral Cloze L1 ESL
Wrat Reading L1 ESL
Bridge Words L1 ESL
79.33
$\begin{array}{lll}75.60 & 12.58 & 116\end{array}$
12.47

28
$75.60-12.58$

| 8.50 | 2.06 | 24 | 6.86 | 2.79 | 7 |
| :--- | :--- | :--- | :--- | :--- | :--- |


| 7.35 | 2.32 | 17 | 6.67 | 2.52 | 3 |
| :--- | :--- | :--- | :--- | :--- | :--- |

Linda Experimental Words

| L1 | 36.88 | 4.36 | 141 | 25.86 | 9.12 | 28 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| ESL | 36.45 | 5.03 | 116 | 27.95 | 7.13 | 20 |
| AS Reading |  |  |  |  |  |  |
| L1 | 63.38 | 14.72 | 117 | 28.57 | 10.03 | 21 |
| ESL | 61.93 | 14.52 | 99 | 28.57 | 10.03 | 21 |

Table 5 continued.....

| G3 Measures | NA |  |  | RD |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | M | SD | $N$ | M | SD | N |
| Rosner Auditory Analysis |  |  |  |  |  |  |
| L1 | 29.07 | 9.10 | 103 | 14.00 | 7.68 | 11 |
| ESL | 30.49 | 7.04 | 67 | 18.40 | 7.35 | 10 |
| RAN |  |  |  |  |  |  |
| L1 | 38.95 | 7.92 | 51 | 42.39 | 10.34 | 4 |
| ESL | 35.16 | 7.34 | 50 | 41.17 | 8.96 | 5 |
| Wrat Spelling (standard score) |  |  |  |  |  |  |
| L1 | 107.81 | 9.92 | 142 | 83.89 | 6.36 | 28 |
| ESL | 106.09 | 8.57 | 117 | 83.95 | 4.32 | 20 |
| Woodcock Word Identification |  |  |  |  |  |  |
| L1 | 62.89 | 12.07 | 52 | 45.43 | 5.00 | 7 |
| ESL | 65.12 | 8.69 | 16 | 51.00 | 6.75 | 5 |
| Coltheart Words |  |  |  |  |  |  |
| L1 | 35.48 | 7.51 | 52 | 22.14 | 5.52 | 7 |
| ESL | 36.19 | 4.34 | 16 | 24.80 | 6.98 | 5 |
| Stanford Reading Comprehension |  |  |  |  |  |  |
| L1 | 37.71 | 9.60 | 49 | 24.57 | 13.13 | 7 |
| ESL | 40.12 | 4.33 | 17 | 29.40 | 11.76 | 5 |
| Wrat Math |  |  |  |  |  |  |
| L1 | 26.90 | 2.43 | 49 | 26.71 | 1.60 | 7 |
| ESL | 29.94 | 2.14 | 17 | 28.00 | 2.55 | 5 |

To determine whether the observed mean differences were statistically significant between the two language groups, a repeated measures one way Analysis of Variance was used for the longitudinal data. ANOVAs were conducted on each task and time was the repeated measure. Separate analyses were performed for the reading disabled and normal readers. However, it is important to note that there was an insufficient number of grade 1 RD participants so the analysis was only conducted on the NA participants in grade 1 . See table 6 below for a list of the measures with significant differences between ESL and L1 students from the ANOVA procedure.

Table 6 F-Values of the Significantly Different Mean Scores found between ESL and L1 Students

| Participants | F value | p value |
| :--- | :--- | :--- |
| JK Rd and Na Students |  |  |
| Phoneme Deletion and Substitution | 5.056 | .032 |
| Rhyme Detection | 5.263 | .025 |
| Stanford Sentence Repetition | 11.945 | .001 |
| Oral Cloze | 6.672 | .015 |

Table 6 continued......

| Participants | Fvalue | P value |
| :--- | :---: | :---: |
| SK NA Students |  |  |
| Rhyme Detection | 9.285 | .003 |
| Syntactic Error Judgement | 8.506 | .005 |
| SK RD Students |  |  |
| Syntactic Error Judgement | 15.561 | .006 |
| Grade 1 NA Students |  |  |
| BAS Reading | 5.309 | .024 |

Table 5 provided information to observe whether there were differences between ESL and L1 participants at certain levels of development. In this case, participants were classified by grade and time was not a factor. For example, all grade one participants irrespective of what year it was when they were in grade one were included in the grade one mean calculations. Bar graphs of the means in table 5 were created to illustrate the observed mean differences. (See Bar Graphs in Appendix D) A simple one factor ANOVA was employed to test whether these observed mean differences were statistically significant. See Table 7 below for a list of significantly different mean scores between ESL and L1 students. Note there were no significant differences between language groups among the Senior Kindergarten, Grade 2 and Grade 3 RD students. Also no significant differences were found among the Grade 4 participants in this study. Consequently they are not included in table 7 below.

Table 7 Mean scores and F values for significantly different mean scores between ESL and L1 students by Grade

| Participants | L1 | ESL | Mlxed | $F$ | $P$ |
| :--- | :---: | :---: | :---: | :---: | :---: |
|  | $M(N)$ | $M(N)$ | $M(N)$ |  |  |

JK NA and RD Students

| S tanford Sentence | $13.83(69)$ | $10.48(50)$ | 20.50 | .001 |
| :--- | :--- | :--- | :--- | :--- |
| Repetition <br> Syntactic Error | $42.61(69)$ | $34.46(49)$ | 4.646 | .033 |

SK NA Students

| Rhyme Detection | $6.51(136)$ | $4.83(88)$ | 16.508 | .001 |
| :--- | :---: | :---: | :---: | :---: |
| Stanford Sentence | $15.73(136)$ | $12.74(88)$ | 31.433 | .001 |
| Repetion |  | 14.185 | .001 |  |
| Syntactic Error | Judgment (\% score) | $46.57(136)$ | $37.89(88)$ | 5.495 |


| Table 7 continued..... |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Participants | $\begin{gathered} \mathrm{L1} \\ M(N) \end{gathered}$ | $\begin{aligned} & \text { ESL } \\ & \mathrm{M}(\mathrm{~N}) \\ & \hline \end{aligned}$ | Mixed $M(N)$ | F | $p$ |
| Grade 1 NA Students |  |  |  |  |  |
| RAN | 51.75 (188) | 46.94 (144) |  | 11.106 | . 001 |
| Syntactic Error Judgement (\%score) | 65.60 (188) | 61.01 (144) |  | 7.900 | . 005 |
| Grade 1 RD Students |  |  |  |  |  |
| Wrat (Raw score) | 15.00 (18) | 17.62 (13) |  | 4.469 | . 043 |
| Grade 2 NA Students |  |  |  |  |  |
| Rosner AAT | 23.84 (112) | 26.72 (93) |  | 5.372 | . 021 |
| RAN | 43.93 (142) | 39.45 (117) |  | 14.651 | . 001 |
| GFW Sound Mimicry Syntactic Error | 51.76 (117) | 50.54 (99) |  | 10.649 | . 001 |
| Judgement (\% score) | 79.33 (141) | 75.60 (116) |  | 6.092 | . 014 |
| WRAT Reading | 30.16 (142) | 29.18 (117) |  | 5.206 | . 023 |
| Grade 3 RD Students |  |  |  |  |  |
| Wrat Spelling (standard score) | 89.00 (7) | 92.00 (5) | 80.00 (3) | 4.719 | . 031 |
| Woodcock Word Ident. | 45.43 (7) | 51.00 (5) | 39.00 (3) | 4.525 | . 034 |
| Coltheart Words | 22.14 (7) | 24.80 (5) | 11.00 (3) | 5.444 | . 021 |
| Grade 3 NA Students |  |  |  |  |  |
| RAN | 38.95 (51) | 35.16 (50) |  | 6.193 | . 014 |
| Wrat Math | 26.90 (49) | 29.94 (17) | 28.05 (21) | 11.001 | . 001 |

Tables 4, 3b and 3c show the means of Junior Kindergarten, Senior Kindergarten, and Grade 1 ESL and L1 participants for each measure over the four years. Overall the means do not appear to be dramatically different between the language groups. The results of the ANOVA calculations confirm that this is true in most cases. However, statistical significance was found for 4 measures in the JK group of participants, 2 measures in the SK group, and 1 measure in the G1 group.

In the JK group, a statistically significant difference in performance between the two language groups was detected for phoneme deletion and substitution ( $\mathcal{F}_{1,32}=5.056, \underline{p}=.032$ ), rhyme detection ( $\mathrm{F}_{1,77}=5.263, \mathrm{p}=.025$ ), Stanford Sentence repetition ( $\mathrm{F}_{1,93}=11.945, \mathrm{p}=.001$ ), and Oral cloze ( $\mathrm{F}_{1,32}=6.672, \mathrm{p}=.015$ ) measures. In all of these tasks the mean performance of the L1 group was higher than the ESL group. For the SK group, separate ANOVA's were calculated for reading disabled and normal readers. Mean differences on the Rhyme Detection task between the ESL and L1 participants were only significant for the normal group of readers ( $\mathrm{E}_{1,80}=9.285, \mathrm{p}=.003$ ) with a higher mean performance for the L1 group; but both normal and
disabled readers showed significant mean differences between the 2 language groups on the Syntactic Error Judgment measure ( $\mathrm{E}_{1.7}=15.561, p=.006$ for the $R D$ group; $\underline{F}_{1.57}=8.506$, $\mathrm{p}=.005$ for the NA group) and the mean performance was higher for the L1 group. Among the grade 11996 participants the number of RD participants was too small (less than 5) so analyses of variance were performed for the NA group only. Only the British Ability Scales (BAS) Reading measure showed significant differences between the 2 language groups ( $\mathcal{F}_{1,71}$ $=5.309$. $\mathrm{p}=.024$ ) with the L 1 mean performance higher than the ESL mean performance. The results of this analysis indicate that overall there are no differences between the two language groups. Furthermore, the number of measures on which the two language groups differed decreases as the group of learners gets older, that is the JK ESL and L1 participants were significantly different on 4 measures whereas the SK and G1 ESL and L1 participants showed significant differences on only 2 and 1 measures respectively. Additionally, the analyses of variance provided multivariate tests that showed the mean performance on most tasks differed significantly over time (p. <.01)

In summary, the results of the analyses of variance provide evidence that there are no significant differences in early reading development between the native learners and English as a second language learners overall. Both L1 and ESL group of learners develop similarly in their reading and phonological processing skills. Among the group of participants who were prereaders in 1996 (JK and SK) certain phonological processing and syntactic awareness measures discriminated between the two language groups, but for the Grade 11996 participants only one word reading measure was able to discriminate between the ESL and L1 learners

Graphs of the 3 longitudinal tables of means (See Appendix $D$ ) suggest a general trend of improvement in phonological processing and reading skill performance over time. The multivariate tests in the repeated measures analyses of variance support that observation. See Table 8 below

Table 8 F -values for Time factor for Measures Employed in ANOVA procedure

| Grade JK Na \& Rd Students | F |  | p |  |
| :---: | :---: | :---: | :---: | :---: |
| Phoneme Deletion |  |  |  |  |
| Phoneme Deletion \& Substitution |  |  |  |  |
| RAN |  |  |  |  |
| Phoneme \& Syllable Identification |  |  |  |  |
| GFW Sound Mimicry |  |  |  |  |
| Pseudoword Reading |  |  |  |  |
| Rhyme Production |  |  |  |  |
| Rhyme Detection |  |  |  |  |
| Real word Spelling |  |  |  |  |
| Pseudo word Spelling |  |  |  |  |
| Letter Identification |  |  |  |  |
| Stanford Sentence Repetition |  |  |  |  |
| Working Memory |  |  |  |  |
| Syntactic Error Judgment (\%score) |  |  |  |  |
| Wrat Reading |  |  |  |  |
| BAS Reading |  |  |  |  |
| Bridge Word Reading |  |  |  |  |
| Linda Experimental Words |  |  |  |  |
|  |  |  |  |  |
| Grade SK Measures | NA | RD | NA | RD |
| Phoneme \& Syllable Identification | 80.525 | 30.162 | . 001 | . 001 |
| Pseudo word spelling | 46.177 | 6.063 | . 001 | . 036 |
| Real Word Spelling | 219.734 | 49.519 | . 001 | . 001 |
| Rhyme Detection | 52.727 | 16.277 | . 001 | . 001 |
| Rhyme Production | 218.116 | 77.462 | . 001 | . 001 |
| Syntactic Error Judgement (\% score) | 57.607 | ns | . 001 | Ns |
| Working Memory for Words | 71.195 | 51.913 | . 001 | . 001 |
| GFW Sound Mimicry (\%ile score) | 14.595 | ns | . 001 | Ns |
| Phoneme Deletion \& Substitution | 143.545 | 28.796 | . 001 | . 001 |
| Phoneme Deletion | 160.822 | 144.146 | . 001 | . 001 |
| Wrat Reading | 423.243 | 142.985 | . 001 | . 001 |
| Pseudoword Reading | 92.075 | 27.234 | . 001 | . 001 |
| RAN | 99.168 | Ns | . 001 | ns |
| Letter Identification | 47.739 | 85.321 | . 001 | . 001 |
| Grade 1 Measures only for NA students |  |  |  |  |
| Phoneme \& Syllable Identification |  |  |  |  |
| Pseudo word spelling |  |  |  |  |
| Real Word Spelling |  |  |  |  |
| Rhyme Detection |  |  |  |  |
| Rhyme Production |  |  |  |  |
| Syntactic Error Judgement (\% score) |  |  |  |  |
| Working Memory for Words |  |  |  |  |
| Phoneme Deletion \& Substitution |  |  |  |  |
| Phoneme Deletion |  |  |  |  |
| Wrat Reading |  |  |  |  |
| BAS Reading |  |  |  |  |
| Bridge Word Reading |  |  |  |  |
| Linda Experimental Words |  |  |  |  |
| Pseudoword Reading |  |  |  |  |
| Rosner Auditory Analysis |  |  |  |  |
| Phoneme Recognition and Location (\%score) |  |  |  |  |

There were significant differences over time for all measures in all groups of learners (JK, SK, G1) excluding the syntactic error judgment and RAN measures for the Senior Kindergarten reading disabled participants. This finding may not be so unusual, as RAN is a measure of speed and not accuracy in naming objects, therefore even if phonological processing skills improved over time, speed performance on the RAN task may not be affected. However a measure such as RAN error performance that is more responsive to phonological processing skills may show significant differences over time. Similarly, the lack of significant differences found over time for the syntactic error judgment measure may be expected if we accept the theory that a certain level of competence in phonological processing skills needs to be reached in order for improved performance in more complex levels of reading development. It is interesting to note that among the normal JK and SK readers, performance on syntactic awareness measures discriminated between the two language groups despite the absence of word reading difficulty for the ESL group because support for this result was documented in other studies (Chiappe \& Siegel, 1999; Da Fontoura \& Siegel, 1995; Lesaux, 2001).

In order to answer the second question of this study, "what is the relationship between the phonological processing skills and reading ability of ESL and native speakers?", correlations were computed using the longitudinal data. Due to the small number of RD participants in this longitudinal data set, correlations including both RD and NA subjects were individually calculated between each of the phonological processing (PP) skills and the WRAT reading scores. Correlations between 1996 PP scores and WRAT reading scores were computed within time 1, 1996, and across the time periods (1997, 1998 and 1999). For example, 96 PP measure correlated with WRAT reading measure in 1996, 96 PP measure correlated with WRAT reading measure in 1997, etc. Correlations were separately calculated for the native and ESL participants. Please see Tables 9a, 9b and 9c in Appendix $C$ for the correlation tables.

In each of the primary grades in 1996 (JK, SK and G1) positive significant correlations were found between phonological processing skills and word reading measures. Additionally, the number of positive correlations was greatest in 1996 and generally tended to decrease over the years for both the L1 and ESL students. Within each grade grouping in 1996 and across the two language groups, the phonological processing task with the strongest correlation to the WRAT reading subtest changed over time. The discussion of the correlation results that follow will be organized into three areas. First I will discuss the correlations found within the L1 group, second I will discuss the correlations found within the ESL group, and lastly I will compare the two groups and note what I observe.

## JK 1996 Correlations

For native English speaking JK participants in 1996, the phoneme deletion task had the strongest correlation with the 1996 WRAT word reading measure. However, the strongest correlation between PP skill and WRAT word reading changed over the years. In 1997 and 1998, the strongest correlation with the WRAT measure was the Rhyme Production task and in 1999 the strongest correlation with the WRAT was the GFW Sound Mimicry.

Within the ESL 1996 JK group of participants, phoneme and syllable identification was the task with the strongest correlation to WRAT reading. However, the phoneme deletion task had the second most significant correlation coefficient. In 1997 and 1998 the GFW Sound Mimicry task had the strongest correlation and in 1999 there were no significantly positive correlations. See table 9 below. Table 9 in the Appendix shows the complete table of correlations

Table 9 Significant Correlations for JK group of Participants across the Four Years

| Phonological Processing Skill | 96 |  | 97 |  | 98 |  | 99 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 | ESL | L1 | ESL | L1 | ESL | L1 | ESL |
| Phoneme Deletion |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | 420** | .428** | .331* |  | . 483 | . 378 * |  |  |
| Sig. (2 tailed) | . 000 | . 002 | . 014 |  | . 001 | . 021 |  |  |
| N | 69 | 50 | 55 |  | 42 | 37 |  |  |
| RAN |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | -.450** | -.341* | -.307** | -.421** | -. 409 |  |  |  |
| Sig. (2 tailed) | . 000 | . 016 | 024 | . 005 | . 007 |  |  |  |
| N | 68 | 49 | 54 | 43 | 42 |  |  |  |
| Phoneme \& Syllable |  |  |  |  |  |  |  |  |
| Identification |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .248* | .438** |  | .339* |  | . $326^{*}$ |  |  |
| Sig. (2 tailed) | 040 | . 001 |  | . 026 |  | . 049 |  |  |
| $N$ | 69 | 50 |  | 43 |  | 37 |  |  |
| GFW Sound Mimicry |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .291* | . $398{ }^{* *}$ |  | .589** |  | ..397* | .466* |  |
| Sig. (2 tailed) | . 015 | . 004 |  | . 000 |  | . 015 | . 045 |  |
| N | 69 | 50 |  | 43 |  | 37 | 19 |  |
| Rhyme Production |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | 358** |  | .461** |  | .508** |  |  |  |
| Sig. (2 tailed) | . 003 |  | . 000 |  | . 001 |  |  |  |
| N | 69 |  | 55 |  | 42 |  |  |  |
| Rhyme Detection |  |  |  |  |  |  |  |  |
| $R^{2}$ | .403** |  | .420** | .311* |  | .375* |  |  |
| Sig. (2 tailed) | . 001 |  | . 001 | . 043 |  | . 022 |  |  |
| N | 69 |  | 55 | 43 |  | 37 |  |  |
| Letter Identification |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ (2 tailed) | .725** | .902** | .491** | 631** | .572** | .589** |  |  |
| Sig. (2 tailed) | . 000 | . 000 | . 000 | 000 | . 000 | . 000 |  |  |
| N | 69 | 50 | 55 | 43 | 42 | . 37 |  |  |

It is interesting to note that Rhyme production had a significant correlation with WRAT reading among the L1 participants in 1996, 1997 and 1998, but it did not have a significant correlation with WRAT reading among the ESL group. Also, the number of significant correlations in 1996 in the L1 group exceeds the number of significant correlations in the ESL group in 1996 by two. This may be a reflection of the lack of familiarity with the English language and its phonological structure given that the 2 tasks missing significant correlations with the WRAT were Rhyme Production and Rhyme detection. Lastly, the phonological recoding measure, RAN, remained a significant negative correlation with WRAT reading in both language groups over the four years. The speech rate measure, Buttercup, also demonstrated a negative correlation with the reading measure but the correlation was insignificant. As mentioned earlier in the results section of the first research question, it is logical that both the RAN and the Buttercup measure correlated negatively with WRAT word reading performance because the RAN and Buttercup measure are measures of speech rate while the WRAT measure is a measure of correct word reading. This means that longer speech rates (higher numerical score) are correlated with lower scores on the word identification WRAT measure. This makes sense because the logic is that both speed in lexical retrieval tasks such as the RAN measure and accuracy in word identification tasks rely on the establishment of a clearly defined phonological processing pathway between words and their pronunciation in the brain. Hence a longer speech rate, indicating a slower reading speed, demonstrates that the cognitive processes involved in lexical retrieval are not well formed; and this lack of an established phonological processing pathway to words in one's lexicon will mean lower scores on the word identification measure. Similarly, it makes sense that shorter speech rates (lower numerical score on RAN) are correlated with higher scores on the WRAT word identification task because the same well formed phonological pathway involved in lexical retrieval task is also used in producing accurate word readings.

## SK Correlations

In grade SK, the phoneme and syllable identification task had the strongest correlation with the 1996 WRAT word reading measure for both the L1 and ESL language groups. In 1997, the 1996 PP measure with the strongest correlation with WRAT reading in 1997 is phoneme and syllable identification. The 96 PP task with the strongest correlation with WRAT reading in 1998 and 1999 changes to the 1996 GFW and 1999 phoneme deletion task.

For the SK ESL learners in 1997, the phoneme deletion task (96) is the strongest correlate with WRAT reading (97). This stays true in 1998 but in 1999 the 96 Rhyme production task has the highest correlation. See table 10 below. Table 10 in the Appendix shows the complete table of correlations.

Similar to the observation noted in the JK correlations, the number of significant correlations is greater for the L1 participants than the ESL participants. Also, the RAN and Buttercup measures continued to have negative correlations with word reading in the SK group of learners.

Table 10 Significant Correlations for SK group of Participants across the Four Years

| Phonological Processing Skill | 96 |  | 97 |  | 98 |  | 99 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 | ESL | L1 | ESL | L1 | ESL | L1 | ESL |
| Phoneme Deletion |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .412** | .439** | .431** | .543** | .306* | .418* | .527** |  |
| Sig. (2 tailed) | . 001 | . 001 | . 001 | . 000 | . 033 | . 003 | . 001 |  |
| N | 67 | 51 | 57 | 49 | 49 | 48 | 36 |  |
| RAN |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | -. 156 | -.329* | -.299* | -.432** | -.327* | -. 272 |  | -.538** |
| Sig. (2 tailed) | . 208 | . 020 | . 024 | . 002 | . 022 | . 064 |  | . 001 |
| N | 67 | 50 | 57 | 48 | 49 | 47 |  | 33 |
| Phoneme \& Syllable Identification |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .562** | 459** | .478** | .380** |  |  |  | .389* |
| Sig. (2 tailed) | . 000 | . 001 | . 000 | . 007 |  |  |  | . 023 |
| N | 67 | 51 | 57 | 49 |  |  |  | 34 |
| GFW Sound Mimicry |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .515** |  | .443** |  | 517** |  | . $415^{* *}$ |  |
| Sig. (2 tailed) | . 000 |  | . 001 |  | . 000 |  | . 012 |  |
| N | 67 |  | 57 |  | 49 |  | 36 |  |
| Rhyme Production |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | 294* | .359** |  | .398** | .284* | .285* | 400* | .542** |
| Sig. (2 tailed) | . 016 | . 010 |  | . 005 | . 048 | . 050 | . 016 | . 001 |
| N | 67 | 51 |  | 49 | 49 | 48 | 36 | 34 |
| Rhyme Detection |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  | .427** | . 228 | . 350 * |  |  |  |
| Sig. (2 tailed) |  |  | . 001 | . 114 | . 014 |  |  |  |
| N |  |  | 57 | 49 | 49 |  |  |  |
| Letter Identification |  |  |  |  |  |  |  |  |
| $R^{2}$ | . $756{ }^{* *}$ | .875** | 536** | .477** | . $368{ }^{* *}$ | .463** | .399* | . $597 * *$ |
| Sig. (2 tailed) | 000 | . 000 | . 000 | . 001 | . 009 | . 001 | . 016 | . 000 |
| N | 67 | 51 | 57 | 49 | 49 | 48 | 36 | 34 |

Within the Grade 1 students the similarities between the two language groups is evident in that the tasks with the highest correlation with reading across the years are the same across the two language groups. Either the phoneme deletion and substitution task (PDS) or the pseudoword reading task (PR) has the strongest correlation with the WRAT over the 4 years. In 1996 the PDS task has the strongest correlation with reading for both the L1 and ESL learners. In 1997 the task with the strongest correlation remains the same for the L1 students, changing to PR in 1998 and 1999. In contrast, among the ESL students in 1997 the strongest correlate is PR, and in 1998 the strongest correlation is PDS. In 1999 there were no significant correlations for the ESL students. See table 11 below. Table 11 in the Appendix shows the complete table of correlations.

The negative correlation between RAN and WRAT word reading remains for this group of participants across the years but is significant only in 1996 and 1997. The lack of significance between 96 RAN measure and 1998 and 1999 WRAT reading measures, may be due to the effects of learning over time which result in 1996 phonological scores no longer being robust enough to be significant with reading scores at a certain developmental level.

Table 11 Significant Correlations for Grade 1 Participants across the Four Years

| Phonological | 96 |  | 97 |  | 98 |  | 99 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Processing Skill | L1 | ESL | L1 | ESL | L1 | ESL | L1 | ESL |
| Phoneme Recognition |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .282* | .333* |  | .305* | . $382 *$ |  |  |  |
| Sig. (2 tailed) | 033 | . 016 |  | . 049 | . 014 |  |  |  |
| N | 57 | 52 |  | 42 | 41 |  |  |  |
| Phoneme Recognition |  |  |  |  |  |  |  |  |
| \& Location |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .335* |  |  |  | .361* |  |  |  |
| Sig. (2 tailed) | . 011 |  |  |  | . 020 |  |  |  |
| N | 57 |  |  |  | 41 |  |  |  |
| Phoneme Deletion |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .569** | .639** | .495** | 616* | 477* |  |  |  |
| Sig. (2 tailed) | . 000 | . 000 | 000 | . 000 | . 002 |  |  |  |
| N | 57 | 52 | 51 | 42 | 41 |  |  |  |
| Phoneme Deletion \& |  |  |  |  |  |  |  |  |
| Substitution | .756** | .706** | .639** | .627** | .543** | .484** | .455* |  |
| $\mathrm{R}^{2}$ | . 000 | . 000 | . 000 | . 000 | 000 | . 001 | . 029 |  |
| Sig. (2 tailed) | 57 | 52 | 51 | 42 | 41 | 41 | 24 |  |
| N |  |  |  |  |  |  |  |  |
| RAN |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | -.343** | -.302* | -.339* |  |  |  |  |  |
| Sig. (2 tailed) | . 009 | . 030 | . 015 |  |  |  |  |  |
| N | 57 | 52 | 51 |  |  |  |  |  |

Table 11 continued....

| Phoneme \& Syllable |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Identification |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | 321* | . $357{ }^{\star *}$ | .326* | .383* |  |  |  |
| Sig. (2 tailed) | . 015 | . 009 | . 019 | . 012 |  |  |  |
| N | 57 | 52 | 51 | 42 |  |  |  |
| GFW Sound Mimicry |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | 408* | 316* | .346* | . $396 * *$ | .359* |  |  |
| Sig. (2 tailed) | . 002 | . 023 | . 013 | . 009 | . 021 |  |  |
| N | 57 | 52 | 51 | 42 | 41 |  |  |
| Pseudoword Reading |  |  |  |  |  |  |  |
| Sig. (2 tailed) | . 000 | . 000 | . 000 | . 000 | . 006 | . 001 | . 000 |
| $N$ | 57 | 52 | 51 | 42 | 41 | 41 | 24 |
| Rhyme Production |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | . 360 ** | .352* | .328* |  |  |  |  |
| Sig. (2 tailed) | 006 | . 010 | . 019 |  |  |  |  |
| N | 57 | 52 | 51 |  |  |  |  |
| Rhyme Detection |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | . 385 ** | .307* | .288* |  |  |  |  |
| Sig. (2 tailed) | . 003 | . 027 | . 040 |  |  |  |  |
| N | 57 | 52 | 51 |  |  |  |  |
| Real word Spelling |  |  |  |  |  |  |  |
| Sig. (2 tailed) | . 000 |  | . 018 | . 039 |  | . 008 | . 004 |
| N | 16 |  | 14 | 4 |  | 13 | 8 |
| Pseudo word Spelling |  |  |  |  |  |  |  |
| $R^{2}$ | 542* |  | .699** |  |  | .561* |  |
| Sig. (2 tailed) | . 030 |  | . 005 |  |  | . 046 |  |
| N | 16 |  | 14 |  |  | 13 |  |
| Letter Identification |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | $348 * *$ |  | .352* |  |  |  | .476* |
| Sig. (2 tailed) | . 008 |  | . 011 |  |  |  | . 019 |
| N | 57 |  | 51 |  |  |  | 24 |

Overall, the results of the correlations demonstrate that early phonological processing skills measured before reading instruction occurs are positively related to word reading. This is shown in the number of positive significant correlations between phonological processing tasks in 1996 and the WRAT word reading measure in 1996, 1997, 1998 and 1999. See table 12 below. Although the number of positive significant correlations decreases greatly over the four years for the 1996 Junior Kindergarten learners and 1999 grade 1 learners, this may be a reflection of growth or changes in reading and reading related skill development that these early phonological processing measures cannot account for. Stated another way, a confounding variable excluded from the list of independent variables (1996 phonological processing measures) may be contributing to the dependent variable (1999 word reading) such as pseudoword reading performance, working memory or phonological processing performance in the immediately following years. It is important to note that the JK students in 1999 are now in
grade 2 and the growth that occurs in their cognitive and linguistic abilities from grade 1 to grade 2 is developmentally significant enough that it is plausible that the JK measures will have less of an association with reading performance at this age. The same is true for the Grade 1 children in 1999 who are now grade 4 children.

Table 12 Number of Positive Significant Correlations by Grade from over the Four Years

| Grade |  |  |  |  |  |  |  |  |
| :--- | ---: | :--- | ---: | :--- | ---: | :--- | :--- | :--- |
|  | 96 |  | 97 |  | 98 |  | 99 |  |
|  | L1 | ESL | L1 | ESL | $L 1$ | ESL | L1 | ESL |
| JK | 6 | 4 | 4 | 4 | 3 | 5 | 1 | 0 |
| SK | 5 | 4 | 5 | 4 | 5 | 3 | 4 | 3 |
| G1 | 12 | 8 | 10 | 7 | 6 | 4 | 4 | 0 |

In conclusion, the results of the correlations suggest that phonological processing skills performance is positively related to word reading. This finding is true for L1 and ESL learners suggesting similar development patterns in both language groups. Furthermore, phonological processing skills measured in the early pre-reading stages of literacy development prove to be robust in their relationship with word reading over a period of four years. Despite the waning number and strength of correlations over the four years, significant correlations are found between early phonological processing skills and word reading.

The presence of ESL students in English speaking schools concerns many parents of ESL and L1 children. Some questions that may be raised are "Do ESL students become literate within the existing school system and instructional programs? Do L1 students suffer because teachers must simplify and alter their instruction to meet the needs of the L1 learner? And do ESL students perform more poorly than L1 students on measures of reading and reading related skills because their mother tongue is not English? This last question has implications for when and whether to enroll an ESL child into an English school.

In the United States of America, ESL and Bilingual programs exist for students with limited English proficiency (LEP students). These ESL programs differ from English programs in that the child is not immersed into the English language. Special instructors introduce the English language slowly and English language concepts are taught in a controlled and systematic manner. Most importantly, the child's first language is not spoken in the school, except to help the child make the social adjustment to the new environment and to communicate with parents. In contrast, in Bilingual programs, the child's native tongue is used as the language of instruction. This ensures that subject matter is acquired and students do not fall behind their native English-speaking peers. Much government spending goes into educating LEP students (12 billion/year in 1995), the majority of which is allocated to Bilingual programs, but do students in Bilingual programs fare better than those in ESL programs? The results of a longitudinal study (Mujica, 1995) show that students in Bilingual programs do not do better than students in ESL program in terms of how soon they qualify to exit the LEP program and join regular English classrooms. This study can provide some insight into why ESL programs may be better than Bilingual programs.

Bilingual and ESL programs such as those found in the United States and other instructional programs for teaching reading to ESL students are grounded in theories, and these theories are in turn based on beliefs about whether ESL and L1 students are different in their reading development. Consequently it is reasonable to question whether ones' beliefs have any validity. Empirical research studying the probable differences between ESL and L1 reading development can provide some objective, scientific evidence to prove or disprove a belief about ESL students and their reading development. This study is one example of a research attempts to scientifically address the validity of these beliefs by examining the differences in reading development between ESL and L1 students. The second question of this study addresses whether the importance of phonological processing skills for reading development found in previous research is similar for ESL students. Research findings from studies on English
speaking and non English speaking students (e.g. Bruck Genessee, \& Caravolas, 1997;Chiappe, Siegel, \& Gottardo,1999; Geva \& Siegel, 2000; So \& Siegel, 1997) support the importance of phonological processing skills for successful early reading ability and this study sought to determine whether this finding was true for ESL learners and also explore just how stable these early phonological processing skills are with respect to their relationship with word reading.

Overall, the findings of this study support previous research findings comparing L 1 and ESL learners (e.g., Chiappe \& Siegel, 1999; Da Fontoura \& Siegel, 1995; Lesaux, 2001) ANOVA results comparing L1 and ESL mean performance on phonological processing and word reading tasks indicated that most of the tasks did not show significant difference between the 2 language groups, thus indicating a similarity in ESL and L1 reading development. In the few cases where significant differences were found between the language groups, most of the results support past research.

For example, the larger number variables showing significantly different mean scores in the JK-G2 grade and the decrease in the number of variables that were significantly different between the 2 language groups in the older SK and G1 groups of learners echo the findings in Lesaux's research (2001) on early reading development of L1 and ESL learners. Lesaux conducted a longitudinal study of children from Kindergarten to Grade 2. In Kindergarten there were significant differences between ESL and L1 children, but by grade 2 the differences by language status had disappeared. Similarly, in this study the participants in the older G1-G4 group had generally no differences in reading and reading related skill performance except for one word reading measure (BAS reading task) compared to the JK-G2 group of learners who showed significant differences between ESL and L1 children on 4 measures (Phoneme Deletion and Substitution, Rhyme Detection, Stanford Sentence Repetition, and Oral Cloze) Although the participants across the 2 groups of learners (JK-G2 and G1-G4) are not the same, this cross sectional examination suggests that ESL children are able to learn and catch up to L1 children within the same instructional literacy program. An additional finding that buttresses the claims made in past research involves the syntactic awareness measure.

Among the JK and SK participants, the mean L1 performance on the Syntactic awareness tests, as measured by either the Oral Cloze or Syntactic Error Judgment task, was significantly higher than the mean ESL performance despite the absence of word reading difficulty for the ESL group. That is, a significant mean score difference on the Syntactic measure between the language groups was found among the Senior Kindergarten normal
readers. This finding fits with the findings of other studies (Chiappe \& Siegel, 1999; Da Fontoura \& Siegel, 1995; Lesaux, 2001). Chiappe and Siegel (1999) found that while phonological processing skill measures did not discriminate between the 2 language groups, the syntactic awareness measure did. They suggest that the exposure to the English syntax was not sufficient to bring them to the same level as their native English-speaking peers. Another possible explanation for this may be that syntactic awareness affects a different level of reading performance such as sentence level reading or reading comprehension. Thus matching participants from the two language groups based on the 2 word level reading performance categories (RD and NA) may superficially show differences on Syntactic awareness performance between the ESL and L1 groups. However, if ESL and L1 participants were matched based on reading comprehension scores, syntactic awareness differences between the language groups may not be observed. Lastly, the observed differences between the L1 and ESL participants on the syntactic awareness measure may be an indication, not that syntactic skills lag behind in development while phonological processing skills do not, but that a certain level of phonological processing is necessary for syntactic development.

It is interesting to note that in this study syntactic awareness did not discriminate between ESL and L1 students in the grade 1-4 group of participants, that is performance on this measure was not significantly different between the 2 language groups. This finding is inconsistent with the findings of Chiappe \& Siegel (1999), Da Fontoura \& Siegel (1995) and Lesaux (2001). Chiappe and Siegel, for example, studied grade 1 ESL and L1 children and found that the ESL group of participants had significantly lower scores on an oral cloze task very similar to the one used in this study compared to L1 participants. Furthermore, Da Fontoura \& Siegel (1995) found that this lag in syntactic skill continues in grades 4,5 , and 6 . This finding was not replicated in this longitudinal study.

The relationship between phonological processing skills and reading ability of ESL and L1 speakers was investigated by conducting correlations between 1996 phonological processing measures and word reading measures in 1996, 19971998 and 1999. In summary the results confirmed that the important role of phonological processing skills in reading acquisition is the same for L1 learners as it is for ESL learners. Although the number and order of the strongest significant correlations were not identical across the language groups in each of the 3 grade levels in 1996, significant correlations with word reading were found in all of the age groups (JK, SK, G1). This finding supports the importance of phonological processing skills for word reading established by research in the past (e.g.. Ball \& Blachman, 1991; Bruck, Genessee, \& Caravolas, 1997;Chiappe \& Siegel, 1999; Chiappe, Siegel, \& Gottardo, 1999; Da

Fontoura \& Siegel, 1995; Stahl \& Murray, 1994) However, this study is limited by the correlational analysis employed. Although the relationship between the variables is positive and strong, we can neither claim that phonological processing skills predict word reading nor conclude that instruction in phonological processing facilitates early word reading success. Nonetheless the findings suggest that this is likely. Furthermore, the results of past longitudinal research (Torgesen, J.K. \& Burgess, S.R., 1998; Torgesen, J.K. \& Wagner, R.K., 1994) on phonological processing and reading have shown that reading related phonological skills are stable across the elementary grades during early reading instruction (K-grade 5). Additionally Torgesen \& Wagner (1994) found the relationships among phonological processing skills (analytic awareness, synthetic awareness, phonological memory, serial naming and isolated naming) also very consistent across the elementary period suggesting that phonological "abilities are not simply a reflection of knowledge and skills [acquired] as a result of learning to read [but] should be considered to be important human abilities in their own right, similar to the intellectual abilities assessed on measures of general intelligence" (p. 283). The correlations between phonological processing skills and word reading also remain fairly stable over time. For example, although the number and strength of significant correlation coeffecients may change over the years, such as the decline in the number of significant correlations in the JK-G2 and G1-G4 groups, there are still significant correlations between phonological processing skills and word reading in 1997, 1998 and 1999.

Past research (Torgesen, J.K.. \& Burgess, S.R., 1998;Torgesen, J.K. \& Wagner, R.K., 1994) confirms that phonological processing skills are stable across the elementary grades. The correlation results of this research show that the positive relationship between phonological processing skills and word reading is also stable. Additionally, the ANOVA results in this research show that ESL and L1 students are not significantly different in their reading and reading related skills performance. Consequently, this study shows support for literacy intervention programs that focus on phonological processing skills for children at risk of reading failure that can be used with both native English speaking and ESL students.

It is interesting to note that according to past research (Castle, Riach \& Nicholson; 1994; Stanovich, 1988) pseudoword reading is associated with word reading. This suggests that pseudoword reading may even be a better measure of word reading because of the different routes available to access phonological information in working memory when reading words. This study included measures of pseudoword reading, although not all grades in each year received this measure. Correlations between phonological processing skills and pseudoword reading were calculated; however, a comparison of the significant correlations between
phonological processing skills and word reading versus phonological processing skills and pseudoword reading (See tables 13, 14, 15 and 16, 17, 18 in APPENDIX C) shows that within and across both language groups there is no trend showing a higher number of significant correlations between pseudoword reading and phonological processing skills. There is also no clear trend that the strength of the significant correlations with pseudoword reading are consistently greater than the strength of the significant correlations with word reading. Consequently, in this study pseudoword reading was not a better measure of word reading.

To further our understanding of the role of phonological processing skills in reading acquisition of ESL learners, future longitudinal research could be conducted employing multiple measures of the phonological and other reading related skills to allow for the study of latent variables, or one could employ composite measures which require standardized tests. The use of latent variables, according to Torgesen and Burgess (1998) provides the most accurate estimate of the true degree of relationship among constructs. Future research in this area could also benefit from following a research design that is similar to the one employed by Good, Simmons and Kame'enui (2001).

Good et. al. (2001) proposed a theory of phonological processing skill development and identified the benchmark skills required to measure success along the continuum of the larger goal of learning to read. This work could be extended to include other reading related variables such as syntactic awareness and working memory. A "backward" examination of the longitudinal data collected would allow researchers to examine what level of skill development is required at a certain stage of development across phonological awareness, syntax, and working memory, and also across other population s including ESL learners, in order to achieve the larger goal of successful reading in the future. This would allow one to create a type of historic profile of good and poor readers.

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## APPENDIX A

Table 1 Number of Participants for each Grade in each year by Gender (M or F), Reading Group (RD or NA), and Language category (ESL or L1)

|  | Gender $(M, F)$ | $\begin{aligned} & \text { Reading Group } \\ & (\text { RD, NA) } \end{aligned}$ | $\begin{gathered} \text { Language } \\ \text { (L1, ESL, MIX) } \\ \hline \end{gathered}$ |
| :---: | :---: | :---: | :---: |
| JK 1996 | $\begin{gathered} 120 \\ (60,60) \end{gathered}$ | $(7,14) *$ | $(70,50)$ |
| SK 1996 | $\begin{gathered} 128 \\ (74,54) \end{gathered}$ | $(17,108) *$ | $(74,54)$ |
| G1 1996 | $\begin{gathered} 111 \\ (51,60) \end{gathered}$ | $(9,101)$ | $(59,52)$ |
| SK 1997 | $\begin{gathered} 139 \\ (61,78) \end{gathered}$ | $(15,124)$ | $(88,51)$ |
| G1 1997 | $\begin{gathered} 146 \\ (80,66) \end{gathered}$ | $(12,134)$ | $(91,55)$ |
| G2 1997 | $\begin{gathered} 128 \\ (52,76) \end{gathered}$ | $(17,111)$ | $(69,59)$ |
| G1 1998 | $\begin{gathered} 108 \\ (52,56) \end{gathered}$ | $(10,98)$ | $(58,50)$ |
| G2 1998 | $\begin{gathered} 131 \\ (72,59) \end{gathered}$ | $(21,107) *$ | $(71,60)$ |
| G3 1998 | $\begin{gathered} 111 \\ (42,69) \end{gathered}$ | $(9,102)$ | $(56,55)$ |
| G2 1999 | $\begin{gathered} 68 \\ (31,31)^{*} \end{gathered}$ | $(11,55)^{*}$ | $(43,21)^{*}$ |
| G3 1999 | $\begin{gathered} 151 \\ (64,63)^{\star} \end{gathered}$ | $(15,92) *$ | (100, 23, 28) |
| G4 1999 | $\begin{gathered} 96 \\ (29,48)^{*} \end{gathered}$ | $(12,78) *$ | $(58,25,13)$ |

Table 2 List of Measures Administered to each Grade over the Years

| Totals | Tasks | $\begin{aligned} & \hline \text { JK } \\ & 96 \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { SK } \\ & 96 \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { G1 } \\ & 96 \end{aligned}$ | SK 97 | $\begin{aligned} & \mathrm{G} 1 \end{aligned}$ | $\begin{aligned} & \text { G2 } \\ & 97 \\ & \hline \end{aligned}$ | G1 | $\begin{aligned} & \mathrm{G} 2 \\ & 98 \\ & \hline \end{aligned}$ | G3 98 | $\begin{aligned} & \hline \text { G2 } \\ & 99 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline \text { G3 } \\ & 99 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline \mathrm{G4} \\ & 99 \\ & \hline \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| PHONOLOGICAL PROCESSING SKILLS MEASURES |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 112 \\ & 140^{*} \end{aligned}$ | Phoneme |  |  | * $\checkmark$ |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
|  | Recognition |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & / 18 \\ & / 54^{\star} \end{aligned}$ | Phoneme |  |  | * |  |  |  |  |  |  |  |  |  |
|  | Recognition \& |  |  | $\checkmark$ |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
|  | Location |  |  |  |  |  |  |  |  |  |  |  |  |
| 16 | Phoneme Deletion | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |  |
| 18 | Phoneme Deletion |  |  |  |  |  |  |  |  |  |  |  |  |
|  | \&Substitution |  |  | $\checkmark$ |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
| 40 | Rosner Auditory |  |  |  |  |  | $\checkmark$ |  | $\checkmark$ | $\checkmark$ |  | $\checkmark$ | $\checkmark$ |
|  | Analysis |  |  |  |  |  |  |  |  |  |  |  |  |
| (seconds) | Rapid Automized Naming RAN | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
| 16 | Phoneme \& Syllable Identification | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |  |
| 55 | GFW Sound Mimicry Subtest | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |  |
| 32 | Pseudoword |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ | $\checkmark$ |
|  | Repetition |  |  |  |  |  |  |  |  |  |  |  |  |
| 45 | Woodcock Word |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |
|  | Attack |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 | Pseudoword |  |  | $\checkmark$ |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
|  | Reading |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 | Coltheart Nonword |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Reading |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |
|  | Rhyme Production | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |  |
| 10 | Rhyme Detection | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |  |
| 20 | Real word Spelling |  |  | $\checkmark$ |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
| 10 | Pseudoword |  |  | $\checkmark$ |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
|  | Spelling |  |  |  |  |  |  |  |  |  |  |  |  |
| 21 | Word Spelling |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |
| 15 | Nonword Spelling |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |
| 55 | WRAT-3 Spelling |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |
| 26 | Letter Identification | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |  |
| WORKING MEMORY |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 42 | Stanford Sentence |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Repetition | $\checkmark$ | $\checkmark$ |  | $\checkmark$ |  |  |  |  |  |  |  |  |
| 12 | Working Memory: |  |  | $\checkmark$ |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |
|  | Words |  |  |  |  |  |  |  |  |  |  |  |  |

Table 2 List of Measures Administered to each Grade over the Years

| Totals | Tasks | $\begin{aligned} & \hline \text { JK } \\ & 96 \end{aligned}$ | $\begin{aligned} & \text { SK } \\ & 96 \end{aligned}$ | $\begin{aligned} & \text { G1 } \\ & 96 \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { SK } \\ 97 \end{array}$ | G1 97 | $\begin{aligned} & \hline \text { G2 } \\ & 97 \end{aligned}$ | G1 | $\begin{aligned} & \text { G2 } \\ & 98 \end{aligned}$ | $\begin{aligned} & \text { G3 } \\ & 98 \end{aligned}$ | $\begin{aligned} & \mathrm{G} 2 \\ & 99 \end{aligned}$ | $\begin{aligned} & \text { G3 } \\ & 99 \end{aligned}$ | $\begin{aligned} & \text { G4 } \\ & 99 \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| SYNTAX |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 120 | Syntax Error | * $\checkmark$ | * | * | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |
| 135* | Judgement |  |  |  |  |  |  |  |  |  |  |  |  |
| 12 | Oral Cloze |  |  |  |  |  |  |  |  |  | $\checkmark$ |  |  |
|  | Syntactic Error |  |  |  |  |  |  |  |  |  |  |  |  |
| 25 | Correction |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |
| READING |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 57 | WRAT-3 Reading | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |
| 69 | Bridge Words |  |  | $\checkmark$ |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
| 40 | Linda Experimental |  |  | $\checkmark$ |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
|  | Words |  |  |  |  |  |  |  |  |  |  |  |  |
| 90 | British Ability Scales |  | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |  |
|  | Woodcock Word |  |  |  |  |  |  |  |  |  |  |  |  |
| 106 | Identification |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |
| 48 | Coltheart Words |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |
|  | Stanford Reading |  |  |  |  |  |  |  |  |  |  |  |  |
| 48 | Comprehension |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |
| 42 | One Minute Reading |  |  |  |  |  |  |  |  |  |  |  |  |
|  | WRAT-Tan |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |
| 55 | WRAT-3 Math |  |  |  |  |  |  |  |  |  |  | $\checkmark$ | $\checkmark$ |

APPENDIX B

## Phoneme Recognition

Pretrials: During the pretrials, say to the child:
Listen for $/ \mathrm{s} /$, sock. Does sock have $/ \mathrm{s} /$ ? $\quad(/ \mathrm{s} /$; sock)
Listen for $/ \mathrm{s} /$, fat. Does fat have $/ \mathrm{s} /$ ?
/s/; fat)
Listen for $/ \mathrm{s} /$, soup. Does soup have $/ \mathrm{s} /$ ? $\quad(/ \mathrm{s} /$; soup)

## Test Trials:

In the test trials, always present the target phoneme prior to each word, using the format used in the pretrials.

1. $/ \mathrm{s} /$ : sock, fat, soup, meat
2. It : pen, take, top, duck
3. /b/: cook, hot, book, beard

Total score: $\qquad$ /12

Phoneme Recognition \& Location Identification
Pretrials: During the pretrials, say to the child:
Listen for $/ \mathrm{s} /$, and tell me if it is the first sound in the word, the last sound in the word, or if it is not
in the word: $/ \mathrm{s} /$; snake: (first, last, or no)
(first, last, or no) /s/; mess
Now listen for $/ \mathrm{k} /$ : first last or no? $\quad / \mathrm{k} /$; park
(first, last, or no) $/ \mathrm{k} /$; ten

## Test Trials:

In the test trials, always present the target phoneme prior to each word, using the format used in the pretrials.

1. $/ \mathrm{m} /$ : milk, ham, sit, pen, moan, comb
2. It: sit, top, milk, grass, toe, cat
3. lb : bike, milk, cab, bus, tub, nose

Subscore: first___ $/ 6$ last____ 6 no____ $/ 6$
Total Score: $\qquad$ 118

## Phoneme Deletion \& Substitution

Pretrials: Say to the child, "Now we are going to change the way words sound. I'm going to say a word, and I want you to say it back to me. After that, 'lll tell you how to change the word.
"Say doll." After the child repeats it, say "Now say doll again, but don't say/d/."
"Say doll." After the child repeats it, say "Now say doll, again, but instead of /d/ say /w/."
Initial:
fill (remove /ff) __________
cup (remove/k) $\qquad$
bat (remove /b/) $\qquad$
Final:
goat (remove /t) $\qquad$
make (remove $/ \mathrm{k} /$ ) $\qquad$
seal (remove $/ /$ ) $\qquad$
Blends:
slip (remove $/ I /$ ) $\qquad$
slip (change $/ / /$ to $/ \mathrm{n} /$ ) $\qquad$
nest (remove /s/) $\qquad$
Total: $\qquad$
fill (change /f/ to /b/) $\qquad$
cup (change $/ \mathrm{k} /$ to $/ \mathrm{p} /$ ) $\qquad$
bat (change /b/ to /s/) $\qquad$
fill (change $/ / /$ to $/ t /$ ) $\qquad$
cup (change $/ \mathrm{p} /$ to It $\qquad$
bite (change /t/ to /k/) $\qquad$
crest (change /s/ to /p/) $\qquad$
stick (remove It) $\qquad$
stick (change /t/ to /II) $\qquad$

## Coltheart Nonwords

Instructions: I am going to show you some funny words, or what we call nonwords. I want you to read out loud what you see written. These are not real words. Read each of them whatever way you thing best, or however you think they could sound. Let's try it!

Practice 1: dep
Practice 2: flope $\qquad$

Nonword Possible Responses (circle one)
Other

1. stull stull (dull) stool (bull)
2. ving ving (wing) vingg
3. vood vood (food) vood (hood) vud (blood)
4. sost sost (lost) soast (most)
5. vind vind (wind) vind (kind)
6. nush nush (hush) nosh (push)
7. tralf traf (calf) tauf tralf traulf
8. pold poald (cold) pold
9. bove boave (stove) buv (love) boov (move)
10. fump fump fum fup
11. grall graul (hall) gral
12. trome trum (some) troam(home)
13. bould bood (could) boald (mould) bood
boold bowd bowld
14. zove zoav (stove) zuv (love) zoov (move)
15. drace drase drake drass drak
16. nalk nauk (chalk) nalk naulk
17. jook jook (book) juke (spook) joke
Nonword Possible Responses (circle one) Other
18. biss biss ..... biz
19. paskk pask (task) paske
20. hane hane han
21. drack drack drake dake
22. fralt frault fralt fraut23. fown fown (down) foan (grown)24. rild rild (wild) rild (hill-d)
23. lail lale lell lill ..... lell
24. slear slear (ear) slair (bear) slar (heart)
25. fide fide (hide) ..... fid
26. hile hile (mile) ..... hill
27. yone hoan (bone) yawn (gone) yun (one)
28. stell stell steel

## Rhyme Detection

Instructions:
Examiner: "Here is a picture of a cat. Down here are three more pictures..." (the examiner points to and names each of the 3 choices pictures). "Now which of these three - fish, gun or hat rhymes with cat?" Provide the correct answer (hat) if necessary and explain that hat rhymes with cat.

Continue as above with the other 2 demonstration items, giving explanations. The instructions for the ten items are the same as for the demonstration item. Feedback may be given for the first 4 test items, and the child supplied with the correct response if necessary. Give no further help after test item 4.

Demonstration Items
Stimulus Word Response Items

| 1. | cat | fish | gun | hat |
| :--- | :--- | :--- | :--- | :--- |
| 2. ball | wall | bell | bag |  |
| 3. | chip | cup | ship | cheese |

Test Items
Stimulus Word Response Items

| 1) | boat | foot | bike | coat |
| :--- | :--- | :--- | :--- | :--- |
| 2) | key | cow | tree | door |
| 3) | chair | car | table | bear |
| $4)$ | house | mouse | horse | window |
| 5) | head | hand | bed | eye |
| $6)$ | bell | bottle | dress | shell |
| $7)$ | sock | clown | clock | shoe |
| $8)$ | train | rain | tractor | spoon |
| $9)$ | egg | bag | spoon | leg |
| $10)$ | car | star | bike | cake |

score: $\quad 110$

## Spelling List

"I am going to read some real words to you and I would like you to print them on the lines on the page in front of you. Try to spell them correctly. I will say the word, then read a sentence with the word in it, and then say the word again. Please write the first word here (point to the first line) and then go down this way as I say each word. Try your best. If you are not sure how to spell a word, it is ok to take a guess."

| 1. | top | The book is on the top of the pile | top |
| :---: | :---: | :---: | :---: |
| 2. | some | Some of the children have brown eyes. | some |
| 3. | food | The baby ate his food. | food |
| 4. | ball | The Raptors play basket-ball. | ball |
| 5. | jump | How high can you jump? | jump |
| 6. | year | A year has 365 days. | year |
| 7. | love | I love bright, sunny days. | love |
| 8. | walk | Many children walk to school | walk |
| 9. | back | He went back to school on Monday. | back |
| 10. | lost | They found their lost puppy. | lost |
| 11. | wear | She will wear a dress to the party | wear |
| 12. | told | He told us to enjoy ourselves at the park | told |
| 13. | king | The king and queen rule the country. | king |
| 14. | home | 1 live at home. | home |
| 15. | grow | Farmers grow corn. | grow |
| 16. | look | Look in the drawer for socks. | look |
| 17. | plane | The plane flew from Toronto to Montreal. | plane |
| 18. | stove | The stove is hot. | stove |
| 19. | done | After they finished, the were done. | done |
| 20. | wild | A bear is a wild animal. | wild |

"Now I am going to read some made-up silly words to you and I would like you to print them. Try to spell them as well as you can. I will say the silly word up to three times. Please write the first word here (point to the first clear line) and then go down this way as I say each word. Try your best. If you are not sure how to spell a made-up word, it is ok to take a guess."

1. bup
2. kib
3. nad
4. pob
5. ves
6. cabe
7. voke
8. yite
9. meve
10. pume

## Syntactic Error Judgement

I am going to say some sentences and would like you tell me which sentences are right and which are wrong. You can tell if a sentence is true or not, can't you? For example, you know that $2+2=4$ is true? [Wait for child's response] and $2+2=5$ is false? Ok that's one kind of right and wrong. But there is another kind. When we talk, there are right and wrong ways to say things. So if I say $2+2$ is 4 , I have said it right, but if $I$ say $2+24$ is, I have said it wrong. And so is $2+2$ be 4 . Nobody would say that, it sounds funny. Let's try some for practice.
Examples: To school go I. Is it right or wrong? (child's response)
To school go $l$ is wrong.
This is a chair. Is it right or wrong? (child's response)
This is a chair is right.
I am sit. Is it right or wrong? (child's response)
I am sit is wrong.
(This task is a forced choice task. No correction should be done in this section. If the child attempts to correct the sentence tell him or her "Now I just want you to tell me if the sentence is right or wrong.") Sentences may be repeated twice. Please indicate number of repetitions on score sheet.

1. Clapped his hands Mark.

Child's Response
*2. The sun shone brightly.
3. The bear brown growled.
4. They went at school.
*5. He answered the ringing phone.
6. I are happy.
7. The boy run quickly.
8. We thanked him much very.
*9. The waiter dropped the tray of plates.
10. The boy be sad.
11. The child the letter wrote.
*12. The woman turned on the light.
13. The lion and the tiger lives in the jungle.
14. The tourists traveled on car.
*15. Many of the children dressed up for the party.
16. The children's mother work very hard.
17. The art the many artists displayed.
18. They went to visit their relatives on England.
*19. The boy was chased by the dog.
20. They watched sadly as the cowboy rode the sunset into.
21. The flock of geese are on the lake.

| Right | Wrong |
| :--- | :--- |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |
| Right | Wrong |

22. Was reading the young woman the mystery novel. Right ..... Wrong
*23. When it rains, we wear our boots. Right ..... Wrong
23. The tall, thin man playing was basketball. Right ..... Wrong
24. The presentation for the award was done by the Queen. Right ..... Wrong
*26. The class was eager to see the movie. Right ..... Wrong
25. The children with the young teacher enjoys the school trip. Right Wrong
*28. The school of brightly coloured fish swam past the boat. Right Wrong
26. The new television were watching the people. Right Wrong
27. The plan was developed to cooperation with famous scientists. Right Wrong
28. One of the children are sick. Right
Wrong
*32. The child, raking the leaves, helps her parents. Right Wrong
29. The business person, waiting for the flight, travel to Europe often. Right Wrong
30. The visitor who wears the dark glasses are friendly. Right
Wrong
31. The racing car traveled quickly quite. RightWrong

The following task was developed by Alexandra Gottardo; however the task instructions have been modified.

ORAL CLOZE

Name $\qquad$

Instructions: This time I will read something to you and there will be word missing. Where the word is missing. I will say "blank". I want you to think of a word that would sound right in the blank. For example, I might say "The moon shines bright in the $\qquad$ ." (pause and repeat) and I want you to say "sky". So, it would be "The moon shines bright in the sky." O.K. let's try another one. I'll say "The children $\qquad$ with the toys." (pause and repeat) What's the missing word? If the child fails to respond, say "How about, play? Then it would be "The children play with toys." Let's try another one. "The puppy wags its $\qquad$ ." (pause and repeat) Good!

1. The $\qquad$ little pigs ate corn.
2. Fred put the big turkey $\qquad$ the oven.
3. The $\qquad$ put his dairy cows in the barn.
4. Jane $\qquad$ her sister ran up the hill.
5. It was a sunny day with a pretty $\qquad$ sky.
6. Betty $\qquad$ a hole with her shovel.
7. Jim set the lamp on the desk so he could $\qquad$ .
8. The boy had big brown eyes and a pleasant $\qquad$ .
9. The children put on their boots $\qquad$ it snows.
10. Jeffrey wanted to go $\qquad$ the roller coaster.
11. When we go $\qquad$ the building, we must be quiet.
12. Dad $\qquad$ Bobby a letter several weeks ago.

## Syntactic Error Correction Task

"I am going to say some sentences that are wrong. I want you to fix them for me. Let's try one. Horse is running. Can you fix it? Horse is running." (If the child gives a grammatical response, continue.) Otherwise say, "The horse is running is the right way. Let's try another one. I am stand. Can you fix it? I am stand." (Allow the child to respond). "I am standing is the right way to say it. Let's try some more."

Sentences can be repeated a maximum of 3 times. Record exactly what the child said for later scoring. Try not to accept a response such as the sentence is OK. If the child says the sentence is correct, ask him/her to "Say it in a different way."

1. Clapped his hands Mark.
2. The bear brown growled.
3. They went at school.
4. I are happy.
5. The boy run quickly.
6. We thanked him much very.
7. The boy run quickly
8. The child the letter wrote.
9. The lion and the tiger lives in the jungles
10. The tourists traveled on car.
11. The children's mother work very hard.
12. The art the many artists displayed
13. They went to visit their relatives on England.
14. They watched sadly as the cowboy rode the sunset into.
15. The flock of geese are on the lake.
16. Was reading the young woman the mystery novel.
17. The tall, thin man playing was basketball.
18. The presentation for the award was done by the Queen.
19. The children with the young teacher enjoys the school trip.
20. The new television were watching people.
21. The plan was developed to cooperation with famous scientists.
22. One of the children are sick.
23. The business person, waiting for the flight, travel to Europe often.
24. The visitor who wears the dark glasses are friendly.
25. The racing car traveled quickly quite.
(CWO)

FUN: function word error $\quad$ SPO: incorrect phrase order within sentence
COP: copula verb error SCO: incorrect word order within clause
S-P: lack of subject predicate agreement

Bridge Word List

| find | orange | bike | car | truck | rabbit |
| :--- | :--- | :--- | :--- | :--- | :--- |
| colour | sandwich | duck | circle | good | little |
| boy | join | mother | the | a | happy |
| yes | came | chair | in | is | on |
| put | shoe | under | here | jumping | make |
| running | walk | they | giraffe | me | monster |
| down | out | up | cleaning | drawing | reading |
| you | zebra | go | box | says | went |
| going | all | some | had | over | stop |
| zoo | rain | cut | dirty | house | jumps |
| stairs | writing |  |  |  |  |

## BAS Word List

| the | up | on | go | he |
| :--- | :--- | :--- | :--- | :--- |
| at | jump | you | box | fish |
| one | cup | van | if | out |
| said | water | bird | wood | running |
| window | ship | clock | men | dig |
| ring | gate | money | thin | light |
| coat | brick | oil | heel | paper |
| carpet | skin | knock | switch | sport |
| building | writing | glove | army | harvest |
| travel | climb | ladies | calf | leather |
| believe | idea | chain | lawn | collect |
| invite | enemy | favour | drab | guest |
| territory | behaviour | massive | error | beard |
| groceries | encounter | statue | ceiling | transparent |
| universal | experience | dough | tentacle | obscure |
| character | exert | diameter | curiosity | environment |
| mosquito | nomadic | velocity | lethal | divulge |
| chaos | emphasise | jeopardy | aborigine | criterion |

## Coltheart Words

| 1. | bead | 25. | worse |
| :---: | :---: | :---: | :---: |
| 2. | bear | 26. | blame |
| 3. | glide | 27. | brace |
| 4. | fold | 28. | ocean |
| 5. | debt | 29. | tribe |
| 6. | cove | 30. | dive |
| 7. | walk | 31. | shove |
| 8. | paid | 32. | doubt |
| 9. | wood | 33. | half |
| 10. | pint | 34. | shoe |
| 11. | stiff | 35. | rhyme |
| 12. | sweat | 36. | aisle |
| 13. | child | 37. | smoke |
| 14. | broad | 38. | speak |
| 15. | yacht | 39. | hind |
| 16. | phone | 40. | hull |
| 17. | ghost | 41. | crane |
| 18. | mild | 42. | puff |
| 19. | dome | 43. | bind |
| 20. | steak | 44. | sword |
| 21. | press | 45. | muscle |
| 22. | island | 46. | malt |
| 23. | halt | 47. | amoeba |
| 24. | slave | 48. | receipt |

## APPENDIX C

Table 3a Mean Phonological Processing and Reading Scores of JK Students by Year as a Function of Language (L1, ESL) and Reading Group (RD, NA)

| Measure | NA |  |  |  | RD |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 |  | ESL |  | L1 |  | ESL |  |
|  | $M$ (SD) | N | M (SD) | N | $M$ (SD) | $N$ | M (SD) | $N$ |
| PHONOLOGICAL PROCESSING SKILLS |  |  |  |  |  |  |  |  |
| Phoneme Recognition (\% score) |  |  |  |  |  |  |  |  |
| 98 | 100.0 (.00) | 5 | 100.0 (.00) | 7 | 100.0 (.00) | 7 | ? | 0 |
| 99 | 100.0 (.00) | 2 | 100.0 (.00) | 4 | 100.0 (.00) | 1 | ? |  |
| Phoneme Recognition \& Location (\% score) |  |  |  |  |  |  |  |  |
| 98 | 100.0 (.00) | $\underline{5}$ | 100.0 (.00) | 7 | 98.15 (3.21) | 3 | 100.0 (-) | 1 |
| 99 | 100.0 (.00) | $\underline{2}$ | 100.0 (.00) | 4 | 100 (.00 | 1 | 88.89 (-) | 1 |
| Phoneme Deletion /16 |  |  |  |  |  |  |  |  |
| 96 | 1.33 (3.27) | 6 | 4.13 (4.58) | 8 | 2.40 (2.88) | 5 | . 00 (.00) | 2 |
| 97 | 10.80 (3.83) | 5 | 8.00 (3.56) | 7 | 7.50 (6.24) | 4 | 4.00 (-) | 1 |
| 98 | 15.60 (.55) | 5 | 16.00 (.00) | 7 | 13.33 (4.62) | 3 | . $00{ }^{(-)}$ |  |
| Phoneme Deletion \& Substitution /18 |  |  |  |  |  |  |  |  |
| 98 | 12.40 (2.07) | 5 | 10.86 (2.19) | 7 | 12.00 (3.61) | 3 | ? | 0 |
| 99 | 13.00 (2.83) | 2 | 12.75 (3.20) | 4 | 13.00 (-) | 1 | ? | 0 |
| RAN (seconds) |  |  |  |  |  |  |  |  |
| 96 | 67.02(14.15) | 6 | 54.90 (10.86) | 8 | 77.47 (12.73) | 5 | 90.00 (15.56) | 2 |
| 97 | 58.71 (9.88) | 5 | 53.86 (16.89) | 7 | 57.75 (12.82) | 4 | 78.00 (-) | 0 |
| 98 | 39.96 (7.47) | 5 | 41.11 (11.16) | 7 | 52.67 (17.21) | 3 | ? (-) | 0 |
| 99 | 39.80 (3.12) | 2 | 34.73 (6.37) | 4 | 42 (-) | 1 | ? (-) |  |
| Buttercup Speech Rate (seconds) ${ }^{\text {a }}$ |  |  |  |  |  |  |  |  |
| 96 | 7.52 (1.03) | 6 | 7.87 (1.24) | 8 | 8.90 (1.41) | 5 | 11.59 (4.22) | 2 |
| 97 | 6.46 (1.18) | 5 | 7.59 (1.26) | 7 | 19.37 (24.70) | 4 | 8.00 (-) | 1 0 |
| 98 | 6.03 (.99) | 4 | 7.60 (2.02) | 7 | 6.50 (1.18) | 2 | - |  |
| Phoneme \& Syllable Identification /16 |  |  |  |  |  |  |  |  |
| 96 | 6.17 (3.92) | 6 | 12.38 (1.77) | 8 | 7.40 (6.15) | 5 | 3.00 (4.24) | 2 |
| 97 | 11.40 (2.07) | 5 | 11.86 (2.54) | 7 | 11.00 (2..16) | 4 | 8.00 (-) | 1 0 |
| 98 | 15.20 (.84) | 5 | 14.29 (1.25) | 7 | 12.67 (4.93) | 3 | ? | 0 |
| GFW Sound Mimicry Subtest /55 |  |  |  |  |  |  |  |  |
| 96 | 44.17 (5.56) | 6 | 43.88 (6.10) | 8 | 33.80 (12.30) | 5 | 20.50 (10.61) | 2 |
| 97 | 49.40 (4.10) | 5 | 46.43 (7.18) | 7 | 51.75 (1.26) | 4 | 46.00 (-) | 1 |
| 98 | 50.40 (4.62) | 5 | 50.29 (1.70) | 7 | 50.33 (4.16) | 3 | ? (-) | 0 |
| GFW Sound Mimicry Subtest (\%ile score) |  |  |  |  |  |  |  |  |
| 96 | 67.17 (21.28) | 6 | 65.50 (23.78) | 8 | 38.20 (27.76) | 5 | 10.00 (11.31) | 2 |
| 97 | 76.80 (21.29) | 5 | 65.71 (33.67) | 7 | 88.25 (8.06) | 4 | 62.00 (-) | 1 |
| 98 | 73.40 (30.69) | 5 | 73.00 (12.44) | 7 | 72.00 (24.27) | 3 | ? (-) | 0 |
| Pseudoword Repetition32 |  |  |  |  |  |  |  |  |
| 99 | 28.67 (2.89) | 3 | 29.00 (1.41) | 5 | 30.00 (-) | 1 | ? (-) | 0 |
| Pseudoword Reading /15 |  |  |  |  |  |  |  |  |
| 98 | 8.80 (3.63) | 5 | 6.43 (2.30) | 7 | 7.33 (3.06) | 3 | ? (-) | 0 |
| 99 | 9.50 (2.12) | 2 | 10.75 (2.87) | 4 | 8.00 (-) | 1 | ? (-) | 0 |


| Measure | NA |  |  |  | RD |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 |  | ESL |  |  |  |  |  |
|  | M (SD) | N | M (SD) | N | M (SD) | N | M (SD) | N |
| Rhyme Production ${ }^{\text {a }}$ |  |  |  |  |  |  |  |  |
| 96 | 5.83 (4.02) | 6 | 5.38 (3.93) | 8 | 4.20 (3.27) | 5 | . 00 (.00) | 2 |
| 97 | 8.40 (3.91) | 5 | 8.57 (6.11) | 7 | 8.50 (5.74) | 4 | . 00 (-) | 1 |
| 98 | 13.40 (3.78) | 5 | 13.71 (3.35) | 7 | 14.33 (7.77) | 3 | ? (-) |  |
|  |  |  |  |  |  |  |  |  |
| 96 | 7.67 (1.75) | 6 | 6.25 (3.06) | 8 | 5.80 (3.70) | 5 | 2.50 (3.54) | 2 |
| 97 | 8.00 (2.00) | 5 | 7.71(1.70) | 7 | 6.75 (4.03) | 4 | 4.00 (-) | 1 |
| 98 | 9.80 (.45) | 5 | 9.29 (1.11) | 7 | 10.00 (-) | 3 | ? ( -1 |  |
| Realword Spelling /20 |  |  |  |  |  |  |  |  |
| 98 | 12.00 (5.79) | 5 | 12.43 (3.69) | 7 | 8.67 (4.73) | 3 | $?(-)$ | ${ }_{0}$ |
| 99 | 17.50 (.71) | 2 | 17.75 (1.26) | 4 | 17.00 (-) | 1 | ? (-) |  |
| Pseudoword Spelling /10 0 |  |  |  |  |  |  |  |  |
| 98 | 5.33 (1.53) | 3 | 4.00 (2.31) | 7 | 4.00 (1.00) | 3 | $\xrightarrow[? ~(-) ~]{?}$ | 0 0 |
| 99 | 5.50 (.71) | 2 | 4.75 (1.71) | 4 | 4.00 (-) | 1 | ? (-) | 0 |
| Letter Identification $/ 26$ |  |  |  |  |  |  |  |  |
| 96 | 11.50 (7.37) | 6 | 17.25 (8.58) | 8 | 7.60 (6.62) | 5 | 2.00 (1.41) | 2 |
| 97 | 22.00 (4.30) | 5 | 24.33 (1.86) | 6 | 23.50 (1.73) | 4 | 21.00 (-) | 1 |
| 98 | 25.60 (.55) | 5 | 25.43 (1.30) | 7 | 25.67 (.58) | 3 | ? - $(-)$ | 0 |
| WORKING MEMORY |  |  |  |  |  |  |  |  |
| Stanford Sentence Repetition 142 |  |  |  |  |  |  |  |  |
| 96 | 17.00 (2.53) | 6 | 13.13 (1.81) | 8 | 11.80 (5.17) | 5 | 4.50 (3.54) | ${ }_{1}^{2}$ |
| 97 | 17.75 (4.19) | 4 | 15.33 (1.97) | 6 | 17.00 (3.46) | 3 | 15.00 (-) |  |
| Working Memory : Words $/ 12$ |  |  |  |  |  |  |  |  |
| 98 | 3.60 (1.52) | 5 | 2.57 (1.90) | 7 | 3.33 (1.53) | 3 | . 00 (-) | 1 |
| 99 | 4.00 (1.73) | 3 | 3.80 (.84) | 5 | 3.00 (-) | 1 | ? (-) | 0 |
| SYNTAX |  |  |  |  |  |  |  |  |
| Syntactic Error Judgement (\% score) |  |  |  |  |  |  |  |  |
| 96 | 55.24 (18.40) | 6 | 38.93 (23.21) | 8 | 46.86 (15.98) | 5 | 7.14 (10.10) | 2 |
| 97 | 76.00 (9.62) | 5 | 52.14 (18.68) | 7 | 67.50 (10.41) | 4 | 35.00 (.00) | 1 |
| 98 | 83.00 (10.37) | 5 | 70.00 (15.28) | 7 | 78.33 (7.64) | 3 | ? (-) | 0 |
| 99 | 105.00 (35.00) | 3 | 94.00 (25.84) | 5 | 85.00 (0) | 1 | ? (-) | 0 |
| Oral Cloze 112 |  |  |  |  |  |  |  |  |
| 99 | 10.00 (.00) | 2 | 8.75 (2.50) | 4 | 7.00 (-) | 1 | ? (-) | 0 |
| READING |  |  |  |  |  |  |  |  |
| Wrat Reading (raw score) 157 |  |  |  |  |  |  |  |  |
| 96 | 11.00 (4.60) | 6 | 12.50 (3.78) | 8 | 2.60 (1.67) | 5 | 1.50 (.71) | 2 |
| 97 | 18.40 (5.64) | 5 | 17.29 (2.56) | 7 | 18.00 (6.78) | 4 | 14.00 (-) | 1 |
| 98 | 24.40 (6.19) | 5 | 23.14 (4.26) | 7 | 23.33 (4.93) | 3 | ? $(-)$ | 0 |
| 99 | 31.67 (6.03) | 3 | 28.80 (1.30) | 5 | 31.00 (-) | 1 | ? $(-)$ | 0 |
| Wrat Reading (\%ile score) |  |  |  |  |  |  |  |  |
| 96 | 63.83 (28.60) | 6 | 69.50 (23.23) | 8 | 13.40 (6.02) | 5 | 9.00 (1.41) | 2 |
| 97 | 58.60 (24.30) | 5 | 58.14 (24.25) | 7 | 53.00 (11.52) | 4 | 39.00 (-) | 1 |
| 98 | 45.20 (24.75) | 5 | 49.71 (24.82) | 7 | 39.33 (7.51) | 3 | ? (-) | 0 |
| 99 | 60.00 (32.51) | 3 | 44.60 (11.87) | 5 | 61.00 (-) | 1 | ? (-) | 0 |



Table 3b Mean Phonological Processing and Reading Scores of SK Students by Year as a Function of Language (L1, ESL) and Reading Group (RD, NA)

| Measure | NA |  |  |  | RD |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 |  | ESL |  | L1 |  | ESL |  |
|  | M (SD) | N | M (SD) | N | M (SD) | N | M (SD) | $N$ |
| PHONOLOGICAL PROCESSING SKILLS |  |  |  |  |  |  |  |  |
| Phoneme Recognition (\% score) |  |  |  |  |  |  |  |  |
| 97 | 97.57 (7.68) | 48 | 97.62 (6.45) | 42 | 83.33 (25.91) | 7 | 94.05 (9.27) | 7 |
| 98 | 100.00 (.00) | 43 | 100.00 (.00) | 41 | 97.22 (6.80) | 6 | 100.00 (.00) | 7 |
| Phoneme Recognition \& Location (\% score) |  |  |  |  |  |  |  |  |
| 97 | 93.87 (12.03) | 48 | 91.80 (15.19) | 42 | 80.95 (23.76) | 7 | 92.06 (7.07) | 7 |
| 98 | 99.61 (1.88) | 43 | 99.60 (1.92) | 41 | 100.00 (.00) | 6 | 99.21 (2.10) | 7 |
| Phoneme Deletion / 16 |  |  |  |  |  |  |  |  |
| 96 | 6.17 (5.48) | 58 | 4.16 (5.28) | 43 | 2.67 (3.24) | 9 | . 00 (.00) | 8 |
| 97 | 13.08 (3.93) | 50 | 12.88 (4.15) | 42 | 8.57 (5.19) | 7 | 9.00 (6.71) | 7 |
| 98 | 15.62 (1.01) | 42 | 15.61 (1.28) | 41 | 13.50 (3.51) | 6 | 13.57 (2.23) | 7 |
| Phoneme Deletion \& Substitution / 18 |  |  |  |  |  |  |  |  |
| 97 | 10.10 (4.43) | 48 | 8.76 (4.48) | 42 | 5.71 (3.77) | 7 | 6.14 (5.61) | 7 |
| 98 | 13.79 (3.43) | 43 | 14.40 (3.15) | 40 | 10.67 (3.72) | 6 | 11.57 (4.31) | 7 |
| RAN (seconds) |  |  |  |  |  |  |  |  |
| 96 | 60.34 (15.73) | 58 | 59.58 (15.87) | 42 | 60.23 (25.20) | 9 | 73.40 (14.11) | 8 |
| 97 | 50.16 (12.96) | 50 | 49.40 (11.94) | 42 | 65.57 (10.42) | 7 | 50.43 (10.66) | 7 |
| 98 | 42.49 (8.36) | 43 | 39.99 (8.22) | 41 | 57.29 (15.90) | 6 | 46.43 (8.48) 1 | 7 |
| Buttercup Speech Rate (seconds) |  |  |  |  |  |  |  |  |
| 96 | ? (-) | 0 | 7.91 (1.31) | 43 | 7.30 (.95) | 9 | 8.08 (1.58) | 8 |
| 97 | ? (-) | 0 | 7.08 (1.39) | 41 | 7.58 (1.10) | 7 | 7.18 (.66) | 7 5 |
| 98 | ? (-) | 0 | 6.58 (1.04) | 33 | 6.59 (.67) | 6 | 6.07 (.72) | 5 |
| Phoneme \& Syllable Identification / 16 |  |  |  |  |  |  |  |  |
| 96 | 9.69 (4.04) | 58 | 9.30 (3.73) | 43 | 5.11 (5.04) | 9 | 6.38 (3.42) | 8 |
| 97 | 13.40 (1.88) | 50 | 13.19 (1.55) | 42 | 11.00 (3.11) | 7 | 12.86 (.90) | 7 |
| 98 | 14.79 (1.05) | 42 | 14.77 (1.23) | 40 | 14.33 (1.51) | 6 | 14.43 (1.27) |  |
| GFW Sound Mimicry Subtest / 55 |  |  |  |  |  |  |  |  |
| 96 | 45.07 (8.01) | 58 | 43.88 (6.54) | 43 | 5.11 (5.04) | 9 | 6.38 (3.42) | 8 |
| 97 | 50.22 (3.98) | 50 | 50.17 (3.63) | 42 | 11.00 (3.11) | 7 | 12.86 (.90) | 7 |
| 98 | 51.24 (2.69) | 42 | 50.40 (2.99) | 40 | 14.33 (1.51) | 6 | 14.43 (1.27) | 7 |
| GFW Sound Mimicry Subtest (\%ile score) |  |  |  |  |  |  |  |  |
| 96 | 63.21 (24.40) | 58 | 61.49 (23.14) | 43 | 28.78 (29.50 | 9 | 48.38 (32.61) | 8 |
| 97 | 76.76 (21.20) | 50 | 76.90(19.59) | 42 | 62.43 (32.45) | 7 | 67.14 (32.43) | 7 |
| 98 | 74.79 (20.41) | 42 | 65.90 (23.50) | 40 | 48.67 (22.43) | 6 | 53.57 (23.64) | 7 |
| Pseudoword Repetition / 32 |  |  |  |  |  |  |  |  |
| 99 | 29.45 (2.43) | 31 | 28.97 (2.86) | 29 | 28.80 (2.95) | 5 | 24.50 (3.32) | 4 |
| WoodCock Word Attack |  |  |  |  |  |  |  |  |
| 99 | 26.32 (8.70) | 31 | 26.93 (8.92) | 29 | 16.40 (3.21) | 5 | 14.25 (11.30) | 4 |
| Woodcock Word Attack (standard) |  |  |  |  |  |  |  |  |
| 99 | 97.48 (13.70) | 31 | 98.83 (14.09) | 29 | 82.40 (4.93) | 5 | 78.50 (17.25) | 4 |
| Woodcock Word Attack (\%ile ) |  |  |  |  |  |  |  |  |
| 99 | 45.23 (29.51) | 31 | 48.59 (29.55) | 29 | 13.00 (5.66) | 5 | 17.00 (29.36) | 4 |
| Pseudoword Reading /15 |  |  |  |  |  |  |  |  |
| 98 | 7.27 (4.32) | 48 | 6.29 (4.29) | 42 | 5.00 (3.56) | 7 | 4.43 (3.87) | 7 |
| 99 | 10.70 (3.05) | 43 | 10.47 (3.30) | 40 | 8.20 (4.97) | 5 | 7.71 (3.20) | 7 |


| Measure | NA |  |  |  | RD |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 <br> M (SD) | N | ESL <br> M (SD) | N | $\begin{aligned} & \text { L1 } \\ & M(S D) \end{aligned}$ | N | $\begin{aligned} & \text { ESL } \\ & \text { M (SD) } \end{aligned}$ | N |
| Coltheart 99 | $\begin{aligned} & \text { ord Reading /30 } \\ & 25.06 \text { (5.34) } \end{aligned}$ | 31 | 27.20 (3.86) | 30 | 23.60 (2.41) | 5 | 17.00 (8.87) | 4 |
| Rhyme Production |  |  |  |  |  |  |  |  |
| 96 | 4.97 (3.75) | 58 | 3.35 (3.37) | 43 | 1.78 (2.54) | 9 | . 38 (.74) | 8 |
| 97 | 10.58 (4.51) | 50 | 10.69 (4.84) | 42 | 5.57 (4.86) | 7 | 5.29 (5.06) | 7 |
| 98 | 13.83 (4.02) | 42 | 14.48 (3.58) | 40 | 11.00 (2.45) | 6 | 9.71 (2.69) | 7 |
| Rhyme Detection /10 |  |  |  |  |  |  |  |  |
| 96 | 6.66 (3.07) | 58 | 4.65 (3.63) | 43 | 4.89 (4.31) | 9 | 2.50 (2.51) | 8 |
| 97 | 9.00 (1.58) | 50 | 7.93 (2.19) | 42 | 5.71 (3.86) | 7 | 4.29 (2.81) | 7 |
| 98 | 9.64 (1.46) | 42 | 9.88 (.40) | 40 | 9.00 (2.00) | 6 | 8.57 (.98) | 7 |
| $\begin{aligned} & \text { Orthograph } \\ & \hline 9 \end{aligned}$ | $\begin{aligned} & \text { hoice / } 17 \\ & 13.60(2.50) \end{aligned}$ | 30 | 14.32 (2.18) | 28 | 12.75 (3.30) | 4 | 12.75 (3.30) | 4 |
| Realword Spelling $/ 20$ ( ${ }^{\text {a }}$ |  |  |  |  |  |  |  |  |
| 97 98 | $\begin{aligned} & 9.00(5.28) \\ & 1581(337) \end{aligned}$ | 48 42 | $8.10(5.52)$ $16.28(4.27)$ | 42 40 | 2.86 (2.48) 10.50 (5.13) | 6 | $\begin{aligned} & 3.86 \text { (3.13) } \\ & 13.14 \text { (5.27) } \end{aligned}$ | 7 |
| Pseudoword Spelling $/ 10$ |  |  |  |  |  |  |  |  |
| ${ }_{97}$ | 3.44 (2.06) | 48 | 3.31 (2.51) | 42 | 1.86 (1.95) | 7 | 2.43 (1.27) | 7 |
| 98 | 5.26 (2.37) | 38 | 4.83 (2.77) | 35 | 3.80 (1.79) | 5 | 3.17 (1.60) | 6 |
| Word Spelling $/ 21$ (99 g384)99$11.00(3.47)$ |  | 30 | 11.18 (3.98) | 28 | 6.00 (5.89) | 4 | 5.50 (4.20) | 4 |
| Nonword Spelling / 15 ('99 g384) ${ }^{\text {a }}$ ( ${ }^{\text {a }}$ |  |  |  |  |  |  |  |  |
| Wrat-3 Spelling / 55 ('99 9384)99 |  | 30 | 28.93 (3.40) | 28 | 24.50 (4.04) | 4 | 23.25 (4.72) | 4 |
| Wrat-3 Spelling ('99 G3\&4) \%ilè score |  |  |  |  |  |  |  |  |
| 99 | 60.38 (23.86) | 30 | 65.04 (21.88) | 28 | 33.00 (25.65) | 4 | 27.25 (34.76) | 4 |
| Wrat-3 Spelling ('99 g3\&4) Standard Score |  |  |  |  |  |  |  |  |
| 99 | 105.1 (11.07) | 30 | 107.50 (10.94) | 28 | 92.50 (10.97) | 4 | 88.00 (16.55) | 4 |
| Letter Identification / 26 |  |  |  |  |  |  |  |  |
| 96 | 21.31 (4.55) | 58 | 21.23 (4.22) | 43 | 11.11 (7.03) | 9 | 6.38 (2.67) | 8 |
| 97 | 24.94 (1.58) | 50 | 25.29 (1.04) | 42 | 21.29 (6.65) | 7 | 25.29 (.49) | 7 |
| 98 | 25.86 (.35) | 42 | 25.85 (.48) | 40 | 25.83 (.41) | 6 | 25.71 (.49) | 7 |
| WORKING MEMORY |  |  |  |  |  |  |  |  |
| Stanford Sentence Repetition / 42 |  |  |  |  |  |  |  |  |
| 96 | 16.95 (4.17) | 58 | 12.93 (3.91) | 43 | 11.89 (4.43) | 9 | 12.38 (2.83) | 8 |
| Working Memory: Words / 12 |  |  |  |  |  |  |  |  |
| 97 | 2.33 (1.42) | 48 | 1.79 (126) | 42 | 2.29 (2.21) | 7 | 1.29 (1.25) | 7 |
| 98 | 3.83 (1.19) | 42 | 3.65 (1.37) | 40 | 3.00 (2.00) | 6 | 3.14 (1.57) | 7 |
| 99 | 4.61 (1.58) | 31 | 4.31 (1.47) | 29 | 5.20 (1.64) | 5 | 5.00 (1.83) | 4 |
| SYNTAX |  |  |  |  |  |  |  |  |
| Syntactic Error Judgement (\% score) |  |  |  |  |  |  |  |  |
| 96 | 51.33 (19.06) | 58 | 42.19 (16.79) | 43 | 39.05 (22.13) | 9 | 38.57 (18.33) | 8 |
| 97 | 70.90 (14.59) | 50 | 61.43 (11.96) | 42 | 62.86 (11.85) | 7 | 57.14 (14.96) | 7 |
| 98 | 80.71 (11.56) | 42 | 77.63 (9.20) | 40 | 72.50 (18.10) | 6 | 67.14 (14.68) | 7 |
| 99 | 77.33 (10.61) | 31 | 75.05 (8.25) | 30 | 72.00 (7.11) | 5 | 62.86 (12.99) | 4 |


|  | NA |  |  |  | RD |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 |  | ESL |  | L1 |  | ESL |  |
|  | M (SD) | N | M (SD) | N | M (SD) | N | M (SD) | N |
| READING |  |  |  |  |  |  |  |  |
| Wrat Reading Subtest (Raw Score) /57 0 |  |  |  |  |  |  |  |  |
| 96 | 14.98 (3.35) | 58 | 14.73 (2.36) | 44 | 5.33 (3.00) | 9 | 6.50 (2.62) | 8 |
| 97 | 24.02 (5.22) | 50 | 22.69 (4.94) | 42 | 16.57 (6.65) | 7 | 19.14 (2.54) | 7 |
| 98 | 28.74 (3.86) | 43 | 28.24 (4.69) | 41 | 23.00 (3.74) | 6 | 24.86 (2.73) | 7 |
| 99 | 32.03 (3.07) | 31 | 32.37 (4.31) | 30 | 26.80 (2.05) | 5 | 25.75 (2.87) | 4 |
| Wrat Reading Subtest (\%ile score) |  |  |  |  |  |  |  |  |
| 96 | 66.41 (17.40) | 58 | 65.64 (16.22) | 44 | 10.78 (6.55) | 9 | 12.62 (7.65) | 8 |
| 97 | 73.58 (22.85) | 50 | 70.74 (21.38) | 42 | 35.71 (29.80) | 7 | 44.86 (26.69) | 7 |
| 98 | 59.88 (22.24) | 43 | 55.80 (24.87) | 41 | 23.50 (16.86) | 6 | 31.43 (21.68) | 7 |
| 99 | 57.03 (19.31 | 31 | 57.77 (24.16) | 30 | 23.00 (9.03) | 5 | 18.25 (19.19) | 4 |
| Wrat Reading Subtest (Standard score) |  |  |  |  |  |  |  |  |
| 96 | 105.5 (9.09) | 28 | 106.8 (10.21) | 10 | 91.75 (6.40) | 4 | ? (-) | 0 |
| 97 | 113.26 (14.11) | 50 | 111.24 (13.08) | 42 | 91.14 (16.42) | 7 | 97.29 (11.29) | 7 |
| 98 | 104.51 (10.03) | 43 | 102.83 (8.16) | 41 | 86.33 (11.57) | 6 | 91.00 (10.60) | 7 |
| 99 | 103.03 (8.16) | 31 | 103.63 (11.45) | 30 | 88.60 (4.34) | 5. | 84.50 (9.71) | 4 |
| Bridge Words / 69 |  |  |  |  |  |  |  |  |
| 97 | 48.13 (18.68) | 48 | 41.74 (21.19) | 42 | 22.86 (18.19) | 7 | 24.67 (14.92) | 6 |
| 98 | 65.77 (6.80) | 43 | 64.44 (9.44) | 41 | 48.00 (15.43) | 6 | 58.43 (7.89) | 7 |
| Linda Experimental Words / 40 |  |  |  |  |  |  |  |  |
| 97 | 27.64 (10.57) | 47 | 25.62 (12.54) | 42 | 13.57 (11.00) | 7 | 17.43 (14.59) | 7 |
| 98 | 36.55 (4.54) | 42 | 35.90 (6.04) | 40 | 24.67 (10.25) | 6 | 31.29 (8.74) | 7 |
| British Ability Scales / 90 |  |  |  |  |  |  |  |  |
| 96 | 5.57 (8.82) | 28 | 6.30 (11.20) | 10 | . 00 (.00) | 3 | ? (-) | 0 |
| 97 | 33.78 (20.20) | 50 | 28.79 (20.10) | 42 | 12.86 (9.56) | 7 | 12.71 (9.12) | 7 |
| 98 | 59.12 (15.82) | 42 | 57.95 (18.90) | 40 | 30.00 (13.36) | 6 | 37.57 (13.00) | 7 |
| Woodcock Word Identification (Raw score) / 106 |  |  |  |  |  |  |  |  |
| 99 | 61.17 (13.36) | 31 | 63.00 (8.46) | 29 | 45.40 (6.15) | 5 | 43.75 (9.14) | 4 |
| Woodcock Word Identification (\%ile score) |  |  |  |  |  |  |  |  |
| 99 | 54.84 (26.02) | 31 | 57.17 (24.79) | 29 | 13.60 (7.83) | 5 | 12.25 (17.25) | 4 |
| Woodcock Word Identification (Standard score) |  |  |  |  |  |  |  |  |
| 99 | 98.94 (21.45) | 31 | 103.21 (10.86) | 29 | 82.40 (5.94) | 5 | 78.25 (12.12) | 4 |
| Coltheart Words / 48 |  |  |  |  |  |  |  |  |
| 99 | 33.68 (8.13) | 31 | 33.10 (8.37) | 29 | 25.00 (4.69) | 5 | 21.25 (14.97) | 4 |
| Stanford Reading Comprehension (Raw score)/48 |  |  |  |  |  |  |  |  |
| 99 | 37.93 (9.01) | 30 | 37.18 (7.63) | 28 | 24.75 (18.95) | 4 | 23.50 (8.58) | 4 |
| Stanford Reading Comprehension (\%ile score) |  |  |  |  |  |  |  |  |
| 99 | 53.70 (28.16) | 30 | 46.46 (20.73) | 28 | 27.75 (27.78) | 4 | 15.25 (13.99) | 4 |
| One 99 | ading WRAT-TA 30.68 (3.64) | $\begin{array}{r} 142 \\ 31 \end{array}$ | 30.59 (4.13) | 29 | 26.60 (1.14) | 5 | 24.25 (4.99) | 4 |
| WRAT-3 Math (Raw score) / 55 |  |  |  |  |  |  |  |  |
| 99 | 26.50 (2.40) | 30 | 29.04 (1.86) | 28 | 26.50 (2.08) | 4 | 26.50 (5.20) | 4 |
| WRAT-3 Math (Standard Score) |  |  |  |  |  |  |  |  |
| 99 | 101.10 (9.29) | 30 | 111.04 (7.15) | 28 | 100.75 (5.38) | 4 | 99.25 (22.44) | 4 |
| WRAT-3 Math (\%ile score) |  |  |  |  |  |  |  |  |
| 99 | 51.90 (21.16) | 30 | 74.79 (13.37) | 28 | 51.74 (14.06) | 4 | 42.00 (38.51) | 4 |

Table 3c Mean Phonological Processing and Reading Scores of Grade 1 Students by Year as a Function of Language (L1, ESL) and Reading Group (RD, NA)

| Measure | NA |  |  |  | RD |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 |  | ESL |  | L. 1 |  | ESL |  |
|  | M (SD) | N | M (SD) | N | M (SD) | $N$ | M (SD) | N |
| PHONOLOGICAL PROCESSING SKILLS |  |  |  |  |  |  |  |  |
| Phoneme Recognition (\% score) |  |  |  |  |  |  |  |  |
| 96 | 96.79 (11.67) | 53 | 96.12 (11.53) | 47 | 97.50 (5.00) | 4 | 98.50 (2.24) | 5 |
| 97 | 100 (.00) | 23 | 99.48 (2.08) | 16 | 100.00 (.00) | 2 | 100.00 (.00) | 2 |
| 98 | 100 (.00) | 36 | 100.00 (.00) | 37 | 100.00 (.00) | 4 | 97.92 (4.17) | 4 |
| Phoneme Recognition \& Location (\% score) |  |  |  |  |  |  |  |  |
| 96 | 93.85 (14.35) | 53 | 93.26 (15.38) | 47 | 94.44 (8.82) | 4 | 90.37 (9.57) | 5 |
| 97 | 96.37 (7.23) | 23 | 98.61 (4.30) | 16 | 97.22 (3.93) | 2 | 100.00 (.00) | 2 |
| 98 | 99.54 (1.56) | 36 | 99.70 (1.27) | 37 | 100.00 (.00) | 4 | 100.00 (.00) | 4 |
| Phoneme Deletion / 16 |  |  |  |  |  |  |  |  |
| 96 | 12.58 (4.79) | 53 | 12.04 (4.97) | 47 | 11.25 (3.59) | 4 | 7.80 (5.54) | 5 |
| 97 | 15.15 (1.76) | 47 | 15.21 (1.34) | 39 | 15.75 (.50) | 4 | 12.33 (3.51) | 3 |
| 98 | 15.67 (.99) | 36 | 15.86 (.35) | 37 | 15.50 (.58) | 4 | 15.75 (.50) | 4 |
| Phoneme Deletion \& Substitution / 18 |  |  |  |  |  |  |  |  |
| 96 | 10.87 (5.42) | 53 | 9.40 (4.88) | 47 | 6.75 (3.86) | 4 | 6.80 (4.21) | 5 |
| 97 | 13.32 (4.12) | 34 | 12.73 (3.74) | 26 | 10.00 (4.36) | 3 | 10.00 (4.24) | 2 |
| 98 | 15.75 (2.94) | 36 | 16.05 (1.85) | 37 | 13.50 (1.00) | 4 | 14.75 (4.57) | 4 |
| RAN (seconds) |  |  |  |  |  |  |  |  |
| 96 | 50.43 (12.18) | 53 | 46.87 (9.69) | 47 | 58.00 (3.16) | 4 | 44.60 (7.83 | 5 |
| 97 | 42.98 (8.91) | 47 | 40.00 (8.39) | 39 | 48.25 (3.95) | 4 | 43.67 (13.58) | 3 |
| 98 | 38.29 (8.03) | 36 | 36.23 (7.42) | 37 | 40.98 (5.49) | 4 | 30.50 (6.24) | 4 |
| Buttercup Speech Rate (seconds) |  |  |  |  |  |  |  |  |
| 96 | 6.98 (1.53) | 52 | 7.65 (2.01) | 47 | 6.49 (.37) | 4 | 7.18 (1.62) | 5 |
| 97 | 6.41 (1.04) | 47 | 6.89 (1.12) | 39 | 7.35 (1.35) | 4 | 6.55 (.69) | 3 |
| 98 | 5.80 (.90) | 36 | 5.77 (.94) | 37 | 5.36 (1.01) | 4 | 6.33 (.47) | 4 |
| Phoneme \& Syllable Identification / 16 |  |  |  |  |  |  |  |  |
| 96 | 12.64 (3.20) | 53 | 12.23 (2.88) | 47 | 11.75 (2.63) | 4 | 11.20 (1.64) | 5 |
| 97 | 13.32 (2.29) | 47 | 13.51(2.29) | 39 | 12.50 (2.08) | 4 | 14.33 (1.53) | 3 4 |
| 98 | 14.36 (1.97) | 36 | 14.49 (2.08) | 37 | 13.75 (1.71) | 4 | 14.75 (1.50) | 4 |
| GFW Sound Mimicry Subtest / 55 |  |  |  |  |  |  |  |  |
| 96 | 50.11 (4.40) | 53 | 47.64 (8.84) | 47 | 44.25 (11.30) | 4 | 45.60 (4.45) | 5 |
| 97 | 51.91 (2.87) | 47 | 50.49 (2.86) | 39 | 51.75 (.50) | 4 | 49.33 (4.16) | 3 |
| 98 | 52.08 (2.32) | 36 | 51.86 (2.59) | 37 | 51.25 (2.87) | 4 | 50.50 (3.00) | 4 |
| GFW Sound Mimicry Subtest (\%ile score) |  |  |  |  |  |  |  |  |
| 96 | 76.26 (23.05) | 53 | 69.28 (28.88) | 47 | 51.75 (41.87) | 4 | 45.20 (28.07) | 5. |
| 97 | 79.37 (20.11) | 46 | 71.15 (20.38) | 39 | 77.25 (5.50) | 4 | 58.67 (32.88) | 3 |
| 98 | 75.67 (21.20) | 36 | 74.97 (21.47) | 37 | 67.25 (24.23) | 4 | 61.50 (22.46) | 4 |
| Pseudoword Repetition / 32 |  |  |  |  |  |  |  |  |
| 99 | 30.10 (1.81) | 21 | 29.58 (2.39) | 19 | 30.33 (1.53) | 3 | 28.00 (2.83 | 2 |
| Woodcock Word Attack / 45 |  |  |  |  |  |  |  |  |
| 99 | 31.67 (7.95) | 21 | 33.89 (5.51) | 19 | 20.00 (10.82) | 3 | 36.00 (2.83) | 2 |


| Measure | NA |  |  |  | RD |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 |  | ESL |  |  |  |  |  |
|  | $M(S D)$ | N | $M$ (SD) | $N$ | M (SD) | N | M (SD) | N |
| Woodcock Word Attack (standard) |  |  |  |  |  |  |  |  |
| 99 | 103.33 (14.29) | 21 | 107.1 .1 (11.12) | 19 | 83.33 (17.47) | 3 | 110.00 (5.66) | 2 |
| Woodcock Word Attack (\%ile ) |  |  |  |  |  |  |  |  |
| 99 | 57.90 (28.34) | 21 | 65.05 (23.26) | 19 | 22.00 (21.52) | 3 | 74.50 (12.02) | 2 |
| Pseudoword Reading / 15 |  |  |  |  |  |  |  |  |
| 96 | 8.02 (4.29) | 53 | 7.17 (4.02) | 47 | 3.25 (3.59) | 4 | 2.80 (3.11) | 5 3 |
| 97 | 10.51 (3.37) | 47 | 9.59 (3.45) | 39 | 6.00 (3.37) | 4 | 8.00 (4.36) | 3 4 |
| 98 | 12.14 (2.84) | 36 | 12.00 (2.92) | 37 | 9.50 (1.29) | 4 | 11.25 (3.30) | 4 |
| Coltheart 99 | Coltheart Nonword Reading / 30 |  | 28.79 (1.18) | 19 | 24.67 (4.04) | 3 | 28.50 (2.12) | 2 |
| Rhyme Production |  |  |  |  |  |  |  |  |
| 96 | 9.06 (4.81) | 53 | 6.60 (4.03) | 47 | 5.50 (3.32) | 4 | 5.60 (5.32) | 5 |
| 97 | 11.28 (5.63) | 47 | 11.15 (5.25) | 39 | 8.00 (2.16) | 4 | 11.33 (11.85) | 3 |
| 98 | 16.25 (4.93) | 36 | 15.35 (5.42) | 37 | 14.25 (1.50) | 4 | 20.00 (3.37) | 4 |
| Rhyme Detection /10 |  |  |  |  |  |  |  |  |
| 96 | 8.53 (2.64) | 53 | 7.51 (2.85) | 47 | 9.00 (.82) | 4 | 6.00 (4.00) | 5 |
| 97 | 9.55 (.83) | 47 | 9.44 (1.23) | 39 | 9.50 (.58) | 4 | 8.00 (3.46) | 3 |
| 98 | 9.92 (.37) | 36 | 9.97 (.16) | 37 | 9.75 (.50) | 4 | 9.75 (.50) | 4 |
| Orthographic Choice / 17 (14.51) ${ }^{\text {a }}$ |  |  |  |  |  |  |  |  |
| Realword Spelling / 20 |  |  |  |  |  |  |  |  |
| 96 | $12.47(4.07)$ | 15 | 11.00 (5.77) | 4 39 | 3.00 (-) | 1 4 | $\begin{aligned} & ?(-) \\ & 12.00(.00) \end{aligned}$ | 3 |
| 97 | 16.60 (3.70) | 47 | 16.62 (3.12) | 39 | 11.50 (1.00) | 4 | $12.00(.00)$ | 3 |
| 98 | 19.00 (1.59) | 36 | 18.70 (2.22) | 37 | 15.50 (3.70) | 4 | 18.25 (.96) | 4 |
| Pseudoword Spelling / 10 ( ${ }^{\text {a }}$ |  |  |  |  |  |  |  |  |
| 96 | 4.40 (2.10) | 15 | 4.25 (2.06) | 4 | . 00 (-) | 1 | ? (-) | 0 |
|  | 4.85 (2.44) | 47 | 3.92 (2.01) | 39 | 2.75 (1.71) | 4 | 2.67 (2.08) | 3 |
| 98 | 5.61 (1.42) | 18 | 5.57 (2.21) | 14 | 3.50 (.71) | 2 | 9.00 (-) | 1 |
| Word Spelling / 21 (99 g384) |  |  |  |  |  |  |  |  |
| Nonword Spelling /15 ('99 g3\&4) |  |  |  |  |  |  |  | 2 |
| Wrat-3 Spelling ('99 g3\&4) Raw score / 55 |  |  |  |  |  |  |  |  |
| Wrat-3 Spelling ('99 G3\&4) \%ile score |  |  |  |  |  |  |  |  |
| 99 | 66.62 (30.57) | 21 | 61.68 (28.18) | 19 | 27.00 (17.32) | 3 | 46.00 (12.73) | 2 |
| Wrat-3 Spelling ('99 g3\&4) Standard Score |  |  |  |  |  |  |  |  |
| 99 | 109.67 (15.97) | 21 | 107.37 (15.93) | 19 | 89.33 (9.81) | 3 | 98.50 (4.95) | 2 |
| Letter Identification / 26 |  |  |  |  |  |  |  |  |
| 96 | 25.36 (.76) | 53 | 25.47 (.75) | 47 | 24.00 (1.41) | 4 | 25.40 (.55) | 5 |
| 97 | 25.83 (.43) | 47 | 25.54 (1.93) | 39 | 25.75 (.50) | 4 | 25.67 (.58) | 3 |
| 98 | 25.83 (.38) | 36 | 25.54 (1.99) | 37 | 26.00 (.00) | 4 | 26.00 (.00) | 4 |
| WORKING MEMORY |  |  |  |  |  |  |  |  |
| Working Memory: Words / 12 |  |  |  |  |  |  |  |  |
| 96 | 2.04 (1.54) | 53 | 1.78 (1.33) | 46 | 1.50 (1.91) | 4 | 2.20 (2.17) | 5 |
| 97 | 3.53 (1.65) | 47 | 3.26 (1.46) | 39 | 2.00 (.82) | 4 | 4.33 (.58) | 3 |
| 98 | 5.58 (1.66) | 36 | 4.76 (1.71) | 37 | 4.75 (.96) | 4 | 5.75 (2.99) | 4 |
| 99 | 6.81 (5.72) | 21 | 5.68 (1.89) | 19 | 5.33 (1.53) | 3 | 5.50 (2.12) | 2 |


| Measure | NA |  |  |  | RD |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | ESL |  |  |  |  |  |
|  | $M(S D)$ | $N$ | M (SD) | N | M (SD) | N | M (SD) | N |
| SYNTAX |  |  |  |  |  |  |  |  |
| Syntactic Error Judgement (\% score) |  |  |  |  |  |  |  |  |
| 96 | 58.06 (16.39) | 53 | 54.16 (11.73) | 47 | 53.57 (11.52) | 4 | 62.86 (9.04) | 5 |
| 97 | 75.64 (12.32) | 47 | 71.41 (12.90) | 39 | 70.00 (7.07) | 4 | 78.33 (10.41) | 3 |
| 98 | 84.31 (9.11) | 36 | 85.13 (8.54) | 37 | 75.00 (11.55) | 4 | 88.75 (8.54) | 4 |
| 99 | 77.42 (7.11) | 21 | 76.99 (8.60) | 19 | 74.29 (2.86) | 3 | 82.86 (8.08) | 2 |
| Oral Cloze / 12 |  |  |  |  |  |  |  |  |
| 99 | 6.19 (2.84) | 53 | 3.89 (2.78) | 47 | 4.25 (1.89) | 4 | 2.80 (3.56) | 5 |
| $\begin{array}{cc}\text { Syntactic Error Correction / } 25 \\ 99 & ?\end{array}$ |  | ? | ? | ? | ? | $?$ | ? | ? |
| READING |  |  |  |  |  |  |  |  |
| Wrat Reading Subtest (Raw score) / 57 |  |  |  |  |  |  |  |  |
| 96 | 25.43 (4.76) | 53 | 24.04 (3.86) | 47 | 16.25 (3.20) | 4 | 18.60 (.55) | 5 |
| 97 | 29.91 (4.35) | 47 | 28.87 (3.58) | 39 | 25.50 (1.73) | 4 | 25.33 (3.21) | 3 |
| 98 | 34.68 (5.68) | 37 | 33.11 (4.64) | 37 | 27.50 (1.29) | 4 | 30.75 (4.35 | 4 |
| 99 | 37.48 (5.23) | 21 | 35.37 (3.22) | 19 | 31.33 (5.69) | 3 | 38.00 (5.66) | 2 |
| Wrat Reading Subtest (\%ile score) |  |  |  |  |  |  |  |  |
| 96 | 75.62 (21.15) | 53 | 72.91 (21.61) | 47 | 16.75 (9.60) | 4 | 20.00 (4.24) | 5 |
| 97 | 66.15 (24.66) | 47 | 61.47 (21.71) | 39 | 28.75 (7.59) | 4 | 26.00 (18.36) | 3 |
| 98 | 71.00 (21.96) | 37 | 66.03 (23.18) | 37 | 26.50 (8.39) | 4 | 42.25 (28.16) | 4 |
| 99 | 71.29 (26.03) | 21 | 61.53 (21.36) | 19 | 36.67 (29.37) | 3 | 69.50 (31.82) | 2 |
| Wrat Reading Subtest (Standard score) |  |  |  |  |  |  |  |  |
| 96 | 115.34 (15.19) | 53 | 112.23 (12.61) | 47 | 84.75 (6.18) | 4 | 87.40 (2.30) | 5 |
| 97 | 108.45 (13.48) | 47 | 105.36 (9.73) | 39 | 91.50 (3.32) | 4 | 89.33 (8.50) | 3 |
| 98 | 111.65 (13.87) | 37 | 108.43 (13.04) | 37 | 90.25 (4.19) | 4 | 97.00 (11.80) | 4 |
| 99 | 111.48 (14.17) | 21 | 105.21 (9.37) | 19 | 92.33 (15.53) | 3 | 110.00 (15.56) | 2 |
| Bridge Words / 69 |  |  |  |  |  |  |  |  |
| 96 | 54.23 (15.31) | 53 | 50.40 (15.01) | 47 | 28.75 (16.24) | 4 | 29.00 (5.24) | 5 |
| 97 | 66.26 (5.11) | 47 | 66.15 (5.14) | 39 | 56.50 (6.81) | 4 | 57.67 (7.09) | 3 |
| 98 | 68.86 (.49) | 36 | 68.86 (.67) | 37 | 64.00 (8.68) | 4 | 68.75 (.50) | 4 |
| Linda Experimental Words / 40 |  |  |  |  |  |  |  |  |
| 96 | 29.02 (10.86) | 53 | 26.77 (9.44) | 47 | 12.25 (9.07) | 4 | 11.80 (6.72) | 5 |
| 97 | 35.81 (6.30) | 47 | 34.72 (7.29) | 39 | 30.50 (1.29) | 4 | 30.00 (6.24) | 3 |
| 98 | 39.14 (1.36) | 36 | 39.03 (1.86) | 37 | 35.25 (5.68) | 4 | 37.50 (2.65) | 4 |
| Ozone Vocabulary |  |  |  |  |  |  |  |  |
| 96 | 55.30 (17.35) | 53. | 53.13 (16.78) | 47 | 28.25 (6.29) | 4 | 30.60 (7.09) | 5 |
| British Ability Scales / 90 |  |  |  |  |  |  |  |  |
| 96 | 41.30 (19.19) | 53 | 34.68 (16.74) | 47 | 13.75 (2.63) | 4 | 15.40 (3.21) | 5 |
| 97 | 65.26 (15.62) | 47 | 59.72 (14.33) | 39 | 38.25 (8.88) | 4 | 37.33 (4.93) | 3 |
| 98 | 77.11 (8.18) | 36 | 74.68 (9.53) | 37 | 50.00 (15.94) | 4 | 64.50 (11.82) | 4 |
| Woodcock Word Identification (Raw score) / 106 |  |  |  |  |  |  |  |  |
| 99 | 74.81 (12.14) | 21 | 74.39 (12.55) | 18 | 64.00 (15.39) | 3 | 77.00 (22.63) | 2 |
| Woodcock Word Identification (\%ile score) |  |  |  |  |  |  |  |  |
| 99 | 62.00 (30.22) | 21 | 61.17 (29.24) | 18 | 37.33 (32.53) | 3 | 57.00 (55.15) | 2 |
| Woodcock Word Identification (Standard score) |  |  |  |  |  |  |  |  |
| 99 | 106.48 (15.39) | 21 | 106.83 (15.24) | 18 | 92.33 (17.79) | 3 | 106.00 (28.28) | 2 |
| Coltheart Words / 48 |  |  |  |  |  |  |  |  |
| 99 | 40.29 (4.86) | 21 | 39.05 (4.12) | 19 | 30.33 (14.15) | 3 | 42.00 (4.24) | 2 |



Table 41996 Junior Kindergarten Students' Mean Phonological Processing and Reading Scores by Year as a Function of Language Group

| Measure | L1 |  | ESL |  |
| :---: | :---: | :---: | :---: | :---: |
|  | M (SD) | N | M (SD) | N |
| PHONOLOGICAL PROCESSING SKILLS |  |  |  |  |
| Phoneme Recognition (\% score) |  |  |  |  |
| 98 | 99.00 (4.20) | 42 | 96.62 (7.72) | 37 |
| 99 | 100.00 (.00) | 17 | 100.00 (.00) | 17 |
| Phoneme Recognition \& Location |  | (\% score) |  |  |
| 98 | 96.56 (10.11) | 47 | 94.59 (10.35) | 37 |
| 99 | 99.35 (1.85) | 17 | 98.69 (3.12) | 17 |
| Phoneme Deletion $/ 16$ |  |  |  |  |
| 96 | 1.93 (3.72) | 69 | 1.70 (3.22) | 50 |
| 97 | 6.51 (4.91) | 55 | 5.63 (5.21) | 43 |
| 98 | 13.67 (4.01) | 42 | 11.19 (6.50) | 37 |
| Phoneme Deletion \& Substitution $/ 18$ |  |  |  |  |
| 98 | 10.26 (4.13) | 42 | 8.22 (5.41) | 37 |
| 99 | 12.65 (3.57) | 17 | 10.94 (3.51) |  |
| RAN (seconds) |  |  |  |  |
| 96 | 73.92 (22.23) | 68 | 76.61 (27.28) | 49 |
| 97 | 63.97 (18.55) | 55 | 67.88 (18.88) | 43 |
| 98 | 49.48 (22.36) | 42 | 50.16 (14.99) | 37 |
| 99 | 43.05 (9.48) | 17 | 41.76 (7.38) | 17 |
| Buttercup Speech Rate (seconds) |  |  |  |  |
| 96 | 8.96 (1.97) | 68 | 9.13 (2.38) | 50 |
| 97 | 8.39 (6.81) | 54 | 8.03 (1.58) | 43 |
| 98 | 7.09 (1.49) | 32 | 7.33 (1.28) | 32 |
| Phoneme \& Syllable Identification $/ 16$ |  |  |  |  |
| 96 | 5.68 (4.59) | 69 | 5.30 (4.95) | 50 |
| 97 | 10.20 (3.61) | 55 | 9.07 (4.43) | 43 |
| 98 | 13.93 (2.31) | 42 | 13.59 (2.70) | 37 |
| GFW Sound Mimicry Subtest/55 |  |  |  |  |
| 96 | 38.45 (10.21) | 69 | 36.88 (11.55) | 50 |
| 97 | 47.24 (6.18) | 55 | 43.81 (9.20) | 43 |
| 98 | 48.60 (5.14) | 42 | 47.70 (4.71) | 37 |
| GFW Sound Mimicry Subtest (\%ile score) |  |  |  |  |
| 96 | 58.25 (27.54) | 69 | 54.80 (30.16) | 50 |
| 97 | 73.20 (22.81) | 55 | 62.95 (26.58) | 43 |
| 98 | 67.02 (25.72) | 42 | 62.95 (22.99) | 37 |
| Pseudoword Repetition / 32 |  |  |  |  |
| 99 | 26.26 (5.97) | 19 | 25.48 (4.84) | 19 |
| Pseudoword Reading / 15 |  |  |  |  |
| 98 | 6.81 (3.97) | 42 | 5.81 (3.78) | 17 |
| 99 | 9.12 (2.85) | 17 | 7.76 (3.33) | 17 |


| Measure | NA |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | L1 |  | ESL |  |
|  | M (SD) | N | M (SD) | $N$ |
| Rhyme Production |  |  |  |  |
| 96 | 2.61 (3.08) | 69 | 2.32 (3.50) | 50 |
| 97 | 5.78 (4.15) | 55 | 7.02 (5.16) | 43 |
| 98 | 11.19 (7.21) | 42 | 11.05 (4.96) | 37 |
| Rhyme Detection / 10 |  |  |  |  |
| 96 | 4.57 (3.13) | 69 | 3.52 (2.95) | 50 |
| 97 | 6.47 (2.61) | 55 | 5.63 (2.92) | 43 |
| 98 | 9.33 (1.30) | 42 | 8.62 (1.77) | 37 |
| Realword Spelling $/ 20$ |  |  |  |  |
| 98 | 8.81 (5.41) | 42 | 8.95 (5.44) | 37 |
| 99 | 15.06 (4.08) | 17 | 14.59 (3.47) | 17 |
| Pseudoword Spelling /10 |  |  |  |  |
| 98 | 3.08 (2.36) | 37 | 2.66 (2.27) | 29 |
| 99 | 4.18 (2.13) | 17. | 3.24 (1.71) | 17 |
| Letter Identification 126 |  |  |  |  |
| 96 | 11.94 (7.77) | 69 | 11.20 (8.94) | 50 |
| 97 | 19.96 (6.74) | 55 | 20.45 (6.24) | 42 |
| 98 | 25.36 (.88) | 42 | 25.30 (1.00) | 37 |
| WORKING MEMORY |  |  |  |  |
| Stanford Sentence Repetition / 42 |  |  |  |  |
| 96 | 13.83 (4.04) | 69 | 10.48 (3.90) | 50 |
| 97 | 15.19 (3.74) | 53 | 13.12 (3.28) | 42 |
| Working Memory : Words / 12 |  |  |  |  |
| 98 | 2.95 (2.07) | 42 | 2.16 (1.46) | 37 |
| 99 | 3.74 (1.37) | 19 | 3.58 (1.74) | 19 |
| SYNTAX |  |  |  |  |
| Syntactic Error Judgement (\% score) |  |  |  |  |
| 96 | 42.61 (18.46) | 69 | 34.46 (22.51) | 49 |
| 97 | 56.73 (16.25) | 55 | 52.33 (15.21) | 43 |
| 98 | 70.48 (13.43) | 42 | 66.22 (14.36) | 37 |
| 99 | 85.00 (19.86) | 19 | 82.89 (20.16) | 19 |
| READING |  |  |  |  |
| Wrat Reading (raw score)/57 |  |  |  |  |
| 96 | 8.80 (5.25) | 70 | 8.34 (5.67) | 50 |
| 97 | 15.11 (4.52) | 55 | 14.72 (4.22) | 43 |
| 98 | 23.17 (4.61) | 42 | 22.84 (4.56) | 37 |
| 99 | 29.00 (4.37) | 19 | 27.11 (3.41) | 19 |
| Wrat Reading (\%ile score) |  |  |  |  |
| 96 | 50.53 (31.15) | 70 | 48.06 (32.02) | 50 |
| 97 | 62.74 (21.28) | 55 | 62.86 (23.50) | 43 |
| 98 | 59.43 (24.78) | 42 | 63.90 (23.79) | 37 |
| 99 | 53.58 (26.08) | 19 | 43.89 (18.93) | 19 |


| - L1 |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | NA |  | RD |  |
|  | M (SD) | N | M (SD) | N |
| Wrat Reading (standard score) |  |  |  |  |
| 96 | 100.75 (14.27) | 69 | 98.55 (15.54) | 49 |
| 97 | 104.91 (14.25) | 55 | 105.77 (11.80) | 43 |
| 98 | 105.57 (13.35) | 42 | 107.27 (12.36) | 37 |
| 99 | 101.58 (12.19) | 19 | 97.23 (8.11) | 19 |
| Bridge Words / 69 |  |  |  |  |
| 98 | 45.45 (19.60) | 42 | 45.92 (19.14) | 37 |
| 99 | 65.53 (5.69) | 17 | 63.06 (6.49) | 17 |
| Linda Experimental words / 40 |  |  |  |  |
| 98 | 24.33 (12.13) | 42 | 23.03 (12.15) | 17 |
| 99 | 36.24 (4.27) | 17 | 35.06 (3.83) | 17 |
| British Ability Scales / 90 |  |  |  |  |
| 97 | 5.05 (13.40) | 55 | 2.95 (5.68) | 43 |
| 98 | 31.71 (19.78) | 42 | 31.24 (19.73) | 37 |

Table 5 Table of Mean Phonological Processing Skills and Reading Scores by Grade, Language Group (L1 \& ESL) and Reading Category (RD \& NA)

Grades JK, SK, and G1

|  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 | ESL |  |  |  |  |  |  |  |  |
| Measure |  |  | NA | RD | NA | RD | NA | RD | NA | RD |
| PHONOLOGICAL PROCESSING SKIL |  |  |  |  |  |  |  |  |  |  |
| Phoneme Recogntion (\% score) |  |  |  |  |  |  |  |  |  |  |
| M |  | - | - | - | - | - | 97.63 | 91.57 | 96.82 | 93.01 |
| SD |  |  |  |  |  |  | 8.21 | 17.15 | 9.61 | 13.02 |
| (N) |  |  |  |  |  |  | (188) | (18) | (144) | (13) |
| Phoneme Recognition \& Location (\% score) |  |  |  |  |  |  |  |  |  |  |
| M | - | ( | ) | - | - | - | 94.78 | 81.48 | 93.40 | 83.05 |
| SD |  |  |  |  |  |  | 11.55 | 25.90 | 13.96 | 22.50 |
| (N) |  |  |  |  |  |  | (188) | (18) | (144) | (13) |
| Phoneme Deletion / 16 |  |  |  |  |  |  |  |  |  |  |
| M | 1.93 | 1.70 | 6.05 | 2.38 | 4.75 | . 62 | 12.79 | 7.61 | 12.47 | 5.77 |
| SD | 3.72 | 3.22 | 5.06 | 3.07 | 5.15 | 1.56 | 4.33 | 5.57 | 4.93 | 6.02 |
| (N) | (69) | (50) | (136) | (16) | (88) | (13) | (188) | (18) | (144) | (13) |
| Stanovich Strip Initial Consonant / 10 |  |  |  |  |  |  |  |  |  |  |
| M |  |  | - | - | - | - | 9.80 | 5.00 | 9.80 | - |
| SD |  |  |  |  |  |  | . 56 | - | . 45 |  |
| (N) |  |  |  |  |  |  | (15) | (1) | (5) |  |
| Phoneme Deletion \& Substitution / 18 |  |  |  |  |  |  |  |  |  |  |
| M |  | - | - | - | - | - | 9.73 | 4.61 | 9.23 | 4.46 |
| SD |  |  |  |  |  |  | 4.72 | 4.31 | 4.69 | 3.89 |
| (N) |  |  |  |  |  |  | (188) | (18) | (144) | (13) |
| Rosner Auditory Analysis / 40 |  |  |  |  |  |  |  |  |  |  |
| M |  | - | - | - | - | - | 18.33 | 22.00 | 25.20 | 9.00 |
| SD |  |  |  |  |  |  | 9.54 | 16.97 | 7.33 | 4.24 |
| (N) |  |  |  |  |  |  | (6) | (2) | (5) | (2) |
| RAN ${ }^{(1)}$ |  |  |  |  |  |  |  |  |  |  |
| M | 73.92 | 76.61 | 63.08 | 76.43 | 63.46 | 79.09 | 51.75 | 60.11 | 46.94 | 57.54 |
| SD | 22.23 | 27.28 | 16.58 | 41.68 | 17.01 | 17.76 | 14.59 | 22.41 | 10.64 | 18.89 |
| (N) | (68) | (49) | (136) | (17) | (87) | (13) | (188) | (18) | (144) | (13) |
| Buttercup Speech Rate (seconds) |  |  |  |  |  |  |  |  |  |  |
| M | 8.96 | 9.13 | 8.17 | 7.88 | 8.11 | 8.80 | 7.09 | 7.61 | 7.38 | 7.32 |
| SD | 1.97 | 2.3753 | 4.46 | 1.10 | 1.60 | 2.50 | 1.26 | 1.56 | 1.55 | 1.55 |
| (N) | (68) | (50) | (134) | (16) | (88) | (13) | (178) | (15) | (129) | (12) |
| Phoneme \& Syllable Identification / 16 |  |  |  |  |  |  |  |  |  |  |
| M | 5.70 | 5.30 | 9.87 | 5.19 | 9.24 | 5.46 | 13.10 | 11.11 | 13.15 | 10.46 |
| SD | 4.59 | 4.95 | 3.84 | 3.76 | 4.14 | 3.15 | 2.51 | 3.50 | 2.31 | 2.50 |
| (N) | (69) | (50) | (136) | (16) | (88) | (13) | (188) | (18) | (144) | (13) |
| GFW Sound Mimicry Subtest / 55 |  |  |  |  |  |  |  |  |  |  |
| M | 38.45 | 36.88 | 45.34 | 36.38 | 44.23 | 36.85 | 49.22 | 44.00 | 48.64 | 43.92 |
| SD | 10.21 | 11.55 | 7.74 | 11.79 | 6.24 | 14.76 | 5.38 | 10.40 | 5.98 | 5.12 |
| (N) | (69) | (50) | (136) | (16) | (88) | (13) | (188) | (18) | (144) | (13) |
| GFW Sound Mimcry Subtest (\%ile score ) |  |  |  |  |  |  |  |  |  |  |
| M | 58.25 | 54.80 | 66.34 | 38.63 | 62.94 | 45.62 | 71.46 | 50.83 | 70.29 | 40.46 |
| SD | 27.54 | 30.16 | 25.04 | 23.44 | 23.34 | 31.80 | 24.33 | 32.10 | 23.44 | 25.38 |
|  | (69) | (50) | (136) | (16) | (87) | (13) | (188) | (18) | (144) | (13) |
| Pseudowrd Reading / 15 (18) 7.07 |  |  |  |  |  |  |  |  |  |  |
| M |  |  |  |  |  |  | 7.07 | 3.22 | 6.70 | 1.69 |
| SD | - | - | - | - | - | - | $3.99$ | 3.46 | 3.94 | 2.36 |
| (N) |  |  |  |  |  |  | (188) | (18) | (144) | (13) |
| Rhyme Production |  |  |  |  |  |  |  |  |  |  |
| M | 2.61 | 2.32 | 5.57 | 2.25 | 4.70 | 1.77 | 9.78 | 5.83 | 9.19 | 6:23 |
| SD | 3.08 | 3.50 | 4.03 | 2.86 | 4.42 | 3.39 | 5.37 | 3.97 | 5.08 | 5.23 |
| (N) | (69) | (50) | (136) | (16) | (88) | (13) | (188) | (18) | (144) | (13) |


| Measure | JK |  | SK |  |  |  | G1 |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 | ESL | L1 |  | ESL |  | L1 |  | ESL |  |
|  |  |  | NA | RD | NA | RD | NA | RD | NA | RD |
| Rhyme Detection /10 |  |  |  |  |  |  |  |  |  |  |
| M | 4.57 | 3.52 | 6.51 | 4.59 | 4.83 | 3.08 | 8.81 | 6.06 | 7.90 | 6.46 |
| SD | 3.13 | 2.95 | 2.85 | 3.20 | 3.29 | 2.33 | 2.05 | 3.83 | 2.54 | 2.96 |
| ( N ) | (69) | (50) | (136) | (17) | (88) | (13) | (188) | (18) | (144) | (13) |
| Realword Spelling/20 |  |  |  |  |  |  |  |  |  |  |
| M |  |  |  |  |  |  | 8.62 | 2.07 | 9.44 | 2.25 |
| SD | - | - | - | - | - | - | 5.10 | 1.87 | 5.41 | 1.98 |
| (N) |  |  |  |  |  |  | (150) | (15) | (101) | (8) |
| Pseudowrd Spelling /10 |  |  |  |  |  |  |  |  |  |  |
| M | - | - | - | - | - | - | 3.27 | 1.27 | 3.09 | 1.29 |
| SD |  |  |  |  |  |  | 2.26 | 1.53 | 2.17 | 1.38 |
| (N) |  |  |  |  |  |  | (143) | (15) | (94) | (7) |
| Letter Identification |  |  |  |  |  |  |  |  |  |  |
| M | 11.94 | 11.20 | 20.94 | 5.44 | 21.74 | 6.85 | 25.22 | 21.78 | 25.45 | 25.00 |
| SD | 7.77 | 8.94 | 5.01 | 4.97 | 3.76 | 5.52 | . 88 | 5.65 | . 83 | . 91 |
| (N) | (69) | (50) | (135) | (16) | (88) | (13) | (188) | (18) | (144) | (13) |
| WORKING MEMORY |  |  |  |  |  |  |  |  |  |  |
| Stanford Sentence Repetition (Raw score) / 42 |  |  |  |  |  |  |  |  |  |  |
| M | 13.83 | 10.48 | 15.73 | 11.94 | 12.74 | 11.08 | - | - | - | - |
| SD | 4.04 | 3.90 | 3.95 | 4.44 | 3.81 | 3.84 |  |  |  |  |
| (N) | (69) | (50) | (136) | (17) | (88) | (13) |  |  |  |  |
| Working Memory: Words / 12 |  |  |  |  |  |  |  |  |  |  |
| M | - | - | - | - | - | - | 2.23 | 1.44 | 2.03 | 1.46 |
| SD |  |  |  |  |  |  | 1.57 | 1.76 | 1.39 | 1.71 |
| (N) |  |  |  |  |  |  | (188) | (18) | (142) | (13) |
| SYNTAX |  |  |  |  |  |  |  |  |  |  |
| Syntactic Error Judgement (\% score) |  |  |  |  |  |  |  |  |  |  |
| M | 42.61 | 34.46 | 46.57 | 35.80 | 37.89 | 35.93 | 65.60 | 57.46 | 61.01 | 60.71 |
| SD | 18.46 | 22.51 | 18.18 | 19.39 | 14.51 | 16.90 | 15.46 | 14.95 | 13.71 | 9.06 |
| (N) | (69) | (49) | (136) | (17) | (88) | (13) | (188) | (18) | (144) | (13) |
| READING |  |  |  |  |  |  |  |  |  |  |
| Wrat-3 Raw |  |  |  |  |  |  |  |  |  |  |
| 157 | 8.83 | 8.34 | 15.34 | 4.82 | 15.59 | 6.54 | 23.88 | 15.00 | 23.65 | 17.62 |
| M | 5.27 | 5.67 | 3.11 | 3.47 | 2.78 | 3.62 | 4.44 | 4.27 | 4.22 | 1.45 |
| SD | (70) | (50) | (136) | (17) | (88) | (13) | (188) | (18) | (144) | (13) |
| (N) |  |  |  |  |  |  |  |  |  |  |
| Wrat-3 (\%ile Score) |  |  |  |  |  |  |  |  |  |  |
| M | 50.53 | 48.06 | 64.76 | 10.12 | 70.22 | 12.31 | 70.51 | 15.33 | 72.53 | 21.23 |
| SD | 31.15 | 33.02 | 17.06 | 8.62 | 16.97 | 7.55 | 22.00 | 8.21 | 20.00 | 3.63 |
| (N) | (70) | (50) | (136) | (17) | (88) | (13) | (188) | (18) | (144) | (13) |
| Wrat-3 |  |  |  |  |  |  |  |  |  |  |
| standard | 100.75 | 98.55 | ? | ? | ? | ? |  |  |  |  |
| M | 14.27 | 15.54 |  |  |  |  | 13.67 | 6.82 | 11.69 | 2.00 |
| SD | (69) | (49) |  |  |  |  | (188) | (18) | (144) | (13) |
| ( N ) |  |  |  |  |  |  |  |  |  |  |
| Bridge Words /69 |  |  |  |  |  |  |  |  |  |  |
| M | - | - | - | - | - | - | 47.91 | 17.39 | 48.21 | 20.25 |
| SD |  |  |  |  |  |  | 17.12 | 13.84 | 17.92 | 10.39 |
| (N) |  |  |  |  |  |  | (188) | (18) | (144) | (12) |
| Ozone Vocabulary / 76 |  |  |  |  |  |  |  |  |  |  |
| M |  | - | - | - | - | - | 55.30 | 28.25 | 53.13 | 30.60 |
| SD |  |  |  |  |  |  | 17.35 | 6.29 | 16.78 | 7.09 |
| (N) |  |  |  |  |  |  | (53) | (4) | (47) | (5) |
| Linda Experimental Words / 40 |  |  |  |  |  |  |  |  |  |  |
| M |  |  |  |  |  |  |  |  |  |  |
| SD |  |  |  |  |  |  |  |  |  |  |
| (N) |  |  |  |  |  |  |  |  |  |  |
| British Ability Scales / 90 |  |  |  |  |  |  |  |  |  |  |
| M |  |  |  | 8.33E- |  |  |  |  |  |  |
| SD |  |  | 3.64 | 02 | 3.95 | . 20 | 33.74 | 9.39 | 32.89 | 10.31 |
| (N) |  |  | 7.61 | . 29 | 6.86 | . 45 | 18.88 | 5.86 | 18.06 | 5.54 |
|  |  |  | (106) | (12) | (55) | (5) | (188) | (18) | (144) | (13) |

Grades G2, G3 and G4

| Measure | G2 |  |  |  | G3 |  |  |  | G4 |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 |  | ESL |  | L. 1 |  | ESL |  | L1 |  | ESL |  |
|  | NA | RD | NA | RD | NA | RD | NA | RD | NA | RD | NA | RD |
| PHONOLOGICAL PROCESSING SKILLS |  |  |  |  |  |  |  |  |  |  |  |  |
| Phoneme Recognition (\% score) |  |  |  |  |  |  |  |  |  |  |  |  |
| M | 99.86 | 99.04 | 99.56 | 99.51 | 100.0 | 100.0 | 99.83 | 98.33 | - | - | - | - |
| SD | 1.52 | 3.60 | 2.24 | 2.02 | . 00 | . 00 | 1.17 | 3.73 |  |  |  |  |
| N | (120) | (26) | (94) | (17) | (51) | (4) | (50) | (5) |  |  |  |  |
| Phoneme Recognitn \& Location (\% score) |  |  |  |  |  |  |  |  |  |  |  |  |
| M | 99.03 | 97.22 | 98.64 | 98.69 | 99.78 | 97.222 | 99.67 | 92.22 | - | - | - | - |
| SD | 3.50 | 8.20 | 5.7 | 4.18 | 1.09 | 5.56 | 1.33 | 17.39 |  |  |  |  |
| (N) | (120) | (26) | (95) | (17) | (51) | (4) | (50) | (5) |  |  |  |  |
| Phoneme Deletion / 16 |  |  |  |  |  |  |  |  |  |  |  |  |
| M | 15.51 | 13.29 | 15.45 | 12.18 | 15.73 | 14.00 | 15.90 | 14.20 | - | - | - | - |
| SD | 1.21 | 2.53 | 1.34 | 3.32 | . 92 | . 82 | . 30 | 2.95 |  |  |  |  |
| (N) | (117) | (21) | (99) | (17) | (51) | (4) | (50) | (5) |  |  |  |  |
| Stanovich Strip |  |  |  |  |  |  |  |  |  |  |  |  |
| Initial Consonant |  |  |  |  |  |  |  |  |  |  |  |  |
| 110 | 9.96 | 10.00 | 9.88 | 7.67 | - | - | - | - | - | - | - | - |
| M | . 20 | . 00 | . 33 | 2.52 |  |  |  |  |  |  |  |  |
| SD | (24) | (7) | (17) | (3) |  |  |  |  |  |  |  |  |
| (N) |  |  |  |  |  |  |  |  |  |  |  |  |
| Phoneme |  |  |  |  |  |  |  |  |  |  |  |  |
| Deletion \& | 13.66 | 8.59 | 13.88 | 8.47 | 15.47 | 10.75 | 15.94 | 11.00 |  |  |  |  |
| Substitutn | 3.33 | 3.52 | 3.35 | 3.94 | 2.82 | 2.22 | 2.46 | 4.36 | - | - | - | - |
| M | (117) | (27) | (103) | (17) | (51) | (4) | (50) | (5) |  |  |  |  |
| SD |  |  |  |  |  |  |  |  |  |  |  |  |
| ( N ) |  |  |  |  |  |  |  |  |  |  |  |  |
| Rosner Auditory |  |  |  |  |  |  |  |  |  |  |  |  |
| Analysis | 23.84 | 14.20 | 26.72 | 12.53 | 29.07 | 14.00 | 30.49 | 18.40 | 30.64 | 18.00 | 32.52 | 24.00 |
| M | 9.14 | 5.68 | 8.52 | 6.64 | 9.10 | 7.68 | 7.04 | 7.35 | 8.33 | 5.90 | 6.40 | 4.36 |
| SD | (112) | (20) | (93) | (17) | (103) | (11) | (67) | (10) | (44) | (8) | (21) | (3) |
| (N) |  |  |  |  |  |  |  |  |  |  |  |  |
| RAN |  |  |  |  |  |  |  |  |  |  |  |  |
| M | 43.93 | 50.58 | 39.45 | 49.46 | 38.95 | 42.39 | 35.16 | 41.17 | - | - | - | - |
| SD | 10.28 | 14.73 | 8.09 | 12.84 | 7.92 | 10.34 | 7.34 | 8.96 |  |  |  |  |
| ( N ) | (142) | (28) | (117) | (20) | (51) | (4) | (50) | (5) |  |  |  |  |
| Buttercup Speech Rate (seconds) |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| M | 6.47 | 6.98 | 6.79 | 7.15 | 5.80 | 5.32 | 5.99 | 6.02 | - | - | - | - |
| SD | 1.06 | . 97 | 1.16 | . 66 | . 88 | . 29 | 1.11 | . 68 |  |  |  |  |
| (N) | (114) | (19) | (91) | (16) | (51) | (4) | (50) | (5) |  |  |  |  |
| Phoneme \& ( ${ }^{\text {\& }}$ |  |  |  |  |  |  |  |  |  |  |  |  |
| Syllable |  |  |  |  |  |  |  |  |  |  |  |  |
| Identificatn | 14.18 | 13.14 | 14.14 | 13.18 | 14.31 | 14.50 | 14.44 | 13.60 | - | - | - | - |
| M | 1.76 | 2.65 | 1.87 | 2.38 | 1.85 | 1.29 | 1.91 | 1.82 |  |  |  |  |
| SD | (117) | (21) | (99) | (17) | (51) | (4) | (50) | (5) |  |  |  |  |
| (N) |  |  |  |  |  |  |  |  |  |  |  |  |
| GFW Sound |  |  |  |  |  |  |  |  |  |  |  |  |
| Mimicry Subtest |  |  |  |  |  |  |  |  |  |  |  |  |
| M | 51.76 | 48.43 | 50.54 | 47.59 | 52.00 | 51.50 | 51.80 | 50.20 | - | - | - | - |
| SD | 2.70 | 3.96 | 2.81 | 4.91 | 2.26 | 2.52 | 2.68 | 2.17 |  |  |  |  |
| (N) | (117) | (21) | (99) | (17) | (51) | (4) | (50) | (5) |  |  |  |  |
| GFW ( |  |  |  |  |  |  |  |  |  |  |  |  |
| Sound Mimcry |  |  |  |  |  |  |  |  |  |  |  |  |
| Subtest \%ile |  |  |  |  |  |  |  |  |  |  |  |  |
| M | 78.15 | 52.71 | 69.75 | 46.06 | 75.37 | 73.75 | 74.18 | 58.80 | - | - | - | - |
| SD | 18.95 | 26.44 | 20.72 | 26.50 | 20.39 | 22.08 | 22.16 | 17.43 |  |  |  |  |
| (N) | (116) | (21) | (99) | (17) | (51) |  | (50) | (5) |  |  |  |  |
| Pseudowrd |  |  |  |  |  |  |  |  |  |  |  |  |
| Repetition | 28.04 | 21.29 | 27.59 | 25.00 | 29.96 | 27.29 | 28.00 | 27.40 | 30.02 | 28.63 | 29.43 | 27.67 |
| M | 4.20 | 9.16 | 3.74 | 4.36 | 1.80 | 3.40 | 3.44 | 4.39 | 2.13 | 3.93 | 2.04 | 3.21 |
| SD | (24) | (7) | (17) | (3) | (52) | (7) | (16) | (5) | (43) | (8) | (21) | (3) |


| Measure | G2 |  |  |  | G3 |  |  |  | G4 |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 |  | ESL |  | L1 |  | ESL |  | L1 |  | ESL |  |
|  | NA | RD | NA | RD | NA | RD | NA | RD | NA | RD | NA | RD |
| Woodcock Wrd |  |  |  |  |  |  |  |  |  |  |  |  |
| Attack | - | - | - | - | 27.19 | 14.00 | 27.94 | 13.40 | 31.68 | 11.13 | 33.14 | 23.00 |
| M |  |  |  |  | 7.91 | 4.32 | 7.39 | 3.29 | 6.52 | 4.64 | 4.91 | 3.61 |
| SD |  |  |  |  | (52) | (7) | (16) | (5) | (44) | (8) | (21) | (3) |
| ( N ) |  |  |  |  |  |  |  |  |  |  |  |  |
| WoodcockWrd |  |  |  |  |  |  |  |  |  |  |  |  |
| Attack |  |  |  | - |  |  |  |  |  |  |  |  |
| \% ile score | - | - | - |  | 48.42 | 10.71 | 49.94 | 9.00 | 56.50 | 3.25 | 62.14 | 22.33 |
| M |  |  |  |  | 28.08 | 7.27 | 24.49 | 6.00 | 25.94 | 1.75 | 20.76 | 9.29 |
| SD |  |  |  |  | (52) | (7) | (16) | (5) | (44) | (8) | (21) | (3) |
| (N) |  |  |  |  |  |  |  |  |  |  |  |  |
| Woodcock |  |  |  |  |  |  |  |  |  |  |  |  |
| Wrd Attack |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| M | - | - | - | - | 99.08 | 79.29 | 99.44 | 79.00 | 103.11 | 67.88 | 105.19 | 88.00 |
| SD |  |  |  |  | 12.74 | 7.59 | 11.73 | 5.39 | 11.87 | 12.67 | 9.08 | 5.29 |
| (N) |  |  |  |  | (52) | (7) | (16) | (5) | (44) | (8) | (21) | (3) |
| Pseudowrd |  |  |  |  |  |  |  |  |  |  |  |  |
| Reading | 10.83 | 5.67 | 10.23 | 5.60 | 11.90 | 5.25 | 12.04 | 6.60 | - | - | - | - |
| M | $3.13$ | 2.86 | 3.29 | 2.48 | 2.96 | 3.86 | 2.70 | 3.78 |  |  |  |  |
| SD | (142) | (27) | (116) | (20) | (51) | (4) | (50) | (5) |  |  |  |  |
| (N) |  |  |  |  |  |  |  |  |  |  |  |  |
| Coltheart |  |  |  |  |  |  |  |  |  |  |  |  |
| Nonword |  |  |  |  |  |  |  |  |  |  |  |  |
| Reading | - | - | - | - | 26.65 | 19.57 | 27.65 | 23.00 | 28.23 | 17.75 | 28.29 | 26.00 |
| M |  |  |  |  | 3.83 | 6.40 | 2.32 | 9.14 | 2.37 | 7.63 | 2.15 | 2.00 |
| SD |  |  |  |  | (52) | (7) | (17) | (5) | (44) | (8) | (21) | (3) |
| (N) |  |  |  |  |  |  |  |  |  |  |  |  |
| Rhyme |  |  |  |  |  |  |  |  |  |  |  |  |
| Production | 13.14 | 10.57 | 12.67 | 9.82 | 16.82 | 12.25 | 15.78 | 13.00 | - | - | - | - |
| M | 5.43 | 3.59 | 4.46 | 5.59 | 5.39 | 1.71 | 5.04 | 7.58 |  |  |  |  |
| SD | (117) | (21) | (99) | (17) | (51) | (4) | (50) | (5) |  |  |  |  |
| (N) |  |  |  |  |  |  |  |  |  |  |  |  |
| Rhyme Detection |  |  |  |  |  |  |  |  |  |  |  |  |
| /10 | 9.73 | 8.62 | 9.63 | 8.41 | 9.88 | 10.00 | 9.96 | 9.20 | - | - | - | - |
| M | . 71 | 2.20 | . 99 | 1.94 | . 38 | . 00 | . 20 | 1.30 |  |  |  |  |
| SD | (117) | (21) | (99) | (17) | (51) | (4) | (50) | (5) |  |  |  |  |
| ( N ) |  |  |  |  |  |  |  |  |  |  |  |  |
| Orthog. Choice |  |  |  |  |  |  |  |  |  |  |  |  |
| M | - | - | - | - | 13.78 | 11.57 | 14.47 | 12.20 | 14.52 | 12.43 | 14.67 | 13.00 |
| SD |  |  |  |  | 2.54 | 3.64 | 2.18 | 2.95 | 2.39 | 3.64 | 1.59 | 1.00 |
| (N) |  |  |  |  | (49) | (7) | (17) | (5) | (42) | (7) | (21) | (3) |
| Realword |  |  |  |  |  |  |  |  |  |  |  |  |
| Spelling/20 | 16.91 | 9.75 | 16.87 | 10.30 | 18.80 | 13.50 | 18.82 | 14.40 | - | - | - | - |
| M | 2.98 | 3.49 | 2.87 | 3.44 | 1.76 | 5.80 | 1.95 | 4.28 |  |  |  |  |
| SD | (141) | (28) | (116) | (20) | (51) | (4) | (50) | (5) |  |  |  |  |
| ( N ) |  |  |  |  |  |  |  |  |  |  |  |  |
| Pseudowrd Spelling/10 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| M | 5.38 | 2.04 | 4.43 | 2.39 | 6.15 | 2.00 | 6.05 | 1.50 | - | - | - | - |
| SD | 2.35 | 1.67 | 2.42 | 1.09 | 2.18 | - | 2.09 | 2.12 |  |  |  |  |
| ( N ) | (133) | (28) | (110) | (18) | (33) | (1) | (19) | (2) |  |  |  |  |
| Word Spelling/21('99 g384) |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| M | - | - | - | - | 12.04 | 4.14 | 12.53 | 5.60 | 14.33 | 5.29 | 13.48 | 11.33 |
| SD |  |  |  |  | 3.49 | 2.12 | 2.55 | 2.61 | 3.20 | 5.25 | 2.99 | 6.35 |
| (N) |  |  |  |  | (49) | (7) | (17) | (5) | (42) | (7) | (21) | (3) |
| Non word |  |  |  |  |  |  |  |  |  |  |  |  |
| Spelling/15 |  |  |  |  |  |  |  |  |  |  |  |  |
| ('99 g3\&4) | - | - | - | - | 8.16 | 3.14 | 8.71 | 6.00 | 7.88 | 3.86 | 8.30 | 6.67 |
| M |  |  |  |  | 2.73 | 2.54 | 3.41 | 3.87 | 3.11 | 1.57 | 2.98 | 5.03 |
| SD |  |  |  |  | (49) | (7) | (17) | (5) | (42) | (7) | (20) | (3) |
| (N) |  |  |  |  |  |  |  |  |  |  |  |  |
| WRAT-3 |  |  |  |  |  |  |  |  |  |  |  |  |
| Spelling ('99 g3\&4) RAW |  |  |  |  |  |  |  |  |  |  |  |  |
| M | - | - | - | - | 28.98 | 23.29 | 30.18 | 24.20 | 30.60 | 23.43 | 30.76 | 25.67 |
| SD |  |  |  |  | 3.49 | 1.80 | 2.86 | 1.30 | 3.98 | 1.99 | 4.41 | 3.21 |
| (N) |  |  |  |  | (49) | (7) | (17) | (5) | (42) | (7) | (21) | (3) |


| Measure | G2 |  |  |  | G3 |  |  |  | G4 |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 |  | ESL |  | L1 |  | ESL |  | L1 |  | ESL |  |
|  | NA | RD | NA | RD | NA | RD | NA | RD | NA | RD | NA | RD |
| WRAT-3 |  |  |  |  |  |  |  |  |  |  |  |  |
| Spelling ('99 |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Standard | - | - | - | - | 107.63 | 89.00 | 111.59 | 92.00 | 105.93 | 83.14 | 105.90 | 89.33 |
| M |  |  |  |  | 11.54 | 5.57 | 9.31 | 5.34 | 13.28 | 4.81 | 13.62 | 7.37 |
| SD |  |  |  |  | (49) | (7) | (17) | (5) | (42) | (7) | (21) | (3) |
| (N) |  |  |  | . |  |  |  |  |  |  |  |  |
| WRAT-3 |  |  |  |  |  |  |  |  |  |  |  |  |
| Spelling ('99 |  |  |  |  |  |  |  |  |  |  |  |  |
| g3\&4) |  |  |  |  |  |  |  |  |  |  |  |  |
| \%ile | - | - | - | - | 66.10 | 24.29 | 74.35 | 30.60 | 60.64 | 14.00 | 59.62 | 25.67 |
| M |  |  |  |  | 23.85 | 11.79 | $18.13$ | $10.64$ | $26.38$ | $7.16$ | $24.33$ | $14.01$ |
| SD |  |  |  |  | (49) | (7) | (17) | (5) | (42) | (7) | (21) | (3) |
| (N) |  |  |  |  |  |  |  |  |  |  |  |  |
| Letter identificatn |  |  |  |  |  |  |  |  |  |  |  |  |
| /26 | 25.88 | 25.52 | 25.78 | 25.35 | 25.78 | 25.25 | 25.64 | 25.40 | - | - | - | - |
| M | . 38 | . 60 | 1.23 | $.93$ | $42$ | 1.50 | 1.72 | . 89 |  |  |  |  |
| SD | (117) | (21) | (99) | (17) | (51) | (4) | (50) | (5) |  |  |  |  |
| (N) |  |  |  |  |  |  |  |  |  |  |  |  |
| WORKING MEMORY |  |  |  |  |  |  |  |  |  |  |  |  |
| Working |  |  |  |  |  |  |  |  |  |  |  |  |
| Memory: |  |  |  |  |  |  |  |  |  |  |  |  |
| Words | 3.76 | 2.54 | 3.44 | 2.70 | 5.07 | 4.18 | 4.77 | 4.40 | 5.61 | 5.13 | 5.29 | 3.33 |
| M | 1.49 | 1.48 | 1.43 | 1.42 | 1.62 | 1.72 | 1.66 | 2.67 | 4.29 | 1.55 | 1.59 | . 58 |
| SD | (141) | (28) | (116) | (20) | (103) | (11) | (66) | (10) | (44) | (8) | (21) | (3) |
| (N) |  |  |  |  |  |  |  |  |  |  |  |  |
| SYNTAX |  |  |  |  |  |  |  |  |  |  |  |  |
| Syntax Error |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| score | 79.33 | 69.64 | 75.60 | 68.75 | 81.03 | 68.70 | 81.76 | 70.79 | 76.56 | 71.43 | 77.55 | 64.76 |
| M | 11.56 | 12.47 | 12.58 | 9.58 | 9.07 | 10.63 | 10.85 | 14.41 | 7.93 | 9.16 | 9.27 | 14.38 |
| SD | (141) | (28) | (116) | (20) | (103) | (11) | (67) | (10) | (44) | (8) | (21) | (3) |
| (N) |  |  |  |  |  |  |  |  |  | $\therefore$. |  |  |
| Oral Cloze |  |  |  |  |  |  |  |  |  |  |  |  |
| M | 8.50 | 6.86 | 7.35 | 6.67 | - | - | - | - | - | - | - | - |
| SD | 2.06 | 2.79 | 2.32 | 2.52 |  |  |  |  |  |  |  |  |
| (N) | (24) | (7) | (17) | (3) |  |  |  |  |  |  |  |  |
| Syntactic Error |  |  |  |  |  |  |  |  |  |  |  |  |
| Correction |  |  |  |  | ? | $?$ | ? | ? | $?$ | $?$ | $?$ | $?$ |
| M | - | - | - | - | - | - | - | - | - | - | - | - |
| SD |  |  |  |  |  |  |  |  |  |  |  |  |
| (N) |  |  |  |  | (0) | (0) | (0) | (0) | (0) | (0) | (0) | (0) |
| READING |  |  |  |  |  |  |  |  |  |  |  |  |
| Wrat-3 Raw $/ 57$ |  |  |  |  |  |  |  |  |  |  |  |  |
| M | 30.16 | 22.00 | 29.18 | 22.45 | 33.34 | 25.64 | 33.18 | 24.90 | 37.11 | 26.00 | 35.76 | 29.00 |
| SD | 3.37 | 2.14 | 3.54 | 1.82 | 4.64 | 2.16 | 3.93 | 3.07 | 4.77 | 3.96 | 2.81 | 1.00 |
| (N) | (142) | (28) | (117) | (20) | (104) | (11) | (67) | (10) | (44) | (8) | (21) | (3) |
| Wrat-3 |  |  |  |  |  |  |  |  |  |  |  |  |
| \%ile Score |  |  |  |  |  |  |  |  |  |  |  |  |
| M | 66.52 | 16.00 | 63.32 | 15.15 | 64.98 | 16.73 | 63.94 | 15.20 | 68.55 | 12.11 | 63.48 | 19.67 |
| SD | 19.69 | 7.54 | 18.68 | 6.07 | 21.43 | 5.87 | 20.84 | 8.07 | 22.73 | 9.05 | 16.83 | 2.89 |
| (N) | (142) | (28) | (117) | (20) | (104) | (11) | (67) | (10) | (44) | (8) | (21) | (3) |
| Wrat-3 standard |  |  |  |  |  |  |  |  |  |  |  |  |
| M | 107.81 | 83.89 | 106.09 | 83.95 | 108.03 | 85.09 | 106.99 | 82.80 | 110.16 | 78.88 | 105.81 | 87.00 |
| SD | 9.92 | 6.36 | 8.57 | 4.32 | 12.44 | 4.23 | 10.97 | 8.39 | 12.97 | 10.80 | 7.30 | 1.73 |
| (N) | (142) | (28) | (117) | (20) | (104) | (11) | (67) | (10) | (44) | (8) | (21) | (3) |
| Bridge Words |  |  |  |  |  |  |  |  |  |  |  |  |
| /69 | 66.83 | 50.61 | 66.73 | 51.95 | 68.29 | 60.50 | 68.96 | 60.00 | - | - | - | - |
| M | 4.07 | 12.51 | 4.05 | 12.22 | 2.63 | 12.40 | . 20 | 14.68 |  |  |  |  |
| SD | (142) | (28) | (117) | (20) | (51) | (4) | (50) | (5) |  |  |  |  |
| (N) |  |  |  |  |  |  |  |  |  |  |  |  |
| Linda |  |  |  |  |  |  |  |  |  |  |  |  |
| Experimental |  |  |  |  |  |  |  |  |  |  |  |  |
| Words | 36.88 | 25.86 | 36.45 | 27.95 | 38.65 | 31.75 | 39.18 | 28.80 | - | - | - | - |
| M | 4.36 | 9.12 | 5.03 | 7.13 | 2.23 | 7.68 | . 98 | 10.64 |  |  |  |  |
| SD | (141) | (28) | (116) | (20) | (51) | (4) | (50) | (5) |  |  |  |  |
| (N) |  |  |  |  |  |  |  |  |  |  |  |  |


| Measure | G2 |  |  |  | G3 |  |  |  | G4 |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 |  | ESL |  | L1 |  | ESL |  | L1 |  | ESL |  |
|  | NA | RD | NA | RD | NA | RD | NA | RD | NA | RD | NA | D |
| British Ability |  |  |  |  |  |  |  |  |  |  |  |  |
| Scales | 63.38 | 28.57 | 61.93 | 29.88 | 73.69 | 48.25 | 74.74 | 41.40 | - | - | - | - |
| M | 14.72 | 10.03 | 14.52 | 9.12 | 12.27 | 18.03 | 8.61 | 15.34 |  |  |  |  |
| $\begin{aligned} & \text { SD } \\ & (\mathrm{N}) \end{aligned}$ | (117) | (21) | (99) | (17) | (51) | (4) | (50) | (5) |  |  |  |  |
| Woodcock Word Ident. Raw |  |  |  |  |  |  |  |  |  |  |  |  |
| M | - | - | - | - | 62.89 | 45.43 | 65.12 | 51.00 | 73.79 | 47.25 | 71.33 | 55.67 |
| SD $(N)$ |  |  |  |  | $\begin{gathered} 12.07 \\ (52) \end{gathered}$ | $\begin{gathered} 5.00 \\ (7) \end{gathered}$ | $\begin{aligned} & 8.69 \\ & (16) \end{aligned}$ | $\begin{gathered} 6.75 \\ (5) \end{gathered}$ | $\begin{aligned} & 10.43 \\ & (43) \end{aligned}$ | $\begin{gathered} 10.36 \\ (8) \end{gathered}$ | $\begin{gathered} 11.56 \\ (21) \end{gathered}$ | $\begin{gathered} 4.16 \\ (3) \end{gathered}$ |
| Woodcock Word Ident. <br> \%ile Score |  |  |  |  |  |  |  |  |  |  |  |  |
| M | - | - | - | - | 59.75 | 11.71 | 63.06 | 26.20 | 59.67 | 7.00 | 52.71 | 12.67 |
| $\begin{aligned} & \text { SD } \\ & (\mathbf{N}) \end{aligned}$ |  |  |  |  | $\begin{gathered} 25.70 \\ (52) \end{gathered}$ | $8.73$ (7) | $\begin{gathered} 23.63 \\ (16) \end{gathered}$ | $\begin{gathered} 22.04 \\ (5) \end{gathered}$ | $\begin{gathered} 25.97 \\ (43) \end{gathered}$ | $8.07$ (8) | $\begin{gathered} 28.01 \\ (21) \end{gathered}$ | $\begin{gathered} 6.11 \\ (3) \end{gathered}$ |
| Woodcock Word Ident Standard |  |  |  |  |  |  |  |  |  |  |  |  |
| M | - | - | - | - | 104.52 | 80.29 | 106.44 | 88.80 | 105.40 | 73.38 | 102.62 | 82.33 |
| SD <br> (N) |  |  |  |  | $\begin{aligned} & 12.27 \\ & (52) \end{aligned}$ | $7.09$ (7) | $\begin{gathered} 11.59 \\ (16) \end{gathered}$ | $11.12$ (5) | $\begin{gathered} 13.25 \\ (43) \end{gathered}$ | $\begin{gathered} 11.20 \\ (8) \end{gathered}$ | $\begin{gathered} 13.60 \\ (21) \end{gathered}$ | $4.73$ (3) |
| Coltheart Words |  |  |  |  |  |  |  |  |  |  |  |  |
| M | - | - | - | - | 35.48 | 22.14 | 36.19 | 24.80 | 39.59 | 21.00 | 39.05 | 32.00 |
| SD |  |  |  |  | 7.51 | $\stackrel{5.52}{(7)}$ | 4.34 $(16)$ | 6.98 | 4.09 | 9.97 | 3.71 | $3.46$ |
| $\xrightarrow[\text { (N) }]{\text { Standford }}$ |  |  |  |  | (52) | (7) | (16) | (5) | (44) | (7) | (21) |  |
| Standford |  |  |  |  |  |  |  |  |  |  |  |  |
| Reading Comp. |  |  |  |  |  |  |  |  |  |  |  |  |
| Raw | - | - | - | - | 37.71 | 24.57 | 40.12 | 29.40 | 37.76 | 19.71 | 39.10 | 32.00 |
| M |  |  |  |  | 9.60 | 13.13 | 4.33 | 11.76 | 9.03 | 8.42 | 7.11 | 12.17 |
| SD |  |  |  |  | (49) | (7) | (17) | (5) | (42) | (7) | (21) | (3) |
| ( N ) |  |  |  |  |  |  |  |  |  |  |  |  |
| Stanford |  |  |  |  |  |  |  |  |  |  |  |  |
| Reading Comp. |  |  |  |  |  |  |  |  |  |  |  |  |
| \%ile | - | - | - | - | 53.76 | 20.86 | 54.88 | 28.20 | 44.00 | 5.00 | 46.10 | 24.33 |
| M |  |  |  |  | 28.02 | 19.12 | 21.77 | 23.95 | 27.47 | 4.28 | 29.19 | 19.66 |
| SD |  |  |  |  | (49) | (7) | (16) | (5) | (42) | (7) | (21) | (3) |
| (N) |  |  |  |  |  |  |  |  |  |  |  |  |
| One Minute Rdg WRAT-Tan |  |  |  |  |  |  |  |  |  |  |  |  |
| M | - | - | - | - | 30.88 | 25.57 | 31.44 | 25.60 | 35.57 | 25.63 | 35.81 | 28.67 |
| SD |  |  |  |  | 3.66 | 1.40 | 4.11 | 1.52 | 4.81 | 3.66 | 5.21 | 2.52 |
| ( N ) |  |  |  |  | (52) | (7) | (16) | (5) | (44) | (8) | (21) | (3) |
| MATH |  |  |  |  |  |  |  |  |  |  |  |  |
| WRAT-3 Math |  |  |  |  |  |  |  |  |  |  |  |  |
| Raw |  |  |  |  |  |  |  |  |  |  |  |  |
| M | - | - | - | - | 26.90 | 26.71 | 29.94 | 28.00 | 29.95 | 28.14 | 30.90 | 27.00 |
| SD |  |  |  |  | 2.43 | 1.60 | 2.14 | 2.55 | 3.54 | 3.34 | 2.77 | 5.00 |
| (N) |  |  |  |  | (49) | (7) | (17) | (5) | (42) | (7) | (21) | (3) |
| WRAT-3 Math |  |  |  |  |  |  |  |  |  |  |  |  |
| Standard |  |  |  |  |  |  |  |  |  |  |  |  |
| M | - | - | - | - | 102.88 | 101.86 | 114.71 | 106.20 | 103.57 | 95.14 | 106.29 | 90.00 |
| SD |  |  |  |  | $9.72$ | $4.14$ | $8.64$ | $9.58$ | $\begin{gathered} 13.00 \\ (42) \end{gathered}$ | $12.38$ | $\begin{aligned} & 9.07 \\ & (21) \end{aligned}$ | $17.00$ |
| WRAT-3 Math \%ile |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| M | - | - | - | - | 54.94 | 54.71 | 80.53 | 64.40 | 55.60 | 40.86 | 64.38 | 32.33 |
| SD |  |  |  |  | 22.96 | 10.86 | 12.52 | 22.45 | 27.01 | 26.98 | 20.65 | 32.62 |
| (N) |  |  |  |  | (49) | (7) | (17) | (5) | (42) | (7) | (21) | (3) |

Table 9 JK Correlations between 1996 Phonological Processing (PP) Skill Measures and Wrat3 Reading by Year and Language Status (L1, ESL)

|  | 96 |  | 97 |  | 98 |  | 99 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| PHONOLOGICAL PROCESSING SKILL | L1 | ESL | L1 | ESL | L1 | ESL | L1 | ESL |
| Phoneme Deletion |  |  |  |  |  |  |  |  |
| R2 | .420** | .428** | .331* | . 247 | .483** | .378* | . 125 | . 341 |
| Sig. (2-tailed) | . 000 | . 002 | . 014 | . 110 | . 001 | . 021 | . 611 | . 153 |
| N | 69 | 50 | 55 | 43 | 42 | 37 | 19 | 19 |
| RAN |  |  |  |  |  |  |  |  |
| R2 | -.450** | -.341* | -.307** | -.421** | -.409** | -. 287 | -. 231 | -. 179 |
| Sig. (2-tailed) | . 000 | . 016 | . 024 | . 005 | . 007 | . 085 | . 342 | . 465 |
| N | 68 | 49 | 54 | 43 | 42 | 37 | 19 | 19 |
| SR Buttercup |  |  |  |  |  |  |  |  |
| R2 | -. 090 | -. 093 | -. 065 | -. 184 | -. 058 | -. 205 | . 063 | -. 099 |
| Sig. (2-tailed) | . 466 | . 518 | . 643 | . 238 | . 718 | . 223 | . 799 | . 687 |
| N | 68 | 50 | 54 | 43 | 41 | 37 | 19 | 19 |
| Phoneme \& Syllable |  |  |  |  |  |  |  | Identification |
| R2 | .248* | .438** | . 146 | .339* | . 213 | .326* | . 094 | . 216 |
| Sig. (2-tailed) | . 040 | . 001 | . 289 | . 026 | . 176 | . 049 | . 701 | . 373 |
| N | 69 | 50 | 55 | 43 | 42 | 37 | 19 | 19 |
| GFW Sound Mimcry |  |  |  |  |  |  |  |  |
| R2 | .291* | .398** | . 178 | .589** | . 189 | .397* | .466* | . 341 |
| Sig. (2-tailed) | . 015 | . 004 | . 192 | . 000 | . 230 | . 015 | . 045 | . 154 |
| N | 69 | 50 | 55 | 43 | 42 | 37 | 19 | 19 |
| Rhyme Production |  |  |  |  |  |  |  |  |
| R2 | .358** | . 177 | .461** | . 281 | .508** | . 231 | . 429 | -. 085 |
| Sig. (2-tailed) | . 003 | . 218 | . 000 | . 068 | . 001 | . 169 | . 067 | . 730 |
| N | 69 | 50 | 55 | 43 | 42 | 37 | 19 | 19 |
| Rhyme Detection |  |  |  |  |  |  |  |  |
| R2 | .403** | . 227 | .420** | .311* | . 285 | .375* | . 242 | . 129 |
| Sig. (2-tailed) | . 001 | . 113 | . 001 | . 043 | . 068 | . 022 | . 319 | . 599 |
| N | 69 | 50 | 55 | 43 | 42 | 37 | 19 | 19 |
| Letter Identification |  |  |  |  |  |  |  |  |
| R2 | .725** | .902** | .491** | .631** | .572** | .589** | . 374 | . 431 |
| Sig. (2-tailed) | . 000 | . 000 | . 000 | . 000 | . 000 | . 000 | . 115 | . 065 |
| N | 69 | 50 | 55 | 43 | 42 | 37 | 19 | 19 |

[^1]Table 10 SK Correlations between Phonological Processing (PP) Skill Measures and WRAT-3 Reading by Year and Language Status (L1, ESL)

| PHONOLOGICAL PROCESSING SKILL | 96 |  | 97 |  | 98 |  | 99 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 | ESL | L1 | ESL | L1 | ESL | L1 | ESL |
| Phoneme Deletion |  |  |  |  |  |  |  |  |
| R2 | .412** | .439** | .431** | .543** | .306* | .418* | .527** | . 190 |
| Sig. (2-tailed) | . 001 | . 001 | . 001 | . 000 | . 033 | 003 | . 001 | . 283 |
| N | 67 | 51 | 57 | 49 | 49 | 48 | 36 | 34 |
| RAN |  |  |  |  |  |  |  |  |
| R2 | -. 156 | -.329* | -.299* | -.432** | -.327* | -. 272 | -. 096 | -.538** |
| Sig. (2-tailed) | . 208 | . 020 | . 024 | . 002 | . 022 | . 064 | 577 | . 001 |
| N | 67 | 50 | 57 | 48 | 49 | 47 | 36 | 33 |
| SR Buttercup |  |  |  |  |  |  |  |  |
| R2 | -. 047 | -. 145 | -. 202 | -. 261 | -. 140 | -. 111 | . 069 | -. 043 |
| Sig. (2-tailed) | . 708 | . 309 | . 131 | . 070 | . 336 | . 451 | . 689 | . 808 |
| N | 66 | 51 | 57 | 49 | 49 | 48 | 36 | 34 |
| Phoneme \& Syllable Identification |  |  |  |  |  |  |  |  |
| R2 | .562** | .459** | .478** | 380** | . 153 | 247 | . 195 | .389* |
| Sig. (2-tailed) | . 000 | . 001 | . 000 | . 007 | . 293 | . 091 | . 255 | . 023 |
| $\mathrm{N}$ | 67 | 51 | 57 | 49 | 49 | 48 | 36 | 34 |
| GFW Sound Mimcry |  |  |  |  |  |  |  |  |
| R2 | .515** | . 201 | .443** | . 245 | . $517^{* *}$ | . 282 | .415** | . 272 |
| Sig. (2-tailed) | . 000 | . 158 | . 001 | . 090 | . 000 | . 052 | . 012 | . 120 |
| N | 67 | 51 | 57 | 49 | 49 | 48 | 36 | 34 |
| Rhyme Production |  |  |  |  |  |  |  |  |
| R2 | .294* | .359** | . 251 | .398** | .284* | 285* | 400* | .542** |
| Sig. (2-tailed) | . 016 | . 010 | . 060 | 005 | 048 | . 050 | . 016 | . 001 |
| N | 67 | 51 | 57 | 49 | 49 | 48 | 36 | 34 |
| Rhyme Detection |  |  |  |  |  |  |  |  |
| R2 | . 193 | . 145 | .427** | . 228 | 350* | -. 056 | . 249 | . 084 |
| Sig. (2-tailed) | . 118 | . 310 | . 001 | . 114 | . 014 | . 707 | . 143 | . 635 |
| N | 67 | 51 | 57 | 49 | 49 | 48 | 36 | 34 |
| Letter Identification |  |  |  |  |  |  |  |  |
| R2 | .756** | .875** | .536** | .477** | 368** | .463** | .399* | .597** |
| Sig. (2-tailed) | . 000 | . 000 | . 000 | . 001 | . 009 | . 001 | . 016 | . 000 |
| N | 67 | 51 | 57 | 49 | 49 | 48 | 36 | 34 |

* $\mathrm{p}<.05$ (2-tailed), ** $\mathrm{p}<.01$ (2-tailed)

Table 11 G1 Correlations between Phonological Processing (PP) Skills and WRAT-3 Reading by Year and Language Status (L1, ESL)

| PHONOLOGICAL PROCESSING SKILL | 96 |  | 97 |  | 98 |  | 99 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L1 | ESL | L1 | ESL | L1 | ESL | L1 | ESL |
| Phoneme Recognition |  |  |  |  |  |  |  |  |
| R2 | .282* | .333* | . 198 | . $305 *$ | .382* | . 239 | . 261 | . 157 |
| Sig. (2-tailed) | . 033 | . 016 | . 164 | . 049 | . 014 | . 132 | . 218 | . 496 |
| N | 57 | 52 | 51 | 42 | 41 | 41 | 24 | 21 |
| Phoneme Recognition \& Location |  |  |  |  |  |  |  |  |
| R2 | . $335{ }^{\text {* }}$ | . 241 | . 144 | . 134 | .361* | . 064 | . 015 | . 115 |
| Sig. (2-tailed) | . 011 | . 085 | . 313 | . 399 | . 020 | . 692 | . 946 | . 619 |
| N | 57 | 52 | 51 | 42 | 41 | 41 | 24 | 21 |
| Phoneme Deletion |  |  |  |  |  |  |  |  |
| R2 | .569** | .639** | .495** | .616* | .477* | . 260 | . 322 | . 114 |
| Sig. (2-tailed) | . 000 | . 000 | . 000 | . 000 | . 002 | . 100 | . 125 | . 624 |
| N | 57 | 52 | 51 | 42 | 41 | 41 | 24 | 21 |
| Phoneme Del. \& Sub. |  |  |  |  |  |  |  |  |
| R2 | .756** | .706** | .639** | .627** | .543** | .484** | .455* | . 315 |
| Sig. (2-tailed) | . 000 | . 000 | . 000 | . 000 | . 000 | . 001 | . 029 | . 165 |
| N | 57 | 52 | 51 | 42 | 41 | 41 | 24 | 21 |
| RAN |  |  |  |  |  |  |  |  |
| R2 | -.343** | -.302* | -.339* | -. 228 | -. 293 | -. 247 | -. 194 | -. 324 |
| Sig. (2-tailed) | . 009 | . 030 | . 015 | . 147 | . 063 | . 120 | . 365 | . 151 |
| N | 57 | 52 | 51 | 42 | 41 | 41 | 24 | 21 |
| SR Buttercup |  |  |  |  |  |  |  |  |
| R2 | -. 093 | . 016 | -. 264 | -. 045 | . 053 | -. 028 | -. 090 | -. 002 |
| Sig. (2-tailed) | . 495 | . 909 | . 061 | . 779 | . 742 | . 862 | . 676 | . 992 |
| N | 56 | 52 | 51 | 42 | 41 | 41 | 24 | 21 |
| Phoneme \& Syllable Identification |  |  |  |  |  |  |  |  |
| R2 | .321* | . $357{ }^{* *}$ | .326* | .383* | . 190 | . 254 | . 263 | . 178 |
| Sig. (2-tailed) | . 015 | . 009 | . 019 | . 012 | . 233 | . 109 | . 215 | . 440 |
| N | 57 | 52 | 51 | 42 | 41 | 41 | 24 | 21 |
|  |  |  |  |  |  |  |  |  |
| R2 | .408* | .316* | . 346 * | .396** | .359* | . 212 | -. 063 | . 347 |
| Sig. (2-tailed) | . 002 | . 023 | . 013 | . 009 | . 021 | . 184 | . 769 | . 123 |
| N | 57 | 52 | 51 | 42 | 41 | 41 | 24 | 21 |
| Pseudoword Reading |  |  |  |  |  |  |  |  |
| R2 | .701** | .681** | .604** | .658** | .419** | .505** | .658** | . 130 |
| Sig. (2-tailed) | . 000 | . 000 | . 000 | . 000 | . 006 | . 001 | . 000 | . 573 |
| N | 57 | 52 | 51 | 42 | 41 | 41 | 24 | 21 |
| Rhyme Production |  |  |  |  |  |  |  |  |
| R2 | .360** | .352* | .328* | . 212 | . 115 | -. 005 | . 225 | . 149 |
| Sig. (2-tailed) | . 006 | . 010 | . 019 | . 178 | . 474 | . 977 | . 291 | . 518 |
| N | 57 | 52 | 51 | 42 | 41 | 41 | 24 | 21 |
| Rhyme Detection |  |  |  |  |  |  |  |  |
| R2 | .385** | .307* | .288* | . 176 | . 103 | . 122 | . 258 | -. 104 |
| Sig. (2-tailed) | . 003 | . 027 | . 040 | . 266 | . 524 | . 447 | . 224 | . 653 |
| N | 57 | 52 | 51 | 42 | 41 | 41 | 24 | 21 |
|  |  |  |  |  |  |  |  |  |
| R2 | .857** | . 784 | .621* | .961* | . 943 | .696** | .882** | . 943 |
| Sig. (2-tailed) | . 000 | . 216 | . 018 | . 039 | . 057 | . 008 | . 004 | . 057 |
| N | 16 | 4 | 14 | 4 | 4 | 13 | 8 | 4 |
| Pseudoword Spelling |  |  |  |  |  |  |  |  |
| R2 | .542* | . 769 | .699** | . 648 | . 778 | .561* | . 509 | . 778 |
| Sig. (2-tailed) | . 030 | . 231 | . 005 | . 352 | . 222 | . 046 | . 198 | . 222 |
| N | 16 | 4 | 14 | 4 | 4 | 13 | 8 | 4 |
| Letter Identification |  |  |  |  |  |  |  |  |
| R2 | .348** | -. 084 | .352* | . 058 | -. 051 | . 259 | .476* | . 029 |
| Sig. (2-tailed) | . 008 | . 554 | . 011 | . 717 | . 753 | . 102 | . 019 | . 900 |
| N | 57 | 52 | 51 | 42 | 41 | 41 | 24 | 21 |

${ }^{*} \mathrm{p}<.05$ (2-tailed), ** $\mathrm{g}<.01$ (2-tailed)

Table 13 Significant Correlations between Phonological Processing Skills and Pseudoword reading (ps) versus Phonological Processing Skills and Word Reading (WRAT) for Native English Speaking JK Students

|  | 96 |  | 97 |  | 98 |  | 99 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| PHONOLOGICAL PROCESSING SKILL | ps | wrat | ps | wrat | ps | wrat | ps | wrat |
| Phoneme Deletion |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  | 420** |  | .331* | .429* | 483* |  |  |
| Sig. (2-tailed) | - | 000 | - | . 014 | . 005 | . 001 |  |  |
| N |  | 50 |  | 55 | 42 | 42 |  |  |
| RAN |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  | -.341* |  | -.307** | -.328* | -.409** |  |  |
| Sig. (2-tailed) | - | 016 | - | . 024 | . 034 | . 007 |  |  |
| N |  | 49 |  | 54 | 42 | 42 |  |  |
| Sig. (2-tailed) | - |  | - |  |  |  |  |  |
| N |  |  |  |  |  |  |  |  |
| $\frac{\text { Phoneme \& Syllable Identification }}{R^{2}}$ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| Sig. (2-tailed) | - |  | - |  |  |  |  |  |
| GFW Sound Mimicry |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  | .291* |  |  |  |  | .526* | 466* |
| Sig. (2-tailed) | - | . 015 | - |  |  |  | 030 | . 045 |
| N |  | 69 |  |  |  |  | 17 | 19 |
| Rhyme Production |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  | .358** |  | .461** | 412** | 508** |  |  |
| Sig. (2-tailed) | - | . 003 | - | . 000 | . 007 | . 001 |  |  |
| N |  | 69 |  | 55 | 42 | 42 |  |  |
| Rhyme Detection |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  | 403** |  | .420** |  |  |  |  |
| Sig. (2-tailed) | - | . 001 |  | . 001 |  |  |  |  |
| N |  | 69 | - | 55 |  |  |  |  |
| Letter Identification |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  | .725** |  | .491** | .365* | .572** |  |  |
| Sig. (2-tailed) | - | . 000 | - | . 000 | . 018 | . 000 |  |  |
| N |  | 69 |  | 55 | 42 | 42 |  |  |

Note. - = no pseudoword measure was administered this year.

```
*p< . }05\mathrm{ (2-tailed). **p < . }01\mathrm{ (2-tailed)
```

Table 14 Significant Correlations between Phonological Processing Skills and Pseudoword Reading (ps) vs Phonological Processing Skills and Word Reading (WRAT) for Native English Speaking SK Students

| PHONOLOGICAL PROCESSING SKILL | 96 |  | 97 |  | 98 |  | 99 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | ps | wrat | ps | wrat | ps | wrat | $\begin{gathered} \mathrm{ps} \\ (\mathrm{cnw}) \end{gathered}$ | $\begin{gathered} \text { ps } \\ \text { (wwa) } \\ \hline \end{gathered}$ | wrat |
| Phoneme Deletion |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  | .434** | .431** | . $384^{* *}$ | .306* | .410* | .365* | . $527^{* *}$ |
| Sig. (2-tailed) | - | - | . 001 | . 001 | . 007 | . 033 | . 013 | . 029 | . 001 |
| N |  |  | 55 | 57 | 48 | 49 | 36 | 36 | 36 |
| RAN |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  | -.294* | -.299* | -.364* | -.327* | -.376* | -.462** |  |
| Sig. (2-tailed) | - | - | . 029 | . 024 | . 011 | . 022 | 024 | . 005 |  |
| N. |  |  | 55 | 57 | 48 | 49 | 36 | 36 |  |
| SR Buttercup |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  |  |  |  |  | -.362* |  |  |
| Sig. (2-tailed) | - | - |  |  |  |  | . 030 |  |  |
| N |  |  |  |  |  |  | 36 |  |  |
| Phoneme \& Syllable Identification |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  | .381** | .478** | .306* |  |  |  |  |
| Sig. (2-tailed) | - | - | . 004 | . 000 | . 035 |  |  |  |  |
| N |  |  | 55 | 57 | 48 |  |  |  |  |
| GFW Sound Mimicry |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  | .320* | .515** | .443** | 517** |  |  | .415** |
| Sig. (2-tailed) | - | - | . 017 | . 000 | . 001 | . 000 |  |  | . 012 |
| $N$ N |  |  | 55 | 67 | 57 | 49 |  |  | 36 |
| Rhyme Production |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  |  |  |  | .284* | .345* | .373* | .400* |
| Sig. (2-tailed) | - | - |  |  |  | . 048 | . 040 | . 025 | . 016 |
| N |  |  |  |  |  | 49 | 36 | 36 | 36 |
| Rhyme Detection |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  | .336* | 427** | . $338{ }^{*}$ | .350* |  |  |  |
| Sig. (2-tailed) | - | - | . 012 | . 001 | . 019 | . 014 |  |  |  |
| N |  |  | 55 | 57 | 48 | 49 |  |  |  |
| Letter Identification |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  | . $388^{* *}$ | .536** | .427** | .368** |  | .472** | .399* |
| Sig. (2-tailed) | - | - | . 003 | . 000 | . 002 | . 009 |  | . 004 | . 016 |
| N |  |  | 55 | 57 | 48 | 49 |  | 36 | 36 |

Note. In 1999 there were 2 measures of pseudo word reading : Coltheart nonword reading (cnw) and the Woodcock Word Attack Subtest from the Woodcock Reading Mastery Tests-Revised (1987) (wwa). - = no pseudoword measure was administered this year.
${ }^{*} \mathrm{p}<.05$ (2-tailed), ${ }^{* *} \mathrm{p}<.01$ (2-tailed)

Table 15 Significant Correlations between Phonological Processing Skills and Pseudoword Reading (ps) vs Phonological Processing Skills and Word Reading (WRAT) for Native English Speaking Grade 1 Students

|  | 96 |  | 97 |  | 98 |  | 99 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| PHONOLOGICAL PROCESSING SKILL | ps | wrat | ps | wrat | ps | wrat | cnw | wwa | wrat |
| Phoneme Recognition 140 |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | . $333{ }^{*}$ | .282* |  |  |  | .382* |  |  |  |
| Sig. (2-tailed) | . 011 | . 033 |  |  |  | . 014 |  |  |  |
| N | 57 | 57 |  |  |  | 41 |  |  |  |
| Phoneme Recognition \& Location $/ 54$ |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .370** | .335* |  |  |  | .361* |  |  |  |
| Sig. (2-tailed) | . 005 | . 011 |  |  |  | . 020 |  |  |  |
| N | 57 | 57 |  |  |  | 41 |  |  |  |
| Phoneme Deletion 116 |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .565** | .569** | .438** | .495** |  | .477* |  | .465* |  |
| Sig. (2-tailed) | . 000 | . 000 | . 001 | . 000 |  | . 002 |  | . 022 |  |
| N | 57 | 57 | 51 | 51 |  | 41 |  | 24 |  |
| Phoneme Deletion \& Substitution /18 |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .697** | .756** | .608** | .639** | .364* | .543** |  | .564** | .455* |
| Sig. (2-tailed) | . 000 | . 000 | . 000 | . 000 | . 021 | . 000 |  | . 004 | . 029 |
| N | 57 | 57 | 51 | 51 | 40 | 41 |  | 24 | 24 |
| RAN |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  | -. $343^{\text {** }}$ |  | -.339* |  |  |  |  |  |
| Sig. (2-tailed) |  | . 009 |  | . 015 |  |  |  |  |  |
| N |  | 57 |  | 51 |  |  |  |  |  |
| Phoneme \& Syllable Identification /16 |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .336* | . 321 * | . 367 ** | .326* |  |  |  |  |  |
| Sig. (2-tailed) | . 011 | . 015 | . 008 | . 019 |  |  |  |  |  |
| N | 57 | 57 | 51 | 51 |  |  |  |  |  |
| Pseudoword Reading /15 |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  | .701** | .584** | .604** | .451** | .419** |  | . $590{ }^{* *}$ | .658** |
| Sig. (2-tailed) | NA | . 000 | . 000 | . 000 | . 003 | . 006 |  | . 002 | . 000 |
| N |  | 57 | 51 | 51 | 40 | 41 |  | 24 | 24 |
| GFW Sound Mimicry $/ 55$ |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .475** | .408* | . $334 *$ | .346* |  | .359* |  |  |  |
| Sig. (2-tailed) | . 000 | . 002 | . 017 | . 013 |  | . 021 |  |  |  |
| N | 57 | 57 | 51 | 51 |  | 41 |  |  |  |
| Rhyme Production |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .424** | . 360 ** |  | .328* |  |  |  |  |  |
| Sig. (2-tailed) | . 001 | . 006 |  | . 019 |  |  |  |  |  |
| N | 57 | 57 |  | 51 |  |  |  |  |  |
| Rhyme Detection /10 |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .512** | .385** |  | .288* |  |  |  |  |  |
| Sig. (2-tailed) | . 000 | . 003 |  | . 040 |  |  |  |  |  |
| N | 57 | 57 |  | 51 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .743** | .857** | . $656{ }^{*}$ | .621* | .736** |  | .843** | .866* | .882** |
| Sig. (2-tailed) | . 001 | . 000 | . 011 | . 018 | . 004 |  | . 009 | . 005 | . 004 |
| N | 16 | 16 | 14 | 14 | 13 |  | 8 | 8 | 8 |
| Pseudo word Spelling /10 |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  | .542* | .635* | .699** |  |  | .829* | .744* |  |
| Sig. (2-tailed) |  | . 030 | . 015 | . 005 |  |  | . 011 | . 034 |  |
| N |  | 16 | 14 | 14 |  |  | 8 | 8 |  |
| Letter Identification /26 |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .448** | .348** | .398** | .352* |  |  |  | .485* | .476* |
| Sig. (2-tailed) | . 000 | . 008 | . 004 | . 011 |  |  |  | . 016 | . 019 |
| N | 57 | 57 | 51 | 51 |  |  |  | 24 | 24 |

${ }^{*} \mathrm{p}<.05$ (2-tailed), **p 01 (2-tailed)

Table 16 Significant Correlations between Phonological Processing Skills and Pseudoword Reading (ps) versus Phonological Processing Skills and Word Reading.(WRAT) for JK ESL Students

|  | 96 |  | 97 |  | 98 |  | 99 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| PHONOLOGICAL PROCESSING SKILL | wrat | ps | wrat | ps | wrat | ps | wrat | ps |
| Phoneme Deletion |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  |  |  | .378* | .416* |  |  |
| Sig. (2-tailed) | - | - | - | - | . 021 | . 010 |  |  |
| N |  |  |  |  | 37 | 37 |  |  |
| RAN |  |  |  |  |  |  |  |  |
| $\frac{\mathrm{R}^{2}}{}$ |  |  |  |  |  | -.339* |  | -.625** |
| Sig. (2-tailed) | - | - | - | - |  | . 040 |  | . 007 |
| N |  |  |  |  |  | 37 |  | 17 |
| SR Buttercup |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  |  |  |  |  |  | -.489* |
| Sig. (2-tailed) | - | - | - | - |  |  |  | . 047 |
| N |  |  |  |  |  |  |  | 17 |
| Phoneme \& Syllable Identification |  |  |  |  |  |  |  |  |
|  |  |  |  |  | .326* |  |  |  |
| Sig. (2-tailed) | - | - | - | - | . 049 |  |  |  |
| N |  |  |  |  | 37 |  |  |  |
| GFW Sound Mimicry |  |  |  |  |  |  |  |  |
|  |  |  |  |  | .397* | $512^{* *}$ |  |  |
| Sig. (2-tailed) | - | - | - | - | . 015 | . 001 |  |  |
| N |  |  |  |  | 37 | 37 |  |  |
| $\frac{\text { Rhyme Production }}{R^{2}}$ |  |  |  |  |  |  |  |  |
| Sig. (2-tailed) | - | - | - | - |  |  |  |  |
| $N$ |  |  |  |  |  |  |  |  |
| Rhyme Detection |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  |  |  | .375* | .410* |  | .505* |
| Sig. (2-tailed) | - | - | - | - | . 022 | . 012 |  | 039 |
| N |  |  |  |  | 37 | 37 |  | 17 |
| Letter Identification |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  |  |  | .589** | .502* |  |  |
| Sig. (2-tailed) | - | - | - | - | . 000 | . 002 |  |  |
| N |  |  |  |  | 37 | 37 |  |  |

Note. - = no pseudoword measure was administered this year.
*p $<.05$ (2-tailed). **p $<.01$ (2-tailed)

Table17 Significant Correlations between Phonological Processing Skills and Pseudoword Reading (ps) versus Phonological Processing Skills and Word Reading (WRAT) for SK ESL Students

| PHONOLOGICAL PROCESSING SKILL | 96 |  | 97 |  | 98 |  | 99 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | wrat | ps | wrat | ps | wrat | ps | wrat | cnw | wwa |
| Phoneme Deletion |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  | .543** | .468** | 418* |  |  |  |  |
| Sig. (2-tailed) | - | - | . 000 | . 001 | . 003 |  |  |  |  |
| N |  |  | 49 | 49 | 48 |  |  |  |  |
| RAN |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  | -.432** | -437** |  | -.366* | -.538** | -.464** | -.486** |
| Sig. (2-tailed) | - | - | . 002 | . 002 |  | . 012 | . 001 | 006 | . 005 |
| N |  |  | 48 | 48 |  | 46 | 33 | 33 | 32 |
| $\underset{R^{2}}{S R \text { Buttercup }}$ |  |  |  |  |  |  |  |  |  |
| Sig. (2-tailed) <br> N | - | - |  |  |  |  |  |  |  |
| Phoneme \& Syllable Identification |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  | .380** | .336* |  |  | .389* |  |  |
| Sig. (2-tailed) | - | - | . 007 | . 018 |  |  | . 023 |  |  |
| N |  |  | 49 | 49 |  |  | 34 |  |  |
| GFW Sound Mimicry |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| Sig. (2-tailed) | - | - |  |  |  |  |  |  |  |
| Rhyme Production |  |  |  |  |  |  |  |  |  |
| $\frac{R^{2}}{}$ |  |  | . $398{ }^{* *}$ |  | .285* | .402** | .542** |  | .441* |
| Sig. (2-tailed) | - | - | . 005 |  | . 050 | . 005 | . 001 |  | . 010 |
| N |  |  | 49 |  | 48 | 47 | 34 |  | 33 |
| Rhyme Detection |  |  |  |  |  |  |  |  |  |
| Sig. (2-tailed) <br> N | - | - |  |  |  |  |  |  |  |
| Letter Identification |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  | 477** | .307* | .463** | .428** | .597** | 519** | .510** |
| Sig. (2-tailed) | - | - | . 001 | . 032 | . 001 | . 003 | . 000 | . 002 | . 002 |
| N |  |  | 49 | 49 | 48 | 47 | 34 | 34 | 33 |

Note. In 1999 there were 2 measures of pseudo word reading: Coltheart nonword reading (cnw) and the Woodcock Word Attack Subtest from the Woodcock Reading Mastery Tests-Revised (1987) (wwa). - = no pseudoword measure was administered this year.

* $\mathrm{p}<.05$ (2-tailed), ** $\mathrm{p}<.01$ (2-tailed)

Table 18 Significant Correlations between Phonological Processing Skills and Pseudoword Reading (ps) versus Phonological Processing Skills and Word Reading (WRAT) for Grade 1 ESL Students

|  | 96 |  | 97 |  | 98 |  | 99 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| PHONOLOGICAL PROCESSING SKILL | wrat | ps | wrat | ps | wrat | ps | wrat | cnw | wwa |
| Phoneme Recognition 140 |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | . $333^{*}$ |  | .305* |  |  |  |  |  |  |
| Sig. (2-tailed) | . 016 |  | . 049 |  |  |  |  |  |  |
| N | 52 |  | 42 |  |  |  |  |  |  |
| Phoneme Recognition \& Location 154 |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  | .398** |  |  |  |  |  |  |  |
| Sig. (2-tailed) |  | . 003 |  |  |  |  |  |  |  |
| N |  | 52 |  |  |  |  |  |  |  |
| Phoneme Deletion /16 |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .639** | .663** | .616* | .583** |  | .480** |  |  |  |
| Sig. (2-tailed) | . 000 | . 000 | . 000 | . 000 |  | . 001 |  |  |  |
| N | 52 | 52 | 42 | 42 |  | 41 |  |  |  |
| Phoneme Deletion \& Substitution /18 |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | . 706 ** | . $628^{* *}$ | .627** | .534** | .484** | .555** |  | .524* |  |
| Sig. (2-tailed) | . 000 | . 000 | . 000 | . 000 | . 001 | . 000 |  | . 015 |  |
| N | 52 | 52 | 42 | 42 | 41 | 41 |  | 21 |  |
| RAN |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | -.302* |  |  |  |  |  |  |  |  |
| Sig. (2-tailed) | . 030 |  |  |  |  |  |  |  |  |
| N | 52 |  |  |  |  |  |  |  |  |
| Phoneme \& Syllable Identification /16 |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .357** | .311* | . 383 * |  |  | .318* |  |  |  |
| Sig. (2-tailed) | . 009 | . 025 | . 012 |  |  | . 043 |  |  |  |
| N | 52 | 52 | 42 |  |  | 41 |  |  |  |
| Pseudoword Reading /15 |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | .681** |  | .658** | .526** | .505** | .438** |  |  |  |
| Sig. (2-tailed) | . 000 | NA | . 000 | . 000 | . 001 | . 004 |  |  |  |
| N | 52 |  | 42 | 42 | 41 | 41 |  |  |  |
| GFW Sound Mimicry $/ 55$ |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ | . 316 * | . $376{ }^{* *}$ | . $396{ }^{* *}$ | .339* |  | .452** |  |  |  |
| Sig. (2-tailed) | . 023 | . 006 | . 009 | . 028 |  | . 003 |  |  |  |
| N | 52 | 52 | 42 | 42 |  | 41 |  |  |  |
| Rhyme Production |  |  |  |  |  |  |  |  |  |
| $R^{2}$ | .352* | .351* |  |  |  |  |  |  |  |
| Sig. (2-tailed) | . 010 | . 011 |  |  |  |  |  |  |  |
| N | 52 | 52 |  |  |  |  |  |  |  |
| Rhyme Detection 110 |  |  |  |  |  |  |  |  |  |
| $R^{2}$ | .307* | .341* |  |  |  |  |  |  |  |
| Sig. (2-tailed) | . 027 | . 013 |  |  |  |  |  |  |  |
| N | 52 | 52 |  |  |  |  |  |  |  |
| Real word Spelling /20 $R^{2}$ |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  | .961* |  | .696** |  |  |  |  |
| Sig. (2-tailed) |  |  | . 039 |  | . 008 |  |  |  |  |
| N |  |  | 4 |  | 13 |  |  |  |  |
| Pseudo word Spelling /10 |  |  |  |  |  |  |  |  |  |
| $\mathrm{R}^{2}$ |  |  |  |  | .561* |  |  |  |  |
| Sig. (2-tailed) $\mathrm{N}$ |  |  |  |  | .046 13 |  |  |  |  |

Note. In 1999 there were 2 measures of pseudo word reading: Coltheart nonword reading (cnw) and the Woodcock Word Attack Subtest from the Woodcock Reading Mastery Tests-Revised (1987) (wwa).

Nonsignificant correlations with Letter Identification and Buttercup Measures were omitted from the table.

- = no pseudoword measure was administered this year.
* $\mathrm{p}<.05$ (2-tailed), ** $\mathrm{p}<.01$ (2-tailed)


## APPENDIX D

|  | L1 NA | ESL NA |
| ---: | ---: | ---: |
| 96 | 1.93 | 1.7 |
| 97 | 6.51 | 5.63 |
| 98 | 13.67 | 11.19 |
| N 96 | 69 | 50 |
| N 97 | 55 | 43 |
| N 98 | 42 | 37 |



|  | L1 NA | ESL NA |
| ---: | ---: | ---: |
| 96 | 73.92 | 76.61 |
| 97 | 63.97 | 67.88 |
| 98 | 49.48 | $50.16 \mid$ |
| 99 | 43.05 | 41.76 |
| N 96 | 68 | 49 |
| N 97 | 55 | 43 |
| N 98 | 42 | 37 |
| N 99 | 17 | 17 |



Jk longitudinal graph

| L1 Na |  | ESL Na |
| :---: | :---: | :---: |
| 96 | 8.96 | 9.13 |
| 97 | 8.39 | 8.03 |
| 98 | 7.09 | 7.34 |
| N 96 | 68 | 50 |
| N 97 | 54 | 43 |
| N 98 | 32 | 32 |



|  | L 1 Na | ESL Na |
| ---: | ---: | ---: |
| 96 | 5.68 | 5.3 |
| 97 | 10.2 | 9.07 |
| 98 | 13.93 | 13.59 |
| N 96 | 69 | 50 |
| N 97 | 55 | 43 |
| N 98 | 42 | 37 |




|  | L1 Na | ESL Na |
| ---: | ---: | ---: |
| 96 | 58.25 | 54.8 |
| 97 | 73.2 | 62.95 |
| 98 | 67.02 | 62.95 |
| N 96 | 69 | 50 |
| N 97 | 55 | 43 |
| N 98 | 42 | 37 |



|  | L1 Na | ESL Na |
| ---: | ---: | ---: |
| 96 | 2.61 | 2.32 |
| 97 | 5.78 | 7.02 |
| 98 | 11.19 | 11.05 |
| N 96 | 69 | 50 |
| N 97 | 55 | 43 |
| N 98 | 42 | 37 |



|  | L1 Na | ESL Na |
| ---: | ---: | ---: |
| 96 | 4.57 | 3.52 |
| 97 | 6.47 | 5.63 |
| 98 | 9.33 | 8.62 |
| N 96 | 69 | 50 |
| N 97 | 55 | 43 |
| N 98 | 42 | 37 |

Rhyme Detection JK-G1


|  | L1 Na | ESL Na |
| ---: | ---: | ---: |
| 96 | 11.94 | 11.2 |
| 97 | 19.96 | 20.45 |
| 98 | 25.36 | 25.3 |
| N 96 | 69 | 50 |
| N 97 | 55 | 42 |
| N 98 | 42 | 37 |



|  | L1 Na | ESL Na |
| ---: | ---: | ---: |
| 96 | 42.61 | 34.46 |
| 97 | 56.73 | 52.33 |
| 98 | 70.48 | 66.22 |
| 99 | 85 | 82.89 |
| N 96 | 69 | 49 |
| N 97 | 55 | 43 |
| N 98 | 42 | 37 |
| N 99 | 19 | 19 |



|  | L1 Na | ESL Na |
| ---: | ---: | ---: |
| 96 | 8.8 | 8.34 |
| 97 | 15.11 | 14.72 |
| 98 | 23.17 | 22.84 |
| 99 | 29 | 27.11 |
| $\mathbf{N ~ 9 6}$ | 70 | 50 |
| $\mathbf{N} 97$ | 55 | 43 |
| $\mathbf{N} 98$ | 42 | 37 |
| $\mathbf{N} 99$ | 19 | 19 |



|  | L1 Na | ESL Na |
| ---: | ---: | ---: |
| 96 | 50.53 | 48.06 |
| 97 | 62.74 | 62.86 |
| 98 | 59.43 | 63.9 |
| 99 | 53.58 | 43.89 |
| N 96 | 70 | 50 |
| N 97 | 55 | 43 |
| N 98 | 42 | 37 |
| N 99 | 19 | 19 |

WRAT-3 Reading Mean \%ile Scores JK-G2


|  | L1 Na | ESL Na | L1 Rd | ESL Rd |  |
| ---: | ---: | ---: | ---: | ---: | ---: |
| 96 | $\mathbf{6 . 1 7}$ | $\mathbf{4 . 1 6}$ | 2.67 | 0 |  |
| 97 | $\mathbf{1 3 . 0 8}$ | $\mathbf{1 2 . 8 8}$ | 8.57 | 9 |  |
| 98 | $\mathbf{1 5 . 6 2}$ | $\mathbf{1 5 . 6 1}$ | 13.5 | 13.57 |  |
| N 96 | $\mathbf{5 8}$ | $\mathbf{4 3}$ | 9 | 8 |  |
| N 97 | $\mathbf{5 0}$ | $\mathbf{4 2}$ | 7 | 7 |  |
| N 98 | $\mathbf{4 2}$ | $\mathbf{4 1}$ | 6 | 7 |  |



|  | L1 Na | ESL Na | L1 Rd | ESL Rd |  |
| ---: | ---: | ---: | ---: | ---: | ---: |
| 97 | $\mathbf{1 0 . 1}$ | $\mathbf{8 . 7 6}$ | 5.71 | 6.14 |  |
| 98 | $\mathbf{1 3 . 7 9}$ | $\mathbf{1 4 . 4}$ | 10.67 | $\mathbf{1 1 . 5 7}$ |  |
|  |  |  |  |  |  |
| N 97 | $\mathbf{4 8}$ | $\mathbf{4 2}$ | 7 | 7 |  |
| N 98 | $\mathbf{4 3}$ | $\mathbf{4 0}$ | 6 | 7 |  |




Buttercup Speech Rate SK-G2


|  |  | L1 Na | ESL Na | L1 Rd | ESL Rd |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | 96 | 9.69 | 9.3 | 5.11 | 6.38 |
|  | 97 | 13.4 | 13.19 | 11 | 12.86 |
|  | 98 | 14.79 | 14.77 | 14.33 | 14.43 |
| N 96 |  | 58 | 43 | 9 | 8 |
| N 97 |  | 50 | 42 | 7 | 7 |
| N 98 |  | 42 | 40 | 6 | 7 |

Phoneme \& Syllable Identification SK-G2


|  | L1 NA | ESL NA | L1 RD | ESL RD |
| ---: | ---: | ---: | ---: | ---: |
| 96 | $\mathbf{4 5 . 0 7}$ | $\mathbf{4 3 . 8 8}$ | 30.44 | 39.25 |
| 97 | $\mathbf{5 0 . 2 2}$ | $\mathbf{5 0 . 1 7}$ | $\mathbf{4 7 . 4 3}$ | $\mathbf{4 8 . 4 3}$ |
| 98 | $\mathbf{5 1 . 2 4}$ | $\mathbf{5 0 . 4}$ | $\mathbf{4 7 . 3 3}$ | $\mathbf{4 8 . 8 6}$ |
| N 96 | $\mathbf{5 8}$ |  | $\mathbf{4 3}$ | 9 |
| N 97 | $\mathbf{5 0}$ | $\mathbf{4 2}$ | 7 | 8 |
| N 98 | $\mathbf{4 2}$ | $\mathbf{4 0}$ | 6 | 7 |




|  | L1 Na |  | ESL Na | L1 Rd | ESL Rd |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | 97 | 7.27 | 6.29 | 5 | 4.43 |
|  | 98 | 10.7 | 10.47 | 8.2 | 7.71 |
| N 97 |  | 48 | 42 | 7 | 7 |
| N 98 |  | 43 | 40 | 5 | 7 |

Pseudoword Reading G1-G2



|  | L1 NA | ESL NA | L1 RD | ESL RD |  |
| ---: | ---: | ---: | ---: | ---: | ---: |
| 96 | $\mathbf{6 . 6 6}$ | $\mathbf{4 . 6 5}$ | 4.89 | 2.5 |  |
| 97 | $\mathbf{9}$ | $\mathbf{7 . 9 3}$ | 5.71 | 4.29 |  |
| 98 | $\mathbf{9 . 6 4}$ | $\mathbf{9 . 8 8}$ | 9 | 8.57 |  |
| N 96 |  | $\mathbf{5 8}$ | $\mathbf{4 3}$ | 9 |  |
| N 97 | $\mathbf{5 0}$ | $\mathbf{4 2}$ | 7 | $\mathbf{7}$ |  |
| N 98 | $\mathbf{4 2}$ | $\mathbf{4 0}$ | 6 | 7 |  |

Rhyme Detection Mean Scores, SK-G2


|  | L1 NA | ESL NA |  | L1 RD | ESL RD |  |
| ---: | ---: | ---: | ---: | ---: | ---: | :---: |
| 97 | $\mathbf{9}$ | $\mathbf{8 . 1}$ | 2.86 | 3.86 |  |  |
| 98 | $\mathbf{1 5 . 8 1}$ | $\mathbf{1 6 . 2 8}$ | 10.5 | 13.14 |  |  |
|  |  |  |  |  |  |  |
| N 97 | $\mathbf{4 8}$ | $\mathbf{4 2}$ | 7 | 7 |  |  |
| N 98 | $\mathbf{4 2}$ | $\mathbf{4 0}$ | 6 | 7 |  |  |

Realword Spelling Mean Scores G1-G2


|  |  | L1 NA | ESL NA | L1 RD | ESL RD |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | 97 | 3.44 | 3.31 | 1.86 | 2.43 |
|  | 98 | 5.26 | 4.83 | 3.8 | 3.17 |
| N 97 |  | 48 | 42 | 7 | 7 |
| N 98 |  | 38 | 35 | 5 | 6 |




|  | L1 NA | ESL NA | L1 RD | ESL RD |
| ---: | ---: | ---: | ---: | ---: |
| 96 | $\mathbf{5 1 . 3 3}$ | $\mathbf{4 2 . 1 9}$ | 39.05 | 38.57 |
| 97 | $\mathbf{7 0 . 9}$ | $\mathbf{6 1 . 4 3}$ | 62.86 | 57.14 |
| 98 | $\mathbf{8 0 . 7 1}$ | $\mathbf{7 7 . 6 3}$ | 72.5 | 67.14 |
| 99 | $\mathbf{7 7 . 3 3}$ | $\mathbf{7 5 . 0 5}$ | $\mathbf{7 2}$ | 62.86 |
| N 96 | $\mathbf{5 8}$ | $\mathbf{4 3}$ | 9 | 8 |
| N 97 | $\mathbf{5 0}$ | $\mathbf{4 2}$ | 7 | 7 |
| N 98 | $\mathbf{4 2}$ | $\mathbf{4 0}$ | 6 | 7 |
| N 99 | $\mathbf{3 1}$ | $\mathbf{3 0}$ | 5 | 4 |

Syntax Error Judgement \% Score SK-G3


|  | L1 NA | ESL NA | L1 RD | ESL RD |  |
| ---: | ---: | ---: | ---: | ---: | ---: |
| 96 | $\mathbf{1 4 . 9 8}$ | $\mathbf{1 4 . 7 3}$ | 5.33 | 6.5 |  |
| 97 | $\mathbf{2 4 . 0 2}$ | $\mathbf{2 2 . 6 9}$ | 16.57 | 19.14 |  |
| 98 | $\mathbf{2 8 . 7 4}$ | $\mathbf{2 8 . 2 4}$ | 23 | 24.86 |  |
| 99 | $\mathbf{3 2 . 0 3}$ | $\mathbf{3 2 . 2 7}$ | $\mathbf{2 6 . 8}$ | $\mathbf{2 5 . 7 5}$ |  |
| N 96 | $\mathbf{5 8}$ | $\mathbf{4 4}$ | 9 | 8 |  |
| N 97 | $\mathbf{5 0}$ | $\mathbf{4 2}$ | 7 | 7 |  |
| N 98 | $\mathbf{4 3}$ | $\mathbf{4 1}$ | 6 | 7 |  |
| N 99 | $\mathbf{3 1}$ | $\mathbf{3 0}$ | 5 | 4 |  |



|  | L1 NA | ESL NA | L1 RD | ESL RD |
| ---: | ---: | ---: | ---: | ---: | ---: |
| 96 | $\mathbf{6 6 . 4 1}$ | $\mathbf{6 5 . 6 4}$ | 10.78 | 12.62 |
| 97 | $\mathbf{7 3 . 5 8}$ | $\mathbf{7 0 . 7 4}$ | 35.71 | 44.86 |
| 98 | $\mathbf{5 9 . 8 8}$ | $\mathbf{5 5 . 8}$ | 23.5 | 31.43 |
| 99 | $\mathbf{5 7 . 0 3}$ | $\mathbf{5 7 . 7 7}$ | 23 | $\mathbf{1 8 . 2 5}$ |
| N 96 | $\mathbf{5 8}$ | $\mathbf{4 4}$ | 9 | 8 |
| N 97 | $\mathbf{5 0}$ | $\mathbf{4 2}$ | 7 | 7 |
| N 98 | $\mathbf{4 3}$ | $\mathbf{4 1}$ | 6 | 7 |
| N 99 | $\mathbf{3 1}$ | $\mathbf{3 0}$ | 5 | 4 |



L1 NA ESL NA L1 RD ESL RD

| 97 | $\mathbf{4 8 . 1 3}$ | $\mathbf{4 1 . 7 4}$ | 22.86 | 24.67 |
| ---: | ---: | ---: | ---: | ---: |
| 98 | $\mathbf{6 5 . 7 7}$ | $\mathbf{6 4 . 4 4}$ | 48 | 58.43 |
| N 97 | $\mathbf{4 8}$ | $\mathbf{4 2}$ | 7 | 6 |
| N 98 | $\mathbf{4 3}$ | $\mathbf{4 1}$ | 6 | 7 |

Bridge Words G1-G2


|  | L1 NA | ESL NA | L1 RD | ESL RD |  |
| ---: | ---: | ---: | ---: | ---: | ---: |
| 97 | $\mathbf{2 7 . 6 4}$ | $\mathbf{2 5 . 6 2}$ | 13.57 | 17.43 |  |
| 98 | $\mathbf{3 6 . 5 5}$ | $\mathbf{3 5 . 9}$ | 24.67 | 31.29 |  |
| N 97 |  |  |  |  |  |
| N 98 | $\mathbf{4 2}$ | $\mathbf{4 2}$ | 7 | 7 |  |
|  |  |  |  | 6 | 7 |

Linda Experimental Words Mean Scores, G1-G2


|  | L1 NA | ESL Na | L1 Rd | ESL Rd |  |
| ---: | ---: | ---: | ---: | ---: | :---: |
| 97 | $\mathbf{3 3 . 7 8}$ | $\mathbf{2 8 . 7 9}$ | 12.86 | 12.71 |  |
| 98 | $\mathbf{5 9 . 1 2}$ | $\mathbf{5 7 . 9 5}$ | 30 | 37.57 |  |
| N 97 |  | $\mathbf{5 0}$ | $\mathbf{4 2}$ |  |  |
| N 98 | $\mathbf{4 2}$ | $\mathbf{4 0}$ | 6 | 7 |  |
|  |  |  |  |  |  |

British Ability Scales Reading Mean Scores G1-G2


|  | L1 NA | ESL NA |
| ---: | ---: | ---: |
| 96 | 93.85 | 93.26 |
| 97 | 96.38 | 98.61 |
| 98 | 99.54 | 99.7 |
| N 96 | 53 | 47 |
| N 97 | 23 | 16 |
| N 98 | 36 | 37 |



|  | L1 NA | ESL NA |
| ---: | ---: | ---: |
| 96 | 12.58 | 12.04 |
| 97 | 15.15 | 15.21 |
| 98 | 15.67 | 15.86 |
| N 96 | 53 | 47 |
| N 97 | 47 | 39 |
| N 98 | 36 | 37 |

Phoneme Deletion Mean Scores, G1-G3


|  | L1 NA | ESL NA |
| ---: | ---: | ---: |
| 96 | 10.87 | 9.4 |
| 97 | 13.32 | 12.73 |
| 98 | 15.75 | 16.05 |
| N 96 | 53 | 47 |
| N 97 | 34 | 26 |
| N 98 | 36 | 37 |

Phoneme Deletion \& Substitution Mean Scores, G1-G3


|  | L1 NA | ESL NA |
| ---: | ---: | ---: |
| 97 | 24.29 | 26.06 |
| 98 | 30.92 | 30.86 |
| 99 | 32.71 | 31.74 |
| N 97 | 41 | 33 |
| N 98 | 36 | 37 |
| N 99 | 21 | 19 |

Rosner Auditory Analysis Mean Scores, G2-G4


|  | L1 NA | ESL NA |
| ---: | ---: | ---: |
| 96 | 50.43 | 46.87 |
| 97 | 42.98 | 40 |
| 98 | 38.29 | 36.23 |
|  |  |  |
| N 96 | 53 | 47 |
| N 97 | 47 | 39 |
| N 98 | 36 | 37 |



|  | L1 NA | ESL NA |
| ---: | ---: | ---: |
| 96 | 6.98 | 7.65 |
| 97 | 6.41 | 6.89 |
| 98 | 5.8 | 5.77 |
| N 96 |  |  |
| N 97 | 47 | 47 |
| N 98 | 36 | 39 |
|  |  | 37 |

Buttercup Speech Rate Mean Scores, G1-G3


| L1 NA |  | ESL NA |
| :---: | :---: | :---: |
| 97 | 13.32 | 13.51 |
| 98 | 14.36 | 14.49 |
| N 97 | 47 | 39 |
| N 98 | 36 | 37 |
|  | Phoneme \& Syllable Identification Mean Scores, G2-G3 |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  | 97 |  |


|  | L1 NA | ESL NA |
| ---: | ---: | ---: |
| 96 | 50.11 | 47.64 |
| 97 | 51.91 | 50.49 |
| 98 | 52.08 | 51.86 |
| N 96 |  |  |
| N 97 | 47 | 47 |
| N 98 | 36 | 39 |
|  |  | 37 |

GFW Sound Mimicry Subtest Mean Scores, G1-G3



|  | L1 NA | ESL NA |
| ---: | ---: | ---: |
| 96 | 8.02 | 7.17 |
| 97 | 10.51 | 9.59 |
| 98 | 12.14 | 12 |
| N 96 |  |  |
| N 97 | 43 | 47 |
| N 98 | 37 | 39 |
|  |  | 36 |



|  | L1 NA | ESL NA |
| :--- | ---: | ---: |
|  | 96 | 9.06 |
|  | 97 | 11.28 |
|  | 98 | 11.15 |
|  |  |  |
| N 96 |  | 15.35 |
| N 97 |  | 53 |
| N 98 |  | 47 |
|  |  | 36 |



|  |  | L1 NA | ESL NA |
| :---: | :---: | :---: | :---: |
|  | 96 | 8.53 | 7.51 |
|  | 97 | 9.55 | 9.44 |
|  | 98 | 9.92 | 9.97 |
| N 96 |  | 53 | 47 |
| N 97 |  | 47 | 39 |
| N 98 |  | 36 | 37 |



|  |  |  |
| ---: | ---: | ---: |
| 97 | 16.6 | ESL NA |
| 98 | 19.62 |  |
| N 97 |  | 18.7 |
| N 98 | 47 | 39 |
|  | 36 | 37 |

Realword Spelling Mean Scores, G2-G3


|  | L1 NA | ESL NA |
| ---: | ---: | ---: |
| 97 | 4.85 | 3.92 |
| 98 | 5.61 | 5.57 |
| N 97 |  | 47 |
| N 98 | 18 | 39 |
|  |  | 14 |

Pseudoword Spelling Mean Scores, G2-G3



|  | L1 NA | ESL NA |
| ---: | ---: | ---: |
| 96 | 2.04 | 1.78 |
| 97 | 3.53 | 3.26 |
| 98 | 5.58 | 4.76 |
| 99 | 6.81 | 5.68 |
| N 96 | 53 | 46 |
| N 97 | 47 | 39 |
| N 98 | 36 | 37 |
| N 99 | 21 | 19 |



|  | L1 NA | ESL NA |
| :--- | ---: | ---: |
|  | 96 | 58.06 |
|  | 97 | 75.64 |
|  | 98 | 71.41 |
|  | 94 | 74.31 |
| N 96 |  | 85.14 |
| N 97 | 53 | 77 |
| N 98 | 47 | 47 |
| N 99 | 36 | 39 |
|  | 21 | 19 |



|  | L1 NA | ESL NA |
| :--- | ---: | ---: |
|  | 96 | 25.43 |
|  | 24.04 |  |
|  | 29.91 | 28.87 |
|  | 98 | 34.68 |
| N 96 | 37.48 | 35.11 |
| N 97 | 53 | 47 |
| N 98 | 47 | 39 |
| N 99 | 37 | 37 |
|  | 21 | 19 |



|  | L1 NA | ESL NA |
| ---: | ---: | ---: |
| 96 | 75.62 | 72.91 |
| 97 | 66.15 | 61.47 |
| 98 | 71 | 66.03 |
| 99 | 71.29 | 61.53 |
| N 96 | 53 | 47 |
| N 97 | 47 | 39 |
| N 98 | 37 | 37 |
| N 99 | 21 | 19 |



|  | L1 NA | ESL NA |
| ---: | ---: | ---: |
| 96 | 115.34 | 112.23 |
| 97 | 108.45 | 105.36 |
| 98 | 111.65 | 108.43 |
| 99 | 111.48 | 105.21 |
| N 96 | 53 | 47 |
| N 97 | 47 | 39 |
| N 98 | 37 | 37 |
| N 99 | 21 | 19 |

WRAT-3 Reading Mean Standard Scores, G1-G4


|  | L1 NA | ESL NA |
| :--- | ---: | ---: |
| G1 96 | 54.23 | 50.4 |
| G2 97 | 66.26 | 66.15 |
| G3 98 | 68.86 | 68.86 |
|  |  |  |
| N 96 | 53 | 47 |
| N 97 | 47 | 39 |
| N 98 | 36 | 37 |



|  | L1 NA | ESL NA |
| ---: | ---: | ---: |
| G1 96 | 29.02 | 26.77 |
| G2 97 | 35.81 | 34.72 |
| G3 98 | 39.14 | 39.03 |
| N 96 |  |  |
| N 93 | 47 | 47 |
| N 98 | 36 | 39 |

Linda Experimental Words Mean Scores, G1-G3


|  | L1 NA | ESL NA |
| :--- | ---: | ---: |
| G1 96 | 41.3 | 34.68 |
| G2 97 | 65.26 | 59.72 |
| G3 98 | 77.11 | 74.68 |
|  |  |  |
| N 96 | 53 | 47 |
| N 97 | 47 | 39 |
| N 98 | 36 | 37 |



|  | $\mathrm{Na} \mathrm{\& Rd}$ | N |
| :--- | ---: | ---: |
| L1 | 1.93 | 63 |
| ESL | 1.7 | 50 |



|  | Na \& Rd | N |
| :--- | ---: | ---: |
| L1 | 73.92 | 68 |
| ESL | 76.61 | 49 |



|  | Na \& Rd | N |
| :--- | ---: | ---: |
| L1 | 38.45 | 68 |
| ESL | 36.88 | 50 |



|  | Na \& Rd | N |
| :--- | ---: | ---: |
| L1 | 58.25 | 69 |
| ESL | 54.8 | 50 |



|  | Na\&Rd | $\mathbf{N}$ |
| :--- | ---: | ---: |
| L1 | 2.61 | 69 |
| ESL | 2.32 | 50 |



|  | Na\&Rd | N |
| :--- | ---: | ---: |
| L1 | 4.57 | 69 |
| ESL | 3.52 | 50 |



|  | Na \& Rd | N |
| :--- | ---: | ---: |
| L1 | 13.83 | 69 |
| ESL | 10.48 | 50 |



|  | Na \& Rd | N |
| :--- | ---: | ---: |
| L1 | 42.61 | 69 |
| ESL | 34.46 | 49 |



|  | Na \& Rd | N |
| :--- | ---: | ---: |
| L1 | 8.83 | 70 |
| ESL | 8.34 | 50 |

JK WRAT-3 Reading Subtest Mean Scores


|  | Na \& Rd | N |
| :--- | ---: | ---: |
| L1 | 50.53 | 70 |
| ESL | 48.06 | 50 |

JK WRAT-3 Reading Subtest Mean \%ile Scores


|  | Rd \& Na | N |
| :--- | ---: | ---: |
| L1 | 5.7 | 69 |
| ESL | 5.3 | 50 |



|  | Na \& Rd | N |
| :--- | ---: | ---: |
| L1 | 11.94 | 69 |
| ESL | 11.2 | 50 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 6.05 | 2.38 | 136 | 16 |
| ESL | 4.75 | 0.62 | 88 | 13 |



|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 63.08 | 76.43 | 136 | 17 |
| ESL | 63.46 | 79.09 | 87 | 13 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 9.87 | 5.19 | 136 | 16 |
| ESL | 9.24 | 5.46 | 88 | 13 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 20.94 | 5.44 | 135 | 16 |
| ESL | 21.74 | 6.85 | 88 | 13 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 45.34 | 36.38 | 136 | 13 |
| ESL | 44.23 | 36.85 | 88 | 13 |

SK Mean GFW Sound Mimicry Subtest Scores


|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 66.34 | 38.63 | 136 | 16 |
| ESL | 62.94 | 45.62 | 87 | 13 |

SK Mean GFW Sound Mimicry Subtest Percentile Scores


|  | NA | RD | $\mathbf{N}$ | $\mathbf{N}$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 5.57 | 2.25 | 136 | 16 |
| ESL | 4.7 | 1.77 | 88 | 13 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 6.51 | 4.59 | 136 | 17 |
| ESL | 4.83 | 3.08 | 88 | 13 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 15.73 | 11.94 | 136 | 77 |
| ESL | 12.74 | 11.08 | 88 | 13 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 46.57 | 35.8 | 136 | 17 |
| ESL | 37.89 | 35.93 | 88 | 13 |



|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 15.34 | 4.82 | 136 | 17 |
| ESL | 15.59 | 6.54 | 88 | 13 |

SK Mean WRAT-3 Reading Subtest Scores


|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 64.76 | 10.12 | 136 | 17 |
| ESL | 70.22 | 12.31 | 88 | 13 |

SK Mean WRAT-3 Reading Subtest Percentile Scores


|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 97.63 | 91.57 | 188 | 18 |
| RD | 96.82 | 93.01 | 144 | 13 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 94.78 | 81.48 | 188 | 18 |
| RD | 93.4 | 83.05 | 144 | 13 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 12.79 | 7.61 | 188 | 18 |
| ESL | 12.47 | 5.77 | 144 | 13 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 9.73 | 4.61 | 188 | 18 |
| ESL | 9.23 | 4.46 | 144 | 13 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 51.75 | 60.11 | 188 | 18 |
| ESL | 46.94 | 57.54 | 144 | 13 |



|  | 1 | NA | RD | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 13.1 | 11.11 | 188 | 18 |
| LI | 13.15 | 10.46 | 144 | 13 |



|  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: |
|  | NA | RD | N | N |
| L1 | 49.22 | 44.64 | 188 | 18 |
| ESL | 48.64 | 43.92 | 144 | 13 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 71.46 | 50.83 | 188 | 18 |
| ESL | 70.29 | 40.46 | 144 | 13 |



|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 111.53 | 83.33 | 188 | 18 |
| ESL | 111.58 | 88 | 144 | 13 |



|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 33.74 | 9.39 | 188 | 18 |
| ESL | 32.89 | 10.31 | 144 | 13 |



|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 23.88 | 15 | 188 | 18 |
| ESL | 23.65 | 17.62 | 144 | 13 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 70.51 | 15.33 | 188 | 18 |
| ESL | 72.53 | 21.23 | 144 | 13 |



|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 2.23 | 1.44 | 188 | 18 |
| ESL | 2.03 | 1.46 | 142 | 13 |



|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 65.6 | 57.46 | 188 | 18 |
| ESL | 61.01 | 60.71 | 144 | 13 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 8.62 | 2.07 | 150 | 15 |
| ESL | 9.44 | 2.25 | 101 | 8 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 3.27 | 1.27 | 143 | 15 |
| ESL | 3.09 | 1.29 | 94 | 7 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 9.78 | 5.83 | 188 | 18 |
| ESL | 9.19 | 6.23 | 144 | 13 |



|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 8.81 | 6.06 | 188 | 18 |
| ESL | 7.9 | 6.46 | 144 | 13 |

G1 Means Rhyme Detection Scores


|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 7.07 | 3.22 | 188 | 18 |
| ESL | 6.7 | 1.69 | 144 | 13 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 47.91 | 17.39 | 188 | 18 |
| ESL | 48.21 | 20.25 | 144 | 12 |



|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 15.51 | 13.29 | 117 | 21 |
| ESL | 15.45 | 12.18 | 99 | 17 |



|  | NA | RD | N |  |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 13.66 | 8.59 | 117 | 27 |
| ESL | 13.88 | 8.47 | 103 | 17 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 23.84 | 14.2 | 112 | 20 |
| ESL | 26.72 | 12.53 | 93 | 17 |

G2 Mean Scores for Rosner Auditory Analysis Task


|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 43.93 | 50.58 | 142 | 28 |
| ESL | 39.45 | 49.46 | 117 | 20 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 14.18 | 13.14 | 117 | 21 |
| ESL | 14.14 | 13.18 | 99 | 17 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 10.83 | 5.67 | 142 | 27 |
| ESL | 10.23 | 5.6 | 116 | 20 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 51.76 | 48.43 | 117 | 21 |
| ESL | 50.54 | 47.59 | 99 | 17 |

G2 Mean GFW Sound Mimicry Subtest Scores


|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 78.15 | 52.71 | 116 | 21 |
| ESL | 69.75 | 46.06 | 99 | 17 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 13.14 | 10.57 | 117 | 21 |
| ESL | 12.67 | 9.82 | 99 | 17 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 9.73 | 8.62 | 117 | 21 |
| ESL | 9.63 | 8.41 | 99 | 17 |



|  | NA | RD | N | $\mathbf{N}$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 16.91 | 9.75 | 141 | 28 |
| ESL | 16.87 | 10.3 | 116 | 20 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 5.38 | 2.04 | 133 | 28 |
| ESL | 4.43 | 2.39 | 110 | 18 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 3.76 | 2.54 | 141 | 28 |
| ESL | 3.44 | 2.7 | 116 | 20 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 79.33 | 69.64 | 141 | 28 |
| ESL | 75.6 | 68.75 | 116 | 20 |



|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 30.16 | 22 | 142 | 28 |
| ESL | 29.18 | 22.45 | 117 | 20 |



|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 66.52 | 16 | 142 | 28 |
| ESL | 63.32 | 15.15 | 117 | 20 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 107.81 | 83.89 | 142 | 28 |
| ESL | 106.09 | 83.95 | 117 | 20 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 66.83 | 50.61 | 142 | 28 |
| ESL | 66.73 | 51.95 | 117 | 20 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 36.88 | 25.86 | 141 | 28 |
| ESL | 36.45 | 27.95 | 116 | 20 |



|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 63.38 | 28.57 | 117 | 21 |
| ESL | 61.93 | 29.88 | 99 | 17 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 15.47 | 51 |
| ESL | 15.9 | 50 |



|  | NA | RD | $N$ | $N$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 29.07 | 14 | 103 | 11 |
| ESL | 30.49 | 18.4 | 67 | 10 |



|  | NA | $N$ |  |
| :--- | ---: | ---: | ---: |
| L1 | 38.95 | 51 |  |
| ESL | 35.16 | 50 |  |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 14.31 | 51 |
| ESL | 14.44 | 50 |



|  | NA | $N$ |
| :--- | ---: | ---: |
| L1 | 27.19 | 52 |
| ESL | 27.94 | 16 |



|  | NA | $N$ |
| :--- | ---: | ---: |
| LI | 48.42 | 52 |
| ESL | 49.94 | 16 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 11.9 | 51 |
| ESL | 12.04 | 50 |



|  | NA | $N$ |
| :--- | ---: | ---: |
| L1 | 26.65 | 52 |
| ESL | 27.65 | 17 |



|  | NA | $N$ |
| :--- | ---: | ---: |
| L1 | 16.82 | 51 |
| ESL | 15.78 | 50 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 13.78 | 51 |
| ESL | 14.47 | 17 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 18.8 | 51 |
| ESL | 18.82 | 50 |



|  | NA | $N$ |
| :--- | ---: | ---: |
| L1 | 6.15 | 33 |
| ESL | 6.05 | 19 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 73.69 | 51 |
| ESL | 74.74 | 50 |



|  | NA | $\mathbf{N}$ |
| :--- | ---: | ---: |
| L1 | 35.48 | 52 |
| ESL | 36.19 | 16 |



|  | NA | $N$ |
| :--- | ---: | ---: |
| L1 | 62.89 | 52 |
| ESL | 65.12 | 16 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 59.75 | 52 |
| ESL | 63.06 | 16 |



|  | NA | $N$ |
| :--- | ---: | ---: |
| L1 | 12.04 | 49 |
| ESL | 12.53 | 17 |



|  | NA | $\mathbf{N}$ |
| :--- | ---: | ---: |
| L1 | 8.16 | 49 |
| ESL | 8.71 | 17 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 28.98 | 49 |
| ESL | 30.18 | 17 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 66.1 | 49 |
| ESL | 74.35 | 17 |



|  | NA | RD | $\mathbf{N}$ | $\mathbf{N}$ |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 33.34 | 25.64 | 104 | 11 |
| ESL | 33.18 | 24.9 | 67 | 10 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 64.98 | 16.73 | 104 | 11 |
| ESL | 63.94 | 15.2 | 67 | 10 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 5.07 | 4.18 | 103 | 11 |
| ESL | 4.77 | 4.4 | 66 | 10 |



|  | NA | RD | N | N |
| :--- | ---: | ---: | ---: | ---: |
| L1 | 81.03 | 68.7 | 103 | 11 |
| ESL | 81.76 | 70.79 | 67 | 10 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 26.9 | 49 |
| ESL | 29.94 | 17 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 30.88 | 52 |
| ESL | 31.44 | 16 |

G3 One Minute WRAT Reading Mean Scores


|  | NA | N |
| :--- | ---: | ---: |
| L1 | 37.71 | 49 |
| ESL | 40.12 | 17 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 53.76 | 49 |
| ESL | 54.88 | 16 |



|  | NA | $N$ |
| :--- | ---: | ---: |
| L1 | 30.64 | 44 |
| ESL | 32.52 | 21 |



|  | NA | $N$ |
| :--- | ---: | ---: |
| L1 | 14.52 | 42 |
| ESL | 14.67 | 21 |



|  | NA | $N$ |
| :--- | ---: | ---: |
| L1 | 31.68 | 44 |
| ESL | 33.14 | 21 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 56.5 | 44 |
| ESL | 62.14 | 21 |



|  | NA | $n$ |
| :--- | ---: | ---: |
| L1 | 14.33 | 42 |
| ESL | 13.48 | 21 |



|  | NA | $n$ |
| :--- | ---: | ---: |
| L1 | 7.88 | 42 |
| ESL | 8.3 | 20 |



|  | NA | $n$ |
| :--- | ---: | ---: |
| L1 | 30.6 | 42 |
| ESL | 30.76 | 21 |



|  | NA | $n$ |
| :--- | ---: | ---: |
| L1 | 60.64 | 42 |
| ESL | 59.62 | 21 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 5.61 | 44 |
| ESL | 5.29 | 21 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 76.56 | 44 |
| ESL | 77.55 | 21 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 37.11 | 44 |
| ESL | 35.76 | 21 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 68.55 | 44 |
| ESL | 63.48 | 21 |

G4 WRAT-3 Reading Mean Percentile Scores


|  | NA | N |
| :--- | ---: | ---: |
| L1 | 73.79 | 43 |
| ESL | 71.33 | 21 |



|  | NA | $N$ |
| :--- | ---: | ---: |
| L1 | 59.67 | 43 |
| ESL | 52.71 | 21 |



|  | NA | $n$ |
| :--- | ---: | ---: |
| L1 | 39.59 | 44 |
| ESL | 39.05 | 21 |



|  | NA | $n$ |
| :--- | ---: | ---: |
| LI | 35.57 | 44 |
| ESL | 35.81 | 21 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 37.76 | 42 |
| ESL | 39.1 | 21 |



|  | NA | $N$ |
| :--- | ---: | ---: |
| L1 | 44 | 42 |
| ESL | 46.1 | 21 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 29.95 | 42 |
| ESL | 30.9 | 21 |



|  | NA | N |
| :--- | ---: | ---: |
| L1 | 55.6 | 42 |
| ESL | 64.38 | 32.33 |




[^0]:    * Missing Values in data files

    L1 =Native English Speakers, ESL=English as a Second Language Speakers, RD=Reading Disabled, NA=Normal Achieving Readers

[^1]:    ${ }^{*} p<.05$ (2-tailed), ** $\mathrm{p}<.01$ (2-tailed)

