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Reading and Test Taking in College English as a Second Language Students

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Abstract

Throughout the United States the number of students who speak English as a second language (ESL) enrolled in United States colleges and universities has been increasing steadily over the past 20 years. ESL students may be considered an at-risk group for performance on reading comprehension portions of classroom and high stakes tests (HST) like the SAT. However, little research has examined the test taking behaviors and skills of ESL college students on timed tests of reading comprehension. The present study assessed 84 ESL and 84 native English speaking (L1) college students on a variety of measures commonly associated with HST. Results revealed that ESL students performed poorer on tests of reading speed, reading comprehension, vocabulary, and word recognition. Despite their lower reading comprehension performance, ESL students did not engage in different testing behaviors or test taking strategies compared to the L1 students. ESL students reported lower confidence in their abilities to perform on reading tests than the L1 students but did not report higher test anxiety. Vocabulary was the strongest predictor of reading comprehension performance for the ESL students. Implications of these findings as well as limitations and directions for future research are discussed.

READING AND TEST TAKING IN COLLEGE ENGLISH AS A SECOND LANGUAGE
STUDENTS

by

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Illustrative Materials

Reading and Test Taking in College English as a Second Language Students

Reading comprehension is one of the most important skills required at the college level. In almost all classrooms in the United States students are required to understand, integrate, and synthesize information obtained from text. Students are often required to demonstrate this knowledge on exams and in research papers. These tasks may be especially difficult for students for whom English is a second language (ESL).

In the fall of 2009, there were 690,923 international students enrolled in universities and colleges within the United States, which comprises approximately 3.5% of total student enrollment in higher education (Institute of International Education, 2010). Throughout the United States the number of international students enrolled in colleges and universities has been increasing steadily since 1989 (Institute of International Education, 2010). At Syracuse University international student enrollment has increased from two to seven percent over the past eight years (Senate Committee on Budget and Fiscal Affairs, 2011). In addition to international students, many students who completed their elementary and secondary education within the United States learned English as a second language (Callahan, Wilkinson, Muller, 2010).

Many terms have been used to describe students who speak English as a second language including ELL (i.e., English Language Learner), ESL (i.e., English second language, and English L2 (i.e., second language). ELL is a commonly used term for elementary and secondary students who are still learning English. This term is used in legislation including No Child Left Behind and research to describe students who are not yet proficient in English. ELL was not used to describe the current sample because, presumably, the college students in the current sample are proficient in English despite once being ELLs. L2 is a commonly used term in the second language acquisition literature where L2 is used to denote any second language; therefore a

student could be French L2 or Spanish L2. The term ESL was used in the current study because it most accurately represented the sample as the second language was English and not French or Spanish. Students enrolled in college in the United States are likely to have a high level of language proficiency and are not beginning to learn English. The term ELL will be used in the current literature review when discussing studies whose samples were elementary and secondary ELLs.

The ESL undergraduate and graduate population is comprised of a diverse group of international and domestic students with varying levels of English exposure and proficiency. Many ESL undergraduates vary in the amount of formal English education they have received, their overall English proficiency, and the amount of time spent in the United States. The amount of formal English education varies by the country in which the students completed their primary and secondary education (Magno, 2010). For example, for many children growing up in the Philippines, formal English training begins at age five, whereas in Korea, children are not exposed to formal English training until age nine (Magno, 2010). Additionally, there may be individual differences in the amount of formal English exposure for students raised abroad (Magno, 2010). For example, some students may take additional English courses or may attend private schools where the English curriculum is different than schools operated by the government. The amount of exposure to English outside of the classroom also varies as a function of the country and individual. In some countries, English is not the national language; however, English is used frequently in the community. In contrast, in some countries English is rarely experienced outside of the classroom. Individual characteristics such as motivation, confidence, and anxiety may also contribute to how often an individual is likely to practice using English outside of the classroom. It is likely that the amount of formal English training and

informal exposure to English are related to an individual's performance on tests involving English reading comprehension. Also, the more proficient individuals are with English the more likely they are to perform well on timed tests of English reading comprehension, such as a language proficiency exam or college admissions test.

Both domestic and international ESL students may be considered at risk groups for performance on timed reading comprehension measures such as those found on college entrance exams (American College Test (ACT) and Scholastic Abilities Test (SAT). A considerable number of these domestic and international ESL students will enroll in college within the United States. In order to enroll in college, virtually all students are required to take the SAT or the ACT. In addition to the SAT and ACT, most universities in the United States require international students to complete timed standardized tests of English proficiency such as the Test of English as a Foreign Language (TOEFL) or the International English Language Test System (IELTS). Such tests contain sections devoted to measuring timed reading comprehension. These sections may be particularly challenging for ESL students.

Hendricks, Lewandowski, Berger, and Garcia (2010) examined reading comprehension in a large sample of college students, and found that 15% of the samples, 39 out of 256 participants, were ESL college students. Due to the unexpectedly large number of ESL students in the sample, exploratory analyses were conducted comparing ESL students to the native English speaking students on various measures of reading performance. The ESL group performed significantly poorer on the reading comprehension measure than the native English speaking (L1) group. Additionally, scores on a brief measure of IQ and vocabulary approached a significant difference. Although the ESL group was not carefully pre-selected and such analysis was not planned, the exploratory finding added to suspicions that ESL students may be disadvantaged on

timed reading comprehension tests such as those found on high-stakes tests (HST). Perhaps in a more carefully selected sample when controlling for confounding variables (i.e., English proficiency), reading comprehension and other differences (i.e., reading speed, vocabulary, word recognition, self-efficacy) would emerge between ESL and L1 groups.

Purpose of the present Study

The goal of the present study was to compare ESL college students with native English speakers on a variety of measures that are commonly associated with HST (i.e., reading comprehension, reading speed, word recognition, vocabulary, timed reading test self-efficacy, test anxiety, time management, and strategy). A secondary goal of the study was to determine which of the above variables was most predictive of reading comprehension performance for ESL college students. The primary research questions were:

a) Do ESL students differ from native English speaking students on any particular reading variables (i.e., reading speed, reading comprehension, word recognition, and vocabulary)?

b) Do ESL students differ from native English speaking students on self-perception of test taking ability (i.e., self-efficacy, test anxiety)?

c) Do ESL students differ from native English speaking students on test taking variables (i.e., time management, navigation)?

d) What reading, test taking, self-perception, and English language proficiency variables significantly predict reading comprehension in ESL students? Are these variables the same variables that predict reading comprehension in native English speaking students?

The current literature review begins by discussing the Research and Development (RAND) Reading Group's Reading Comprehension Conceptual Model (RAND Reading Group,

2002). The different facets that comprise reading comprehension are delineated below, including the reader, the text, the purpose and consequence of reading, and the context in which reading comprehension is occurring. Additionally, issues specific to ESL students and HST within each of these areas (i.e., the reader, the text, etc.) are discussed. Following the conceptual model, what is already known regarding ESL students and HST and reading development in ESL students is summarized. Lastly, research is summarized regarding variables that should be important to consider when examining ESL students and timed tests of reading comprehension. Due to the scarcity of research on college ESL students and reading on HST, the first group of variables discussed is the product of research in Second Language Acquisition and the second group of variables is the product of research in the native English speaking population.

Reading Comprehension: A Conceptual Model

Reading comprehension is defined as "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language" (RAND Reading Group, 2002, p.11). RAND (2002) provided a conceptual model for understanding reading comprehension by stratifying reading comprehension into three main elements; the reader, the text, and the activity (Appendix A). Several variables specific to the reader can impact reading comprehension, for example, individual differences in vocabulary, cognitive abilities, motivation, self-efficacy, anxiety, strategy use, and past experiences. Additionally, many features of the text can impact comprehension. As readers read text they generate and process information based on the exact wording of the text and the general meaning of the text. The activity or the purpose for reading the text also impacts comprehension, for example, skimming the text for the general meaning of the passage versus reading for details necessary to answer questions on HST. Such tests like the ACT, SAT, the Graduate Record Examinations

(GRE), and the Law School Admissions Test (LSAT), are often used to determine admittance to institutions of higher education, as well as make important scholarship decisions. Most HST contain reading comprehension sections that are timed and in multiple-choice format. The HST reading comprehension activity is somewhat unique and brings its own set of demands (i.e., consequences of test performance, pressure, stress, and future direction).

Individual Differences in the Reader. Individuals vary in their ability to construct meaning from text. Individual differences in component skills account for some of the variability in reading comprehension ability. Any study comparing ESL and L1 students must consider individual difference variables beside language, such as educational, developmental, and cultural differences between students. The proposed study focused predominately on individual differences in the reader (e.g., vocabulary, anxiety) and how these variables impacted the activity of a timed test of reading comprehension. Variables such as English education, ethnicity, and age of English acquisition were considered in supplementary analyses.

There is considerable research support in the elementary school population that component reading skills such as fluency, decoding skill, vocabulary, and phonemic awareness are strongly tied to reading comprehension (Braze, Tabor, Shankweiler, & Mencl, 2007; Fuchs, Fuchs, Hosp, Jenkins, 2001; Martino & Hoffman, 2002; McKeown, Beck, Omanson, & Perfetti, 1983; Medo & Ryder, 1993; National Reading Panel, 2000; RAND, 2002; Snow, Burns, & Griffin, 1998). Research has documented that students that perform better on measures of reading comprehension utilize more metacognitive strategies (Risemberg & Zimmerman, 1992; Ruban & Reis, 2006; Schunk, 2005; Vermetten & Lodewiks, 1997). Other factors specific to the reader that have been demonstrated to have an impact on reading comprehension are motivation,

domain knowledge, and anxiety (Cantor, Engle, & Hamilton, 1991; Engle, Cantor & Carullo, 1999; Hembree, 1988).

Some studies have examined the adequacy of different models in explaining reading comprehension (Cromley & Azevedo, 2007; Gottardo & Mueller, 2009; Gough & Tumner 1986). These factor models examine a combination of individual skills (e.g., decoding, vocabulary) that may explain individual differences in reading comprehension. One such model is the Simple View of Reading (SVR), which posits that reading comprehension is the result of a combination of decoding and listening comprehension ability (Gogh & Tumner, 1986). Research examining the SVR has found developmental differences in the relative importance of each of these skills (Gottardo & Mueller, 2010).

In general research has demonstrated that decoding is more related to reading comprehension in younger readers (Cutting & Scarborough, 2006; Braze, Tabor, Shankweiler, & Mencl, 2007). Catts, Hogan, and Adolf (2005) found that as age and reading ability increase listening comprehension becomes more predictive of reading comprehension. Research suggests that as age and reading skill increase vocabulary may become more predictive of overall reading comprehension (Braze, Tabor, & Shankweiler, 2007, Cromley & Azevedo, 2007; Hendricks et al., 2010). This may be especially true for ESL students who may struggle with English vocabulary. Braze et al. (2007) expanded the SVR to include vocabulary and found that it explained unique variance in reading comprehension for older (i.e., high school students) more advanced readers. The above mentioned variables will be discussed later in more detail.

Differences in how reading comprehension is measured. In addition to the reader, specific aspects of the passage or the test can impact an individual's reading comprehension. There are several ways to measure reading comprehension. Some common ways to assess

reading comprehension are cloze tasks, summarization, open-ended questions, and multiple-choice questions (National Reading Panel, 2000). A "cloze" task involves a passage or a sentence in which word(s) are omitted and the student must fill in the blank or select the correct word from a group of choices. Summarization involves the student putting the main idea of the story into his/her own words. For both open-ended and multiple-choice questions, the student reads a passage and is then asked factual or inferential questions about the content. The most commonly used measure of reading comprehension on HST is a passage with a multiple-choice question format, and typically these tests are time sensitive. The LSAT, GRE, SAT, and ACT exams all contain timed, multiple-choice measures of reading comprehension.

Research has demonstrated that the format used in assessing reading comprehension impacts what variables predict performance (e.g., vocabulary, decoding, and fluency) (Cutting & Scarborough 2009; Keenan, Betjemann, & Olson, 2008). One study found that the length of the passage affects what skills are more predictive of reading comprehension (Keenan, et al., 2008). Keenan et al. (2008) found that decoding was more predictive of reading comprehension performance on tasks with shorter passages (i.e., cloze tasks). This suggests that various measures of reading comprehension may not necessarily be measuring the same skill(s). Additionally, these findings suggest that the importance of different contributing factors to reading comprehension is affected by the format of the test rather than reading comprehension as a construct. These findings call into question the construct validity of some reading comprehension measures. One of the most debated issues about reading comprehension is the validity of reading comprehension on HST.

Reading comprehension in the high stakes test format. Some researchers have questioned the construct validity of the reading comprehension portions of HST (Katz,

Lautenschlager, Blackburn, & Harris, 1990). Katz et al. (1990) found that without reading the passage, students were able to achieve better than chance performance on SAT reading comprehension portion. Participants in the study were able to answer slightly more than half of the SAT questions without the passage. There are a couple of possible explanations for this result; (1) the questions were poorly worded and allowed participants to eliminate responses and make educated guesses and (2) the participant's background knowledge allowed them to answer the questions without the passage. Whatever the reason for this finding, the results of the study suggest the need for care in the construction and development of reading comprehension tests.

In contrast to this study, other studies have provided support for the construct validity of reading comprehension on HST (Daneman & Hannon, 2001; Freedle & Kostin 1992; Powers & Leung, 1995; Scheunmann & Gerritz, 1990). Daneman and Hannon (2001) examined the construct validity of the SAT reading comprehension portion. The researchers examined the relationship between two variables: (1) working memory and (2) the Nelson Denny Reading Test (NDRT), and performance on the SAT critical reading section. Working memory was used because it is considered one of the underlying processes involved in reading comprehension (Daneman & Meikle, 1996).They found that reading span and operation span, both measures of working memory, were significantly correlated with SAT critical reading score (.46 - .64). Additionally, they found that the reading comprehension portion on the Nelson Denny Reading Test (NDRT) correlated highly with SAT critical reading performance (.74-.76), which offers evidence of concurrent validity

Daneman and Hannon (2001) also examined the impact of these variables on SAT reading comprehension when passages were not present. They hypothesized that when presented with no passage participants would use higher level reading strategies to reconstruct the meaning

of the passage and answer the question (Powers & Leung, 1995). These verbal reasoning strategies were considered to be highly related to working memory. Therefore, working memory would remain related to SAT reading comprehension performance, while scores on the NDRT would not. The results supported their hypothesis. Scores on the NDRT reading comprehension test were correlated .38 with SAT critical reading score in the no passage condition as compared to .74-.76 in the passage conditions. Additionally, measures of working memory remained significantly correlated (.54) with SAT score regardless of condition. This study provides some support for the construct (concurrent) validity of passage multiple choice reading comprehension tests.

In addition to this study, other studies have found support for the construct validity of reading comprehension portions of HST by examining variables that predict item difficulty (Freedle and Kostin, 1992). These researchers examined the relationship between several predictor variables and comprehension item difficulty on the SAT and GRE. Predictor variables could be grouped into three categories; pure-item, text, and text by item. Pure-item variables are related to specific item content (e.g., the frequency of negations, 'no' 'not' 'never', used in the item stem). Text variables refer to text related content (e.g., the frequency of negations used in the passage). Text by item variables refer to items that require the participant to examine both the item and the passage. Reading comprehension on HST can be thought of as utilizing cognitive strategies and skills in order to understand the meaning of text. Therefore, in order for the SAT and GRE to have construct validity one would expect that much of the item difficulty is explained by text and text by item variables. There would be little evidence of construct validity if the majority of item difficulty was explained by only item related variables (e.g., stem of the

questions, negations in the questions). This would suggest that the actual passage does not impact item difficulty.

Results revealed that eight predictors accounted for 58% of item difficulty. Of these eight predictors seven were considered "text" or "text by item" interaction variables. Text variables refer to purely text related content (e.g., the frequency of negations used in the passage). These finding suggest that much of item difficulty is predicted by variables found in the text or the text in conjunction with the item. This offers support for the construct validity of reading comprehension on HST.

Although there is debate regarding the validity of reading comprehension portions of HST, there is evidence for the construct validity of reading comprehension. For example, Coyle and Pillow (2008) found that verbal scores on the SAT predict college grade point average (GPA) after controlling for intelligence. Also, HST continue to be a common way reading comprehension is assessed for potential undergraduate and graduate students. Due to their predictive validity of college performance, it is important to understand what factors contribute to performance on HST of reading comprehension, especially for students that may be considered at risk. In addition to differences in the reader and the way reading comprehension is assessed, differences in the purpose and consequences of reading for comprehension could impact performance.

Differences in the purpose and consequences of reading for comprehension. The purpose of reading often drives the different actions we engage in while reading. For example, someone would approach text very differently depending on whether they were reading for pleasure, to assemble a desk, or for an entrance exam to college. Additionally, the specific consequences of reading for comprehension can differ. For example, the consequences of

reading for pleasure are very different than the consequences of reading a passage on the reading comprehension section of HST. The specific purposes and consequences of reading can impact performance on tests of reading comprehension.

Completing a reading comprehension portion on HST could be considered a specific type of activity. The reader is attempting to read a passage and understand it well enough to answer multiple-choice questions correctly. Depending on the examinees and the type of test, they could be taking the test for a variety of reasons (i.e., college admission, scholarships, and professional license). Additionally, the scores could have a variety of consequences (i.e., entry to college, graduate school, or profession). These tests are considered "high stakes" because of the important decisions that are made based on the results. These tests also create a unique testing environment whereby the individual characteristics of the students, the various test demands, and the student's investment in taking the test interact to impact their performance.

Differences in contextual factors. When examining variables that affect reading comprehension it is important to also consider the sociocultural context in which the reading comprehension or learning is occurring. For example, research has demonstrated that children from lower socioeconomic status (SES) have less access to literacy promoting activities (i.e., access to books, rhymes, writing materials) than children from higher SES (Sonnenschein, Baker, Serpell, Scher, Truitt, & Munsterman, 1997). Additionally, children from higher SES tended to enter school with greater alphabetic knowledge and print concepts. This seems to suggest that children from lower SES may be less prepared to engage in literacy learning upon entering school compared to their higher SES counterparts.

One example of how contextual variables may affect ESL students specifically relates to background knowledge. Research has demonstrated that students with more background

knowledge of a topic do better on measures of reading comprehension for that topic. ESL students are often coming from extremely different socio cultural backgrounds compared to L1 students. This difference in cultural experiences may result in ESL students being at a disadvantage when it comes to background knowledge on many of the topics of English texts. Additionally, ESL students may have difficulty with culture-laden concepts, for example idioms, jokes, and analogies. This lack of background knowledge may result in ESL students struggling with some reading comprehension tasks. In this example, individual differences on a variable like background knowledge have been impacted by the socio-cultural context in which the students were educated and in turn this impacts their reading comprehension.

In summary, several types of variables can impact a student's reading comprehension. The RAND (2002) conceptual model for understanding reading comprehension stratifies variables impacting reading comprehension into three general categories the reader, the text, and the activity. Additionally, these variables interact within a larger contextual framework that can also impact reading comprehension. Student's taking high stakes exams bring with them their own individual differences in skills that impact performance. Also, specific aspects of the test itself may impact student performance. Lastly, timed, high stakes, multiple-choice tests of reading comprehension used for admittance to college create a unique type of activity and these task demands will impact performance.

Take for example, an ESL student from China named Lu taking a college entrance exam such as the SAT. Lu will bring with her several individual characteristics that could impact her performance such as overall English proficiency, reading and decoding speed, breadth of English vocabulary, strength of verbal working memory, and test-taking strategies. At the same time, there are motivational concerns such as the importance of her score to get a college scholarship

and the anxiety associated with failure to achieve a certain score. The text material on these tests is relatively standard. It is likely that Lu will have to read 300-400 word passages written at a grade level between eight and 15. Passages will likely contain novel information of low personal interest and four to eight multiple-choice questions. Lastly, Lu's experiences in her own culture with timed multiple-choice tests, standardized testing, and the setting could also impact her performance.

This broad conceptual model of reading comprehension provides a good framework for understanding the different variables that may impact reading comprehension. This model can also be applied to our understanding of ESL students' reading comprehension processes. Due to their unique cultural experiences ESL students may be at a disadvantage on HST especially on sections that emphasize reading. This is supported by some research that suggests that due to disadvantages ESL students do not perform as well as L1 students on HST at the elementary, secondary, and post secondary level.

What We Know: ESL Students and HST

In the elementary and secondary schools within the United States a student is classified as an English Language Learner (ELL) if they speak English as a second language and do not demonstrate adequate English proficiency usually measured by a standardized measure of English proficiency (e.g., Woodcock Munoz Rating System – Revised, 2005). Data indicate that students classified as ELLs do not perform as well as L1 students on HST of reading and mathematics (National Center for Education Statistics, 2009). Overall ELLs struggled in both areas; however, more elementary ELLs struggled in reading than in mathematics. The NAEP report indicates that in mathematics 88% of fourth grade ELLs were below proficiency level as compared to 58% of L1 students. In reading, 94% of ELLs were below proficiency level

compared to 64% of L1 students. In high school differences between reading and mathematics scores for ELLs appear to disappear and the majority of students classified as ELLs struggle in both areas. Ninety-six percent of ELLs were below proficiency in mathematics and 98% were below proficiency in reading this is compared to 73% of L1 students in mathematics and 66% in reading. These data suggest that ELLs struggle significantly more than L1 students on HST at the elementary and secondary level.

Research on the differences between post-secondary ESL students verbal and mathematics performance on HST is virtually nonexistent. However, the few studies that reported data on ESL students verbal and mathematics performance found that ESL students tended to perform better on quantitative sections and tended to perform poorer on verbal sections. One study (Wilson, 1987) which examined all GRE test takers between 1982 and 1984, found that, in general, international ESL examinees significantly outperformed U.S. examinees on more quantitatively based GRE subject tests (i.e., mathematics, computer science, chemistry, physics, and economics). However, U.S. examinees tended to have higher scores on the GRE verbal section compared to international ESL examinees. Additionally, international ESL examinees tended to perform more poorly on subject tests that required more complex English verbal knowledge like those in the humanities and social science fields. However this study is not without limitations, cultural variables that could impact performance were not controlled for, such as years of informal and formal English education and age of acquisition. Additionally there was no information about test takers' English proficiency. It is possible that there was a wide variety of English language proficiencies within the ESL group.

While investigating the validity of the computer based TOEFL, Strickler (2004) reported larger differences in ESL test takers' GRE-verbal (GRE-V) and -quantitative (GRE-Q) than

native English speaking students GRE-V and GRE-Q scores. In the first study the researcher found a 267 point difference between GRE-V and GRE-Q scores for 6,334 ESL test takers (GRE-Q= 657.60, SD = 128.80; GRE-V = 387.70, SD = 107.43). In the second study, Strickler (2004) reported a similarly large 261 point difference between GRE-V and GRE-Q average scores for 3,489 GRE test takers (GRE-Q= 654.33, SD = 131.51; GRE-V = 392.39, SD = 109.71). For L1 test takers (n = 168) there was only a 39 point difference between GRE – V and GRE – Q (GRE-Q= 584.46, SD = 132.45; GRE-V= 545.66, SD = 108.48). It appears that ESL test takers' of the GRE struggled significantly more with the verbal section than with the quantitative section, whereas L1 test takers do not display such a discrepancy. This discrepancy may be due to differences in overall English proficiency. These results provide an impetus to further investigate ESL students English reading abilities and what factors contribute to their overall reading comprehension.

These findings suggest that ESL students may struggle with English reading skills much more than with quantitative reasoning ability. Although there is no research examining ESL students taking the SAT and ACT, it is possible that such a difference exists for ESL students on these exams, as well. It appears the demands and importance of reading comprehension tests can place ESL students in a very challenging testing situation that focuses on skills of less proficiency (language) versus greater proficiency (mathematics and science). Additionally, it appears that elementary and secondary students classified as ELLs struggle with performance on reading assessments much more than L1 students. Together these findings suggest that students' English language proficiency contributes to their performance on measures that require English reading or assess skills related to reading

In order to gain a better understanding of the unique challenges facing ESL students it is important to examine research focusing on ESL students' overall reading development. It is possible that the variables impacting ESL students' performance may not necessarily be the same variables impacting L1 students' performance. Although, comprehensive models of reading have not yet been developed for the ESL population there is some research examining general reading and fluency development in young ESL students.

What We Know: Reading Development in ESL students

Although there is extensive research examining reading development in the L1 population, there is less research examining English reading development for ESL students. As stated previously, ESL students as a group are extremely diverse in a variety of areas (e.g., first language, cultural experiences, and English training). Due to this heterogeneity, it may be difficult to conceptualize a comprehensive framework for reading development in these individuals.

Tabors and Snow (2001) reviewed the current research on the reading development of young (i.e., birth to 8 years) ESL students within the United States. A common trend in the literature was that ESL students in the United States experience varying amounts of exposure to their native language and English within the home, outside the home, and in academic settings. This variability impacts eventual literacy in their native language as well as English. For example, there is speculation that pre-literacy skills in ESL children whose native language is alphabetic may be transferred to their ability to learn English (Nagy, McClure, & Mir, 1997). However, if parents begin speaking English in the home, when it is not the parent's stronger language, this may lead to difficulty in developing important pre-literacy skills in either language for the child (Tabors & Snow, 2001).

Based on their review, Tabors and Snow (2001) reported a variety of factors that may impact reading skills in ESL students. Factors identified in the literature as important to reading development in English and the child's native language were age of acquisition of English, proficiency in English and the native language, beginning age of formal English education, the child's proficiency in the language in which print exposure and early literacy education begins, and the amount of support for English and the child's native language both at school and at home (Aarts &Verhoeven, 1999; Appel & Vermeer, 1998; Pearson & Fernandez, 1994; Rodriguez, Diaz, Duran, & Espinosa, 1995; Tabors & Snow, 2001).

Yesil-Dagli (2011) examined the reading development of ESL students by investigating what factors best predict reading fluency in ESL students from Kindergarten to first grade. Participants were 2,481 first grade students classified as ELL. Data were collected on participants' vocabulary with the Picture Peabody Vocabulary Test (PPVT). Additionally, the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) was use to collect data on participants' letter naming fluency, initial sound fluency, and the dependent measure, oral reading fluency (ORF). Participants' ORF was collected four times throughout their first grade school year whereas the other measures were collected during their Kindergarten year.

Results indicated that letter-naming fluency correlated moderately and positively with ORF, correlations ranged from .34 to .46. Vocabulary was also positively correlated with ORF, however, not as strongly as letter naming fluency, correlations ranged from .22 to .24. Lastly, initial sound fluency was correlated with ORF in first grade but only slightly, correlations ranged from .14 to .19. Multilevel quadratic modeling was used to examine the impact of the literacy variables on ORF. All three variables significantly predicted ORF. Letter naming fluency was the strongest predictor followed by, vocabulary, and initial sound fluency, they explained 30%

9%, and 12% of explained variance in ORF, respectively. These findings emphasize the importance of letter-naming fluency and vocabulary in ESL students' reading development.

As stated previously, compared to the research examining reading development in the L1 population there is little research examining English reading development in the ESL population. The research that does exist with respect to reading development in ESL students tends to focus on the transfer of literacy skills from students' native language to English (Carlo et al., 2004; Ciscero & Royer, 1995). New research is emerging examining reading development in young ESL students that suggests the importance of letter knowledge and vocabulary. In contrast with the literature examining English reading development in ESL students, there is a large body of literature examining the factors that contribute to successful second language acquisition.

Important Contributing Factors from the Second Language Acquisition (SLA) Research

Second language acquisition (SLA) refers to the processes the learner goes through when learning a second language. As stated previously, there is a considerable amount of research on SLA, whereas there is significantly less research examining reading development in ESL students. However, successful SLA encompasses second language reading development. That is to say, being literate in another language is part of SLA. Individuals who have mastered a second language are typically also literate in that language. Therefore, it may be beneficial to examine what factors ultimately impact SLA as they are likely to impact second language reading development and reading comprehension. Current SLA theory emphasizes the roles of sociocultural, contextual, and cognitive variables and processes (Swain & Deters, 2007) in developing second language proficiency. Research has identified several factors (i.e., affective factors, age of acquisition, cognitive factors, motivation, and amount of exposure to the second

language) that contribute to developing second language proficiency (Onwuegbuzie, Bailey, & Daley, 2000; Perales & Cenoz, 2002; Sparks, Patton, Granscho, & Humbach, 2009).

Formal and Informal Exposure to English. One important variable that contributes to English proficiency is the amount of exposure to English. Exposure to English can occur informally. For example, a Spanish-speaking child moves to the United States and is surrounded by English speaking adults at the supermarket and the playground. Individuals can also be formally exposed to English. For example, a Korean child begins taking an English class in school. The amount of formal English curriculum varies significantly by the country. Some countries require extensive English curriculum beginning at an early age, while other countries may not require any English curriculum in schools (Magno, 2010). It seems logical that the amount of time spent in formal English training would be related to English reading comprehension performance. Studies have demonstrated that years spent in formal English training are related to reading comprehension performance and overall English fluency (Gradman & Hanania, 1991; Magno, 2010)

Magno (2010) examined what the best predictors of English proficiency in 302 Korean students ranging in age from 14 years to 18 years. These students were completing their education in the Philippines because the entire curriculum in the Philippines is taught in English. Additionally, English is used outside of the school mainly for business transactions. The Strategy Inventory for Language Learning (SILL) was used to assess memory, compensation, metacognitve, cognitive, affective, and social strategies associated with learning a second language. The SILL is a self-report five item Likert scale measure and was given in Korean. In addition to the SILL, the English subtest of the Assessment of School Potential, developed by Asian Psychological Services, was used to assess English proficiency. The English subtest

contains items that assess grammar, vocabulary, and reading comprehension. They also obtained information about the months they had formally been studying English in school. All participants received the English proficiency test first followed by the SILL.

Results revealed that months studying English and the cognitive subscale of the SILL were the most strongly correlated variables with performance on the English proficiency test, $r = .27$ for both variables. However, all subscales of the SILL (i.e., memory strategies, compensation strategies, metacognitve strategies, cognitive strategies, affective strategies, and social strategies) were not very strong but were significantly and positively related to English proficiency, correlations ranged from .13 to .26. A multiple regression was performed using the English proficiency measure as the dependent variable and the subscales from the SILL and months studying English as predictors. The model accounted for only 10% of the variance in the English proficiency. The two strongest predictors of English proficiency were months studying English and the compensation strategies subscale of the SILL (e.g., When I can't think of an English word, I use a word or phrase that means the same thing).

This study provides some support for the impact of years of formal English study on eventual English proficiency but it is not without limitations. One potentially confounding variable is that months of formal study of English are in this case inextricably linked with months of informal exposure to English. As stated previously, English is commonly used in the Philippines outside of school for business transactions. English is also the language the Korean students are using to communicate with any Filipino classmates or people outside of school who are not Korean. Lastly, the entire model only accounted for 10% of the variance in English proficiency suggesting that there must be other variables (e.g., age of acquisition, intensity of English training) that impact English proficiency.

Another study (Gradman & Hanania, 1991) also found support for the impact of English

exposure variables on English proficiency. Gradman and Hanania (1991) investigated what

factors were most predictive of ESL students' proficiency as measured by students' scores on the

TOEFL. The participants were 101 ESL students at Indiana University who were enrolled in a

seven week intensive English program. Participants varied considerably in the amount of

exposure they had to formal English training. Information was obtained via interview about

participants' general background, formal exposure to English, exposure to and use of English in

class, extracurricular exposure to and use of English, and attitudes and motivation towards

English. The English proficiency variables used were the composite and individual scores for the

TOEFL subtests (i.e., listening comprehension, structure and written expression, and vocabulary

and reading comprehension). Several variables were found to be significantly and positively

correlated to vocabulary and reading comprehension on the TOEFL. The majority of variables

that were most related to English vocabulary and reading comprehension were informal and

formal exposure to English variables. Extracurricular reading in English was found to be the

most significantly related to reading comprehension and vocabulary. The other significantly

related variables included months of intensive English training, $r = .22$, attending a private

school, $r = .20$, having a teacher whose native language is English, $r = .27$, having English as the

language of instruction in class, $r = .30$, reading in English outside of class, $r = .50$, and

perceived future need of English proficiency, $r = .23$.

Both stepwise forward selection and backward elimination multiple regressions were

used to determine which variables best predicted TOEFL composite score. Both procedures were

used to determine if the same variables were identified in either regression equation. Again,

some informal and formal English exposure variables were found to be predictive of TOEFL

score as well as some motivational variables. The stepwise multiple regression accounted for 43% of the variance in TOEFL score. The two most important factors identified were extracurricular reading, $R^2 = .28$ and having a native English speaker for a teacher, $R^2 = .35$. The second regression procedure accounted for 57% of the total variance in TOEFL score and retained extracurricular reading and having a native English speaking teacher in addition to English as the language of instruction, $R^2 = .19$, months of intensive English training, $R^2 = .17$, recognition of current need, $R^2 = .16$, age they began learning English, $R^2 = -.15$ and future need for English, $R^2 = .13$,. Based on these results it appears that having a teacher who is a native English speaker is an important predictor of TOEFL scores. Additionally, the age at which individuals began learning English, extracurricular use of English, and affective variables (i.e., motivation) are significant predictors of TOEFL scores.

Gradman and Hanania (1991) further analyzed their data by grouping students by both age at which they began English training and whether or not they had intensive English training. They found that without intensive English training students who began English training earlier had an advantage. However, intensive English training appeared to remediate any disadvantage from starting English education later. This finding provides some hope for individuals who have begun learning English as a second language later in life.

When learning a second language, often language instructors will emphasize the importance of exposure to a language. Many individuals report that they did not become completely fluent until they were completely immersed in that language. There is some empirical support for the impact of exposure variables on eventual English proficiency Gradman & Hanania, 1991; Magno, 2010. Time spent in formal study in English, extracurricular reading, having a teacher who is a native English speaker, being enrolled in an intensive English program,

and being instructed in English, have all been found to have an impact on English proficiency. English proficiency is multifaceted and multiply determined, therefore, information on informal and formal exposure must be considered when examining ESL reading comprehension. It is likely that ESL students vary considerably in degree of English exposure and this could explain some of the differences in reading comprehension performance.

  Age of Acquisition (AOA). Another variable that has extensive empirical support for its impact on SLA is the age at which someone begins learning a second language, referred to as the age of acquisition (AOA). Age of acquisition refers to the age at which an individual is regularly exposed to a second language. It has been well established that the earlier students are exposed to a second language, the more proficient they eventually are in that second language (Johnson & Newport, 1989; Stevens, 1999; Weber-Fox & Neville, 1996). The Critical Period Hypothesis (CPH) posits there is a critical period during which language acquisition can occur and that language obtained outside of that period can never reach native like fluency (Dekeyser, Alfi-Shabtay, & Ravid, 2010). However, there is considerable debate over the validity of the (CPH). Proponents of CPH claim that an individual must be exposed to a second language before a certain age, usually before puberty, in order to achieve native like proficiency (Pinker, 1994). In contrast, critics of CPH claim that native like fluency can be achieved by individuals who begin learning a second language or are exposed to a second language later in life. Some critics of CPH have argued for different periods of development of different aspects of language (i.e., phonology, morphology). Despite the debate over a critical period of second language development, everyone acknowledges that there are maturational constraints on second language acquisition and that it is much easier to learn a second language prior to puberty (Birdsong 2010; Dekeyser, et al., 2010). Therefore, it is important to consider when an individual began regular

exposure to a second language when examining factors contributing to overall second language reading comprehension.

Dekeyser, Alfi-Shabtay, and Ravid (2010) examined the nature of age effects in acquiring second language grammar for ESL and Hebrew as a second language in two studies. The researchers were interested in examining the CPH across two different languages. English and Hebrew were selected because they were typographically different particularly in their morphology in a number of ways. For example, Hebrew has two basic word orders -- subject - verb - object (SVO) and predicate-first word order, while English only has one basic word order SVO. In Hebrew you could say "better to you to come" as well as "you'd better come over." In Hebrew nouns and adjectives are inflected for gender and number. Also, verbs are inflected for gender, number, person, tense (i.e., past or future). In contrast, English has virtually no marking or inflection for gender, number, or person. Lastly, Hebrew allows for an unvoweled script, whereas English does not. This means that Hebrew can be written without vowels and the meaning of words are derived from the context. Overall, Hebrew is considerably more grammatically complex language, which allows for more flexibility in word order, whereas English is somewhat rigid in its word order and simplistic in grammatical structure.

The researchers purported that if similar patterns emerged for both groups it would provide support for the CPH regardless of the morphological complexity of the second language. Participants for the first study were 76 Russian-speaking immigrants to the United States attempting to learn English as a second language. The AOA for learning English varied considerably among participants ranging from 5 years to 71 years. Participants were given a grammatical judgment test to assess English proficiency, an aptitude test consisting of verbal sections of the Russian version of the Inter-University Psychometric Entrance test, a test similar

to the SAT, and a biographical questionnaire that contained questions about the participants'

language and educational background, age of immigration and AOA.

Results revealed a strong significant negative relationship between AOA and English

proficiency as measured by the grammatical judgment test (r =-.81). Individuals who were older

when they began learning or were exposed to English tended to do worse on the grammatical

judgment test. However, Dekeyser et al. (2010) believed this statistic may mask crucial

differences in the relationship between AOA and proficiency in different AOA groups.

Additionally, there was a strong and significant negative relationship between age at time of

testing and performance of English proficiency measure (r = -.78). Dekeyser et al. (2010) ran the

correlations again with participants grouped into different AOA age ranges (e.g., <18years,

between 18-40 years, >40 years) and controlled for age at time of testing. Results revealed a

strong significant negative relationship between AOA and English proficiency for the <18 years

group (r =-.71), however, no significant relationship between AOA and English proficiency in

the two other older groups (18-40 and >40). This suggests that if the AOA occurs before puberty

it may be more related to later language proficiency than if the AOA occurs after puberty. Based

on these results, the younger the AOA the more likely it will be related to overall reading

comprehension and English proficiency.

In the second study, participants were 62 Russian-speaking immigrants to Israel

attempting to learn Hebrew as a second language. In this sample the AOA for Hebrew as a

second language ranged from 4 years to 65 years. Participants were given the same battery of

tests except that the grammatical judgment test focused on Hebrew morphology as opposed to

English. Results were similar, the relationship between AOA and Hebrew proficiency was high,

significant, and negative, r = -.79. The participants were then split into groups according to age

ranges (<18, 18-40, >40) and age of testing was controlled for. Commensurate with the first

study, the relationship between AOA and Hebrew proficiency remained moderate and significant

for the <18 years group (r = .51); however that relationship was not significant for either of the

older groups (18-40 and >40). These results provide support for a moderate to strong link

between younger AOA and language proficiency across two different morphologically distinct

languages. Thus, AOA has implications for anything having to do with language proficiency

including the reading comprehension of ESL students.

Research on the relationship between AOA and second language proficiency is often

confounded by other variables that may be intertwined with AOA, such as amount of formal

exposure to the second language, amount of informal exposure to the second language, and age

at arrival to the U.S. or English speaking countries (AoAR). Some studies have found that the

age at which children arrive in the United States is an important factor for determining English

proficiency (Jia & Fuse, 2007; Stevens, 1999). Jia and Fuse (2007) conducted a five year

longitudinal study following 10 native Mandarin-speaking children and adolescents in the United

States. The goal of the study was to examine age related differences in acquiring different

English grammar concepts. Participants were five girls and five boys and their AoAR varied

from five years to 16 years. Data were collected via language tasks, child interview, parent

interview, language background questionnaire, and observation of the child's language use.

Jia and Fuse (2007) examined the acquisition of six different morphemes. A morpheme is

the smallest meaningful unit in the grammar of a language (e.g., third person singular). Although

they did not find a significant correlation between AoAr and morpheme acquisition, the general

trend for participants across morphemes and over time was that the relationship between AoAr

and acquisition of morphemes switched from positive to negative. This means that initially

individuals with an older AoAr were able to learn more English morphemes than those with a younger AoAr. However, after their first or second year in the United States individuals with a younger AoAr were able to learn more English morphemes than those with an older AoAr. The data were further analyzed using a two way mixed ANOVA (age group x morpheme structure). Results revealed a significant effect for type of morpheme structure and a significant interaction between age groups (i.e., young AoAr v. old AoAr). In general, students who had a younger AoAr did better on more difficult morpheme structures than students who had an older AoAr.

Additionally, Jia and Fuse (2007) examined the developmental trajectories of the morpheme structures using growth curve analysis through hierarchical linear modeling (HLM). Results revealed when AoAr and richness of second language environment were entered in as predictors for five of the six morpheme structures only richness of the second language environment was found to be a significant predictor. Taken together these results suggest that AoAr may be important in acquiring different English morpheme structures. It appears that the advantage of a younger AoAr does not appear until a couple of years after arriving in the United States. Additionally, AoAr is not the most important factor and is intertwined with informal and formal exposure to English (second language environment), and AOA. However, these results cannot be generalized due to the small sample size (10 students) and the large age range (5 to 16 years).

In the current study, AOA was examined because there is considerably more evidence for the impact of AOA on language proficiency than AoAR (Bialystok & Miller, 1999; Birdsong & Molis, 2001; Hakuta, Bialystok & Wiley, 2003). In the majority of research in SLA, AOA is examined while AoAr is not. As suggested by research it appears that AOA is more likely to have a significant relationship with reading comprehension.

As stated previously, several studies have examined factors that relate to overall second language proficiency. These studies have provided support for cognitive, affective, developmental, educational, and experiential variables related to eventual second language proficiency. AOA and the amount of informal and formal exposure to English, including reading in English, appear to be important factors in developing second language English proficiency as well as second language English literacy. Also, these variables will likely have an impact on reading comprehension in ESL students and should be considered when examining ESL reading comprehension.

In addition to variables impacting second language proficiency, some variables may impact ESL students reading comprehension performance specifically. Studies examining reading and English proficiency in ESL students focus on the impact of phonology and orthography of the first and second language, strategy use, anxiety, and motivation (Haynes & Carr, 1990; Kato; 2009; Liu, 2006; Nassaji & Geva, 1999; Teemant, 2010). In addition to the variables identified in the second language literature, the research conducted on L1 reading has identified several variables as contributing to reading comprehension that need to be considered including reading speed, vocabulary, and decoding (Braze et al. 2007; Cromely & Azevedo, 2007; Fuchs et al. 2001; Martino & Hoffman, 2002). Combining the variables identified by the second language literature and the L1 literature as important to reading comprehension may help to provide a more complete picture of variables that may be important for ESL students on timed tests of reading comprehension. Additionally, it may provide the foundation for identifying important variables on which ESL students and L1 students differ. Some variables that the ESL reading literature and the L1 reading comprehension literature have identified as important

include reading speed and fluency, word recognition, vocabulary, self-efficacy and self-perceptions of reading ability, strategy use, and anxiety.

Important Contributing Factors from the English as a First Language Research

   Reading Speed and Reading Fluency. Fluency refers to the ability to read text with accuracy, proper expression, and speed (National Reading Panel, 2000). Fluency is built through a number of prerequisite skills (i.e., decoding, vocabulary knowledge, and phonemic awareness) and extensive practice reading text (National Reading Panel, 2000). Numerous studies on L1 students have demonstrated a strong relationship between reading fluency and reading comprehension (Deno, Mirkin, Chiang, 1982; Fuchs, Fuchs, Hosp, Jenkins, 2001; Fuchs, Fuchs, & Maxwell, 1988). The Verbal Efficiency Theory for native English speakers posits that inefficient word identification and other reading processes place demands on attention and memory. As readers become more skilled at word identification, attentional and working-memory resources can be devoted to text comprehension. Readers with poor word identification skills place greater strains on their attentional and working-memory resources. By taxing these resources, less skilled readers have fewer resources to devote to text comprehension. The verbal efficiency theory provides a framework for explaining the relationship between reading comprehension and reading fluency. Reading fluency is a necessary prerequisite skill for reading comprehension.

  In the literature there are measures of reading fluency and reading speed. Reading fluency is measured by calculating the number of words read correctly, this is computed by subtracting the number of errors out of the total number of words read in an interval of time. Reading fluency involves both speed and accuracy. Reading speed, also called reading rate, is measured by calculating how many words an individual can read in an interval of time. Accuracy is not a

component of measures of reading speed/rate. One example of a reading speed test is the Nelson Denny Reading Test - reading rate subtest, which involves reading speed without error correction. In the current study reading speed is assessed and accuracy is not measured. However, the majority of research is on reading fluency and its relationship with comprehension. Reading fluency and reading speed are related to one another but are not identical terms.

Studies on younger L1 students have demonstrated a strong relationship between reading fluency and comprehension (Fuchs, et al., 2001; Fuchs, Fuchs, & Maxwell, 1988). However, research has demonstrated that the relationship between reading fluency and text comprehension may weaken as reading skill increases (Jenkins & Jewell, 1993; Yovanoff et al., 2005). Despite these findings, there is some evidence to suggest a relationship between reading fluency and text comprehension on timed measures of reading comprehension in native English speakers (Jackson, 2005). There is less research examining the relationship between reading fluency and its relationship to reading comprehension in ESL students. However, some studies have found support for a similar connection in ESL students.

One such study provided support for the relationship between English oral reading fluency and text comprehension in ESL college students (Saiegh-Haddad, 2003). Participants were 50 university students learning English as a second language, 22 were native Arabic speakers and 28 were native speakers of Hebrew. Participants were given two texts, one in their native language and one in English. Texts were expository and contained material that the participants were not expected to have prior knowledge of. Participants read each passage aloud and their reading was recorded and their reading fluency was calculated. Reading comprehension was assessed in two ways for both passages. The first way reading comprehension was assessed was through paraphrasing of paragraphs. Participants were asked to retell in their native language

what they understood from each paragraph after they read it and their responses were compared with 10 main content items. The second way in which reading comprehension was assessed involved a multiple-choice test developed by the researcher.

Results revealed that there were no significant correlations between reading fluency and reading comprehension in either Arabic or Hebrew. However, reading fluency was significantly and moderately related to reading comprehension performance in English for both the native Arabic-speaking group (.43) and the native Hebrew-speaking group (.65). Additionally, multiple linear regression was used to determine what aspects of reading fluency (i.e., speed versus accuracy) were more predictive of reading comprehension. Commensurate with their correlational findings, neither speed nor accuracy was significantly predictive of reading comprehension in participants' native languages. However, speed was found to be a significant predictor of English reading comprehension for both language groups.

These findings support the conclusion that reading fluency may contribute to English reading comprehension performance in ESL college students. Interestingly, reading fluency was not related to reading comprehension performance in these participants' native languages. This may be a result of the weakening of the relationship between reading fluency and reading comprehension as reading skill increases (Jenkins & Jewell, 1993; Yovanoff et al., 2005). This also suggests that the relationship between reading fluency and reading comprehension may be stronger for ESL students than native English speakers due to differences in English proficiency. Another possible explanation is that both Arabic and Hebrew have unvoweled scripts, and research examining the reading of unvoweled scripts has found that accuracy is not related to reading comprehension in these languages (Abu-Rabia, 2001). An unvoweled script refers to language written without vowels. Word meanings are derived from familiarity with consonant

letter combinations and the context of the sentence. This study is not without limitations, due to the unique properties of the Hebrew and Arabic languages (i.e., the frequency of unvoweled scripts) and the specifics of the sample these results may not generalize to ESL students who speak other languages as their native language. Lastly, the retell reading comprehension measure is not similar to the reading comprehension portions of the HST and therefore these results may not generalize to other timed multiple choice reading comprehension measures.

Another study (Nassaji & Geva, 1999) examined the relationship between reading rate and reading comprehension in 60 ESL graduate students studying in Canada. Participants had completed their undergraduate education in Iran and were all native speakers of Farsi. Participants were given measures of a variety of reading related skills including, reading comprehension, silent reading rate, single word recognition, phonology, orthography, syntax, and vocabulary, as well as, two cognitive measures, working memory and rapid automatized naming of letters. Reading comprehension and reading rate were assessed using sections of the Nelson Denny Reading Test (NDRT). Word recognition was assessed using the word reading section of the Wide Range Achievement Test – Third Edition (WRAT – 3).

Efficiency scores were calculated for several variables (i.e., phonological, orthographic, syntactic, and syntactic-semantic). Results revealed that reading rate had the highest significant correlation with reading comprehension, $r = .71$. Word recognition and vocabulary scores also had moderate significant relationships with performance on reading comprehension, .53 and .59 respectively. Surprisingly, syntactic efficiency and syntactic-semantic efficiency had moderate negative relationships with reading comprehension, -.51 and -.65 respectively. Syntactic efficiency was assessed by having participants read sentences and indicate whether or not the sentence was syntactically correct (e.g., they went to the store, Went they to store the). The

syntactic semantic task required students to read sentences and indicate whether or not the word meanings in the sentences were correct (e.g., the teacher praised the diligent student; the teacher praised the incompetent student). Overall, these findings suggest that reading rate continues to be related to reading comprehension even in ESL students with presumably fairly advanced English skills.

Overall, there is considerably less research on the relationship between reading fluency and reading comprehension in adult ESL students compared to L1 students. The research that does exist provides some evidence for a relationship even in students with fairly advanced English skills. Additionally, the L1 student literature documents a relationship between reading fluency and reading comprehension that may weaken with overall reading proficiency. Taken together this provides strong support for including reading speed as a possible contributor to timed reading comprehension performance in ESL students. It may also be one of the variables on which ESL and native English speaking students differ given the differences in overall English proficiency.

Decoding/Word Recognition. In addition to reading rate and fluency, other reading variables may impact reading comprehension such as decoding skill. Decoding refers to the ability to recognize and pronounce written words. It involves processing both the orthography (i.e., basic shapes of print) and phonology of written words (i.e., sound of written words, basic sound units). There is substantial research in the L1 literature supporting the relationship between oral decoding of words and reading comprehension in both younger and older students (Braze et al., 2007; Martino & Hoffman, 2002; National Reading Panel, 2000).

In the proposed study the decoding task is best described as a lexical decision task or a word recognition task, rather than an oral pronunciation of the words. Participants were asked to

indicate if a word was a real word or a fake word. Research has demonstrated that lexical decision tasks are related to overall English L1 reading ability (Seidenberg & McClelland, 1989). Decoding is one of the component processes involved in recognizing and pronouncing written words. Additionally, lexical decision tasks may be considered another of these processes. Within the ESL literature similar tasks are often used as measures of orthographic and phonological knowledge.

In a study discussed previously (Nassaji & Geva's, 1999), these researchers examined what variables best predicted reading comprehension. Two regressions were conducted, one in which lower level processing measures (i.e., phonological or orthographic tasks) were entered into the equation before higher level processing measures (i.e., vocabulary) based on the assumption that these lower level processes take place before higher level processes when reading. The researchers computed another regression model in which the higher level processes were entered before the lower level processes.

The task used to measure orthographic processing in the study presented participants with pairs of pseudowords. Each pair consisted of one word that was considered orthographically regular in English (e.g., gnub) and one word that was considered orthographically irregular in English (e.g., gmub). Participants were then required to quickly determine which word looked more like an English word. This task is somewhat similar to the task being used in the current study in that participants must use knowledge of orthographically regular English to determine if a word is a real word or a fake word. Phonology was assessed by again presenting participants with a pair of pseudowords. Participants were asked to indicate whether or not each pair of pseudowords rhymed.

Results revealed that efficiency of orthographic processing was the only lower level-processing variable to contribute unique variance above and beyond the higher level processing variables. Orthographic processing involves recognizing and applying knowledge about the regularity of English letter combinations (i.e., sight word recognition). This suggests that having knowledge of English orthographic regularity and being able to apply that knowledge with speed and accuracy is an important component of reading comprehension in ESL students. However, this study is not without limitations. The sample used in this study were students completing graduate work in an English speaking university, therefore, they are likely to be more fluent than many ESL students studying in the United States. Additionally, it can be difficult to isolate orthographic from phonological processes as they may be intertwined. For example, the task used to assess orthographic processing (i.e., determining if a pseudo word conformed to regular English orthography) may also require knowledge of English phonology. No information about overall English proficiency was gathered so these results may not generalize to other populations. Additionally, Farsi like Hebrew and Arabic is often written without vowels, which means these participants may come in with different orthographic processing skills than participants who are native speakers of another language where unvoweled scripts do not occur may not have.

Kato (2009) also found support for the impact of orthographic and phonological processing skills on English reading comprehension. Participants were 64 undergraduate and graduate native Japanese-speaking students enrolled in a university in the United States. Reading comprehension was assessed by students' score on the TOEFL. Participants were also given a phonological processing task where they were shown a pair of words and asked to pick which one would sounded like a real English word and an orthographic processing task where they

were shown a pair of words and asked to pick which word was orthographically regular in English. Lastly, they were given a sentence processing task where they were asked to read a sentence and then read an additional sentence and determine whether the second sentence contained the same meaning as the initial sentence. Additionally, each participant completed the sentence processing task under three conditions, (1) silently, (2) while tapping a foot, and (3) while repeating sounds (i.e., articulatory suppression condition).

A correlation analysis was conducted across all three conditions and results revealed that orthographic processing efficiency was moderately and significantly related to reading comprehension performance, $r = .35$. However, phonological processing efficiency was not found to be significantly related to reading comprehension across all three conditions, $r = -.24$. Additionally, only orthographic processing, $r = .28$, not phonological processing, $r = .19$, was found to be related to performance on the sentence verification task in the articulatory suppression condition. It appears that participants used only an orthographic strategy during the suppression conditions. Participants were also grouped into proficient and non-proficient groups based on their performance on the TOEFL. For the proficient group, orthographic skill was no longer significantly related to reading comprehension. This finding may be due to the different processes involved in L1 versus second language acquisition. It may also be due to the differences between Japanese and English writing systems in that they require different types of phonological codes.

Orthographic processing involves the visual recognition of lexical strings, which appears to depend on repeated exposure to letter strings. It may be that ESL students have less exposure to English print materials (e.g., magazines, books) than L1 students. The findings of Kato (2009) and Nassaji and Geva (1999), in conjunction with the importance placed on decoding in the L1

reading literature suggest, that orthographic processing skills may contribute to overall reading comprehension performance in ESL students. Additionally, these studies were conducted with ESL speakers with different first languages suggesting that orthographic processing may be a factor that is related to reading comprehension and second language fluency regardless of the type of first language spoken. In other words for fluent reading one has to automatically recognize words as being familiar, having a phonetic code and having meaning (vocabulary) in order to have reading comprehension. In general, as reading proficiency increases more emphasis is placed on learning vocabulary in order to understand the meaning of text. Additionally, vocabulary is often the focus in many ESL learning classrooms. It is very likely that vocabulary is an important contributor to overall reading comprehension.

Vocabulary. In order to understand text, readers must be able to not only read the words but also understand them. In order to extract meaning from text, readers must have a large word knowledge base. This is especially important if the language in which the student is reading is not her native language. Many language education programs focus on vocabulary development in order to increase overall language fluency. If readers do not understand the words they are reading, it is difficult for them to gather the overall meaning of the text. The National Reading Panel (2000) reports vocabulary is a critical component to becoming a skilled reader. The connection between reading comprehension and vocabulary has been long established in English L1 college students (Davis, 1942; Stahl & Fairbanks, 1986). Hendricks et al. (2010) found that in native English speaking college students vocabulary was the strongest predictor of timed reading comprehension performance. Research has also demonstrated a strong connection between vocabulary and overall language fluency (Lugo-Neriz, Jackson, Goldstein, 2010). In addition,

some studies have examined the relationship between vocabulary and reading comprehension in ESL students (Toboada, 2009; Tozcu, 2004).

A number of studies have documented a moderate positive relationship between vocabulary and reading comprehension in ESL college students (Alderson, 1984; Guo & Roehrig, 2011; Laufer, 1992; Qian, 1999; 2001). For example, Guo and Roehrig (2011) investigated the joint contribution of metacognitive knowledge and more language specific knowledge (vocabulary and grammar) to English reading comprehension performance in college students. Participants were 278 college students majoring in English education at universities in Mainland China. The TOEFL reading comprehension subtest and the Grey Silent Reading Tests were used as measures of English reading comprehension. Additionally, measures of syntactic awareness, metacognition and two English vocabulary tests were used.

The two vocabulary tests had the highest overall correlations with both measures of English reading comprehension of any of the variables in the study, ranging from .35 to .43. Confirmatory factor analysis was used to develop a two-factor model to explain reading comprehension, factor 1 included vocabulary and syntactic awareness and factor 2 included metacognitive strategies. Structural equation modeling (SEM) was used to evaluate the relative contribution of each of the factors to reading comprehension. Overall, both factors accounted for a large amount (87%) of the variance in English reading comprehension performance. Interestingly, the path for the first factor (vocabulary and syntactic awareness) was significant and the path for the second factor (metacognition) was not. The results of this study of a large sample of Chinese ESL students suggest that vocabulary may have a large impact on reading comprehension in ESL students. However, only the relationships among three factors (i.e., vocabulary, syntactic awareness, metacognition) and reading comprehension were examined.

Therefore, it may not be a comprehensive examination of the factors contributing to reading comprehension performance in ESL students.

Qian (1999) also found support for the impact of vocabulary on reading comprehension in ESL students. Participants were 80 adults enrolled in intensive academic ESL programs in Canada. Reading comprehension was assessed using the reading comprehension subtest of the TOEFL. Vocabulary was assessed via two measures, the vocabulary size test (designed to assess the breadth of English vocabulary knowledge) and the depth of vocabulary test (designed to assess the depth of English vocabulary knowledge). The vocabulary size test presented participants with six lists of six different words at five different levels for a total of 180 words. Participants were also presented with three definitions for each list of six words and were required to match the appropriate definition with the correct word. The depth of vocabulary test presented participants with one stimulus words and eight additional words that were either synonymous with part or all of the word or had nothing to do with the stimulus word. There were always four additional words that were partial or whole synonyms. The participant was required to select the four words that were synonyms to the stimulus word. A measure of morphological knowledge was also collected.

Correlations for both vocabulary measures were high and positively related to English reading comprehension, $r = .50 - .78$. A forced entry multiple regression analysis was then run to examine the unique contribution of each variables. Breadth of vocabulary knowledge alone accounted for 60% of the variance in reading comprehension. Depth of vocabulary knowledge was added as a second variable and accounted for an additional 11% of the variance in English reading comprehension. Lastly, morphological knowledge accounted for an additional 1% of the

variance in English reading comprehension. These findings suggest that vocabulary contributes significantly to reading comprehension in adult ESL students.

The impact of vocabulary on reading comprehension is relatively well researched and the positive impact of vocabulary on reading comprehension is well documented in the ESL literature (Alderson, 1984; Guo & Roehrig, 2011; Laufer, 1992; Qian, 1999; 2001). This is not surprising given the emphasis on vocabulary instruction in many second language-learning programs. Additionally, there is well established support for the contribution of vocabulary to reading comprehension in the English L1 literature (Davis, 1942; Stahl & Fairbanks, 1986). It is very likely that vocabulary will contribute to reading comprehension in college ESL students. There may also be group differences in vocabulary between ESL and L1 college students.

Strategy Use. One particular area of research that is more emphasized in the ESL literature than in the L1 reading literature is strategy use and its impact on reading comprehension. Several studies have examined how strategy use is related to English proficiency (Anderson, 1991; Davis & Bistodeau, 1997; Magno, 2010; Taillefer & Pugh, 1998). In general, these studies find that strategy use differentiates proficient from less proficient ESL students. More proficient ESL students utilize more strategies and do so more efficiently. Considerably less research has examined differences in strategy use between ESL and L1 students.

One study (Davis & Bistodeau, 1997) examined the differences in reading strategy between native English speakers and native French speakers using a think aloud procedure while reading both English and French texts. Results revealed that native English speakers utilized top-down approaches when reading in their native language, when the text was in their second language they utilized more bottom-up strategies. However, results revealed no statistically significant differences in approach were documented for native French speakers. However, for

both groups, restating ideas in their second language was positively correlated with idea units recalled about the texts. As stated previously few studies have directly examined differences in reading comprehension or component reading skills (i.e., vocabulary, decoding, and reading speed) between ESL and L1 students. Studies examining strategy use tend to focus on its contribution to reading comprehension in ESL students or how strategy use differentiates more from less English proficient ESL students. This lack of research comparing ESL to L1 college students should be addressed. Research comparing ESL to L1 college students could provide valuable information about how each group approaches timed tests of reading comprehension and factors that contribute to overall performance.

In another study on reading comprehension strategies, Anderson (1991) examined individual differences in strategy use in 28 native Spanish-speaking undergraduates. One way in which participants' reading comprehension was assessed was with a timed standardized multiple-choice test of reading comprehension. A second form of assessment was an untimed multiple-choice reading comprehension task, with passages taken from undergraduate textbooks. While completing each of the tasks, participants were asked to think aloud and report on the strategies they were using. Participants' responses were recorded and coded into 13 strategy use categories (i.e., individual word focus, intrasentential features, restatement, prediction, confirmation of prediction, reference, inferences, associations with prior knowledge, text order, self-questioning, comments on task itself, comments on own behavior). Intrasentential features referred to anything having to do with text itself, for example, "the fact that there aren't any periods or commas or anything at all."

Two regressions were run using performance on either reading comprehension task as dependent variables. For both reading comprehension tasks, strategy use was a significant

predictor of performance. Participants who reported using more strategies (i.e., skipping unknown words, paraphrasing) on both of the measures tended to perform better. These findings suggest that strategy use is related to reading comprehension whether or not the task is timed. However, the sample size used in the study was small and the think aloud procedure may not be an accurate measure of the actual strategies engaged in by students. The findings from this study are consistent with Magno (2010) who found that different language strategies (e.g.,, memory, compensation, metacognitve, cognitive, affective, and social strategies) were significantly and positively related to English proficiency, correlations ranging from .13 to .26, and that compensation strategy (i.e., when I am unsure of a word I use words that mean the same thing) use in particular was a significant predictor of English performance. Together these studies suggest that strategy use is related to overall English proficiency and reading comprehension in ESL students.

Another study that provides support for the link between strategy and reading comprehension in ESL students examined the strategy use of 39 native speakers of French (Taillefer & Pugh, 1998). Participants completed a reading comprehension test, an English proficiency test, and a strategy use questionnaire in both their L1 (French) and their second language (English). Participants were grouped as strong or weak readers in both languages based on their performance on the reading comprehension test. ANOVA was used to compare each group of readers on several of the strategies and overall English proficiency. Readers who were strong in both languages tended to employ the same strategies while reading either language; whereas readers who were weak in English tended not to apply the same reading strategies they were using in French when they were reading in English. Taillefer and Pugh (1998) also examined the specific strategies that differentiated between strong and weak readers. Problem

solving strategies appeared to uniquely differentiate strong from weak readers in English (e.g. "When you were blocked did you look for clues in the context").

Overall, these studies suggest that strategy use may be important to reading comprehension for ESL students. Studies have documented that strategy use differentiates stronger and weaker English readers (Davis & Bistodeau, 1997; Magno, 2010; Taillefer & Pugh, 1998). More proficient ESL students appear to use more strategies and use them more efficiently to understand text. Additionally, it appears that problem solving or compensation strategies, strategies employed when a reader is unsure or having difficulty, may be more related to reading comprehension performance than other types of strategies (e.g., cognitive, memorization) (Magno, 2010; Taillefer & Pugh, 1998). However, few large sample studies have directly compared strategy use between ESL and L1 students. Additionally, the majority of studies rely on talk aloud or self-report data to measure strategy use.

Perceptions of Reading Ability and Test Taking. In addition to strategy use, self-efficacy and motivation have been researched as potentially impacting reading comprehension in ESL students. Self-efficacy refers to the belief that one is able to perform certain actions and produce certain outcomes. The relationship between self-efficacy and reading achievement in L1 students is somewhat mixed. Some studies find that students with high self-efficacy do better on academic reading tasks (Schunk, 1999), while other studies argue that high self-efficacy may lead to detrimental academic outcomes (Stevenson, 1992). Research examining self-efficacy and reading in ESL students is sparse and as a result the relationship between self-efficacy and reading comprehension performance in ESL students is unknown.

One study (Yamashita, 2004) investigated the relationships among reading self-perception, anxiety, and English proficiency as well as performance in an intensive English

reading course. The participants were 54 Japanese-speaking college students enrolled in an English class in a university in Japan. Participants were given an attitudes questionnaire that assessed a variety of affective variables (i.e., reading self-perception, anxiety, and comfort with English, self-perception of the value of learning English), an English proficiency test, and performance in an English reading class, which was assessed by measuring the average number of pages read per week.

Self-perception of English reading was found to be significantly and positively related to the average number of pages read per week in an extensive English reading class. The correlation between self-perception of English reading and English proficiency approached significance. This finding indicates that self-perception of reading may be related to other reading variables in ESL students, however, which reading variables and the magnitude of the relationship is unclear. More studies need to be conducted in order to fully understand the relationship between ESL students' self-perception of reading ability and reading comprehension performance. One study did compare ESL to L1 students on measures of self-efficacy specifically related to reading.

Tercanlioglu (2004) investigated differences in the reading strategies, profiles, and self-perceptions related to reading in English between native English speakers ($n = 6$) and ESL postgraduate students ($n = 11$). Results revealed significant group differences in the amount of anxiety and difficulty associated with reading in English as well as the number of different sources used while reading a text in English. ESL students had significantly higher anxiety while reading in English and reported using more outside sources when reading text in English. With respect to self-efficacy, ESL post-graduate students tended to rate themselves as significantly lower than native English speakers on statements such as "I am average/above average at reading and understanding research and research terminology related to my field." However, due to the

small restricted sample, it is difficult to generalize these findings to other ESL students. There are only a few studies in this area and findings are tentative but they tend to suggest self-perception may be an important variable for ESL students' reading comprehension. Therefore, it is important to examine self-perception between ESL and L1 students in a larger sample and as part of a more comprehensive study.

Although there is little research examining the relationship between self-efficacy and reading in ESL students, there is some research examining the relationship between students' self-efficacy of their second language proficiency and overall language proficiency. Templin, Guile, and Okuma (2001) investigated whether an intensive self-efficacy course would be associated with increases in English proficiency and self-reported self-efficacy in ESL college students. Participants were 293 native Japanese-speaking undergraduates enrolled in a required basic collegiate level English course at a Japanese University. Participants were given pre- and post-tests of English proficiency and a measure of self-efficacy of English proficiency. Participants completed an intensive summer self-efficacy course designed to increase ESL students' self-efficacy and thus increase their overall English proficiency. The intensive summer self-efficacy program was designed as a summer class and focused on four areas listening, speaking, reading, and writing in English. After the intensive self-efficacy course participants did report significantly higher self-efficacy and performed significantly better on the test of English proficiency. It should be noted this study is not without limitations there was no control group or random assignment of participants. Therefore, results of this study should not be generalized to other ESL students. However, it is one of the few studies examining self-efficacy as it relates to second language proficiency.

As stated previously, there is very little to no research examining the effects of self-efficacy on reading comprehension in ESL students of any age. There is little research examining self-efficacy related specifically to reading in ESL students. The research that does exist is difficult to generalize and does not definitely demonstrate a link between self-efficacy and reading in ESL students (Tercanlioglu, 2004; Yamashita, 2004). There is some research examining self-efficacy and overall English language proficiency (Templin et al., 2001). This research suggests that there may be a relationship between self-efficacy and overall English language proficiency. However as with the English L1 literature, the direction of the relationship is somewhat unclear. For example, in general do students have higher self-efficacy because they are better in school or do students do better in school because they have higher self-efficacy? Additionally, ESL students may be more likely to have low self-efficacy about the English language and reading in English.

In the proposed study, I used a measure of self-perception of performance on timed reading tests. There is some evidence that The Self-Evaluation of Performance on Time Academic Reading (SEPTAR) is related to reading comprehension in L1 college students. In one study (Kleinmann & Lewandowski, 2005); the SEPTAR was used to assess college student's self-perceptions of reading speed and performance on timed reading tests. The SEPTAR was found to be significantly correlated with reading comprehension ($r = .39$). This suggests that self-evaluation of performance may be a contributor to reading comprehension score in the L1 college student population. Other studies using the SEPTAR with English L1 students that are considered at risk for performance on HST (i.e., students with learning disabilities and attention deficit/hyperactivity disorder) found that these students had significantly lower scores than typical peers, suggesting lower self-efficacy on timed reading tests (Berger, 2010; Lewandowski,

Gathje, Lovett, Gordon, 2012). It should be noted that this measure has not be used in a study of ESL performers.

Overall, the relationship between ESL students' reading self-efficacy and reading comprehension performance is unclear. There has been no large scale comprehensive study of the impact of self-efficacy on ESL students reading comprehension performance. Studies have documented that English language self-efficacy is related to overall English proficiency, however, the direction of the relationship remains unknown (Templin et al., 2001). Additionally, studies have documented a relationship between reading self-efficacy and performance on timed reading comprehension tests in other at risk groups (i.e., students with learning disabilities and students with ADHD) (Berger, 2010;Lewandowski, et al., 2012). The impact of self-efficacy as it relates to reading comprehension in the ESL population needs to be examined.

Test Anxiety. Another self-perception variable that could have an effect on one's ability to perform on HST is test anxiety. Test anxiety is defined as excessive worry and/or physiological arousal in an evaluative setting (Spielberger, 1972). Anxiety can be further stratified into two subdimensions referred to as worry and emotionality (Ziedner, 1991). Worry refers to the cognitive component of test anxiety (i.e., negative thoughts), while emotionality refers to the physiological component (i.e., racing heart). Research has demonstrated that the worry component of test anxiety has a greater negative impact on performance than the emotionality component (Powers, 1986). One explanation for the negative impact of test anxiety on test performance is that excessive and persistent negative thoughts may consume the test takers attention and concentration. The test taker is then unable to focus on the test. Another possible explanation is that anxious test takers are more likely to utilize ineffective metacognitive test taking strategies than less anxious test takers. Test anxiety has been

extensively studied and several studies have documented a negative relationship between test anxiety and timed HST in the English L1 population (Powers, 1986; Zeidner 1990, 1991).

ESL students may be at increased risk for test anxiety on college admissions exams simply because English is their second language. Although there are not many studies examining test anxiety and ESL students, a few studies have demonstrated that language anxiety is negatively related to second language acquisition and proficiency (Ariza, 2002; Perales & Cenoz, 2002; Sparks et al., 2009). Individuals that are highly self-conscious may be less likely to practice speaking the second language with others or participate in classes where the second language is being used. Similarly, if a student does not feel that they are completely fluent in English, taking a timed test in English may lead to an increase in test anxiety.

Yamashiro and McLaughlin (2001) examined the relationship between several affective variables and English language proficiency. Participants were 202 Japanese-speaking college students. Data were collected on four main variables, attitudes about English, anxiety, motivation, and overall English proficiency. SEM was used to examine the fit of their overall English proficiency model. Anxiety was found to be negatively related to English proficiency with a correlation of -.25. Those participants that had higher levels of anxiety related to English tended to be less proficient at English overall.

Another study (Liu, 2006) examined the impact of language anxiety in students with varying levels of English proficiency. Participants were 547 first year college students enrolled in a Chinese university. Participants completed a measure of classroom anxiety and background information. Additionally, researchers completed a semi-structured interview with each participant as well as teacher's classroom observations. Participants were grouped into high,

medium, and low proficiency groups based on the level of the English class they were enrolled in at university.

Significant differences in anxiety were observed between the high proficiency group and the low proficiency group. Participants who were placed in the higher English proficiency classroom tended to have lower overall anxiety as compared to participants in the lower English proficiency classroom. This indicates that individuals with lower English proficiency may feel more anxiety related to English activities. There were no significant differences between the medium proficient group and either the high or the low proficient group.

Overall, research has demonstrated a negative relationship between anxiety and general second language acquisition (Liu, 2006; Yamashiro & McLaughlin, 2001). There is substantially less research on the impact of anxiety on reading comprehension in ESL students. There is even less research examining test anxiety in ESL students. This is especially surprising in the United States given the increasing amount of high stakes testing that ESL students are required to complete. The research in the English L1 literature suggests a strong negative relationship between test anxiety and timed testing performance (Powers, 1986; Zeidner 1990, 1991). Additionally, ESL students are likely at risk for developing English test anxiety due to lower levels of English proficiency.

Purpose of the current study

One goal of the present study was to compare ESL and L1 college students on a host of variables associated with timed reading comprehension tests. Another goal of the study was to examine what variables best predict reading comprehension performance in ESL college students. Based on the reviewed literature a variety of variables may be related to reading comprehension in ESL college students including word recognition, vocabulary, reading speed,

test anxiety level, self-perception of reading performance, and strategy use. I predicted that ESL students would perform significantly poorer than L1 students on measures of reading comprehension, vocabulary, word recognition, and reading speed. I also predicted that ESL students would report higher test anxiety scores and lower self-perceptions of their performance on reading tests than the native English-speaking students. Finally, I anticipated that L1 participants would attempt significantly more reading comprehension items and do so more accurately than ESL students.

Multiple regression models were generated for both groups. Regression models were compared to determine if there were differences between groups in what best predicts reading comprehension controlling for all variables. I predicted that word recognition and reading speed would be significant predictors of reading comprehension performance in the ESL population but not in the L1 population. I predicted that for the L1 group, vocabulary would be the strongest predictor of reading comprehension, as several studies have documented the impact of vocabulary on reading comprehension especially in older more proficient readers (Braze, et al., 2007; Cromely & Azevedo, 2007). The other variables were too new or lacked consistent clear findings to make predictions, so examination of these variables (i.e., time management, test navigation) was exploratory. The purpose of including them in the model was to determine if they contributed to the prediction of reading comprehension.

Method

Participants

Institutional Review Board approval was obtained from the participating University prior to data collection. Participants were recruited from an introductory psychology course and upper level psychology courses. Participants were awarded course or extra credit upon completion of

the study as determined by their professors. Data were initially collected from 234 participants (ESL n = 98, L1 n = 136). Participants' data were removed from the final analyses if they (1) self-reported depression, anxiety, or learning disabilities, (ESL n = 4, L1 n = 13), (2) scored above/below two standard deviations on the English language proficiency measure, (ESL n = 5, L1 n = 1) or (3) scored above/below two standard deviations on reading speed, (ESL n = 5, L1 n = 6), (Table 1).L1 participants were then matched to the remaining 84 ESL participants based on (1) age, (2) sex, and (3) year in school. Using this technique there were 168 remaining participants (ESL n = 84, L1 n = 84) included in the final analyses. Participants with self-reported Attention Deficit/Hyperactivity Disorder (ADHD) were included in the analyses (ESL n =3, L1 n = 2), as a previous study using *TestTracker* (described below) demonstrated that college students with ADHD and college students without disabilities do not perform differently (Lewandowski et. al., 2012). An a priori power analysis was conducted using G*Power software with an effect size of .70, an alpha value of .05, and a power value of .80 (Faul, Erdfelder, Lang, & Buchner, 2007). The estimate indicated that a total sample size of 52 participants was necessary for sufficient power for the t-tests. Additionally, it was determined that 80 participants would be necessary to have sufficient power to conduct the regression analyses with eight predictor variables (Tabachnick & Fidell, 2007).According to these analyses the current sample size of 84 participants per group was adequate for both the regression analysis and the t-tests.

Demographic information for both groups is presented in Table 2 and 3. Chi Square tests and independent samples t-tests were used to examine group differences on the following variables: age, sex, year in school, socioeconomic status (SES), race, self-reported SAT Verbal and SAT Quantitative, self-reported effort, and self-reported grade point average (GPA).The alpha level was set at .05 for main group comparisons. Bonferroni's correction was used when

multiple comparisons were made. For variables with unequal group sizes (Table 3), Levene's test was used to examine the equality of variance assumption. If there were unequal variances between groups, Welch's correction was used.

Result indicated that the groups were not significantly different by age, F (1, 166) = 1.15, p = .29, sex, χ^2 (1, N = 168) = .10, p = .75, year in school, χ^2 (4, N = 168) = 5.31, p = .26, self-reported effort, F (1, 166) = -1.90, p = .06, SES based on the Hollingshead 2-factor formula, F (1, 158) = .11, p = .74, SAT verbal, F (1, 71) = -1.60, p = .12, or GPA, F (1, 123) = .14, p = .89 (Tables 2 and 3). The majority of participants in both the ESL (n = 80) and the L1 (n = 80) provided information to calculate their SES. Overall, both ESL and L1 groups were from more affluent families than the general U. S. population, and therefore this sample may not be representative of all people at this age. However, it is what might be expected at a large, expensive, private university.

It should be noted that in both groups there were more female than male participants, a proportion that reflects the greater proportion of females at this university. The groups were significantly different by race, χ^2 (7, N = 168) = 109.87, p < .001. There were more African Americans and Caucasians in the L1 group and more Asians and Hispanics in the ESL group. Additionally, the ESL group reported a significantly higher SAT Quantitative score, F (1, 76) = -3.48, p = .001 than the average SAT Quantitative score for the L1 group. However, this should be interpreted cautiously as participants were self-reporting their performance and only about half of ESL (n = 36) and L1 (n = 42) participants reported their SAT scores.

ESL participant demographic information. Information about the English language experience of the ESL participants was obtained via interview. This information is summarized in Tables 4, 5, and 6. Participants reported speaking 17 different native languages (Table 4). The

majority of participants were native speakers of Chinese ($n = 33$), Korean ($n = 17$), or Spanish ($n = 17$). Not surprisingly, participants reported that they grew up in a variety of countries (Table 5). The majority of ESL participants grew up in China ($n = 20$), South Korea ($n = 9$), or Puerto Rico ($n = 12$). Some participants reported that they grew up in more than one country ($n = 19$). The number of total languages spoken by participants including English ranged from two to four, with the majority of students only speaking two languages (i.e., their native language and English).

Overall, this sample represents a diverse group of ESL students coming from a variety of different backgrounds and language experiences. Self-reported age of English acquisition ranged from less than 1 year old to 18 years old ($M = 8.31$, $SD = 3.87$) (Table 6). Similarly, the age at which participants reported taking their first class to learn English as a second language ranged from 2 years to 17 years old ($M = 8.30$, $SD = 3.43$). Participants reported a range of 4 to 18 years spent in school to learn English as a second language ($M = 1.98$, $SD = 3.58$). Additionally, participants indicated a range of 0% to 100% of time they spoke with their parents in English when they were younger ($M = 1.38\%$, $SD = 2.05\%$) and a range of 0% to 95% of time they are currently speaking with their parents in English ($M = 15.58\%$, $SD = 26.72\%$).

Materials

TestTracker. A computer-based system designed to measure behaviors and test-taking skills similar to those required on HST, *TestTracker*, was used. Similar to the SATs, *TestTracker* contained timed measures of reading fluency, reading comprehension, vocabulary, and word recognition (Berger, 2010; Lewandowski et al., 2012). See Table 7 for a full list of *TestTracker* tasks. In addition, *TestTracker* recorded participants' navigation style (i.e., how often they switched their focus across the passage, question, and answer choices), and how much time was

spent looking at the reading passages, questions, and answer choices. It also contained measures of test anxiety, self-evaluation of performance (i.e., how well participants believed they did on the test), strategy use, and demographic information. Before beginning the *TestTracker* program, participants were instructed to exhibit as much effort as they would on the SAT or ACT. Once *TestTracker* began, the instructions were automated and run on the computer.

Reading Speed Test. *TestTracker* began with a measure of reading speed. Participants were instructed by the computer to read a passage of approximately 389 words for both speed and comprehension. Participants were instructed to click the start button in order to view the passage and the stop button once they had completed reading the passage. During this time, the computer recorded in milliseconds how long it took participants to read the passage. This information was then converted into reading speed (words read per min). This portion of the test took between one and five minutes.

The reading speed test on *TestTracker* correlated slightly with reading rate on the NDRT .31 and reading fluency on the WJ-III .25. This may be due to the different procedures involved in each task. On the NDRT, participants read a passage for a minute and circle the last word. On the WJ-III, participants determine whether simple sentences are true or false. On *TestTracker*, participants are asked to read a passage and indicate when they are finished and their time is recorded. Each method may reflect different reading processes, which may explain why they do not correlate more strongly with one another.

Reading Comprehension. Participants were then instructed to complete the reading comprehension section of *TestTracker*, the primary dependent measure of interest. Participants were instructed to complete as many reading comprehension questions as possible within 20 minutes. There were a total of ten passages and each passage had five reading comprehension

questions associated with it. The number of passages and questions were chosen based on pilot

data to ensure that ceiling effects would be avoided. In addition to how many questions they had

left, participants were able to see how much time they had remaining. This was an effort to

mimic some of the time constraints experienced during high-stakes testing. Also during the

reading comprehension section, *TestTracker* recorded a number of variables including total items

answered correctly, total number of items attempted, navigation style (i.e., number of switches

among passage questions and answers), and time utilization (i.e., how much time is spent looking

at passage questions and answers).

Flesch-Kincaid Grade Level readability estimates were calculated for all passages.

Readability estimates ranged from 10th to 17th grade level and passages were ordered from

easiest to hardest on the test. These readability estimates are similar to those calculated for the

SAT and ACT, which range from 9th to 15th grade level. Also, similar to the SAT and ACT,

participants were presented with a mix of inferential and factual passages. Efforts were made to

include passages containing information that college level students are generally not taught. This

was to ensure that participants would not know the answer to the question without reading the

paragraph. In a previous study (Berger, 2010) split-half reliability coefficients were calculated

for 185 college students for the comprehension tests. Results indicated a split-half reliability

estimate of .80. Validity results from a previous study (Lewandowski et al., 2012) in 32 college

students indicated that the comprehension percent correct on *TestTracker* correlated .51, *p<*.01,

with the comprehension percent correct on the Nelson Denny Reading Test.

Word Recognition Task. Following the reading comprehension measure participants

completed a word recognition test. This is a word/non-word lexical decision task, where

participants were presented with a combination of letters and were asked to determine if the

letters were a real word or a pseudo-word. There were a total of 90 word recognition items.

Participants had three minutes to complete as many items as they could. During this section,

TestTracker recorded the number of items attempted and completed correctly. This test was

designed based on the pseudo-word decoding subtest of the Wechsler Individual Achievement

Test – 2nd Edition (WIAT-II; Wechsler, 2001) and the word attack subtest from the Woodcock

Johnson III (WJ-III; Woodcock, McGrew, Mather, 2001). There is some emerging reliability and

validity evidence for the word recognition portion on *TestTracker*. Split-half reliability estimates

indicated adequate reliability, .81 (Berger, 2010). However, a one month test-retest analysis

conducted on 22 college students indicated low reliability .64. However, this test is highly

susceptible to practice effects therefore a more appropriate measure of consistency may be

obtained by using alternative forms of the test with a larger sample size.

Vocabulary Test. Following the word recognition test, participants completed a

vocabulary synonym test. Participants were presented with a word followed by five possible

answer choices. They were asked to select the answer choice that was synonymous with the

word. This section consisted of a total of 80 items. Participants were given three minutes to

complete as many items as possible. *TestTracker* recorded the number of items attempted and

completed correctly. This test was similar to the vocabulary portions on the SAT and ACT and

standardized tests like the Nelson-Denny Reading Test. Preliminary reliability evidence

indicated that the vocabulary test on *TestTracker* demonstrated good (.81) internal consistency

estimates. Similarly with the word recognition measure the vocabulary test demonstrated poor

one month test-retest reliability .61. However, as stated previously this is likely due to practice

effects and a more appropriate measure of consistency might be obtained using alternative forms

of the test on a larger sample. Preliminary validity evidence indicated that percent correct

vocabulary on *TestTracker* was moderately correlated with percent correct on the NDRT, .64, *p* <.01.

Demographic Questionnaire. Participants then completed a demographic questionnaire (Appendix B). The questionnaire asked participants to report age, gender, ethnicity, year in school, estimated GPA or grade percentage, whether they had received a diagnosis that would interfere with test-taking (i.e., ADHD, learning disability in reading, anxiety, depression), whether they had any other disability that might interfere with test-taking (i.e., visual or physical impairment that they received accommodations for or that affected their ability to use a computer), and whether English was their primary language.

Additionally, participants were asked to report their mothers' and fathers' highest level of education and occupation. Socioeconomic Status was calculated using Hollingshead's four factor index of social status (Hollingshead, 1975). A composite score for each participant was generated by multiplying the Occupation scale by a weight of five and the Education scale by a weight of three and then summing the products. Hollingshead Education codes ranged from 1 (less than seventh grade) to 7 (graduate professional training). Hollingshead Occupation codes ranged from 1 (farm laborers/menial service workers) to 9 (higher executives, proprietors of large businesses, and major professionals). Hollingshead Four Factor Index raw scores ranged from 8 to 66, with higher scores reflecting higher SES. In homes with two employed parent figures, the scores were averaged to obtain a single score per family. Participants who did not report any occupational or educational information for their parents were not included in the SES comparison. SES was treated as a continuous variable and was only used to compare groups for demographic purposes.

Self-Evaluation of Performance on Timed Academic Reading (SEPTAR). The SEPTAR (Kleinmann & Lewandowski, 2005; see Appendix C) was used to assess students' self-perceptions about their reading performance on high-stakes exams and their perceived need for extended time accommodations. It has been used in previous studies with college populations (Berger, 2010; Hendricks, 2010; Lewandowski et al., 2012). Participants were asked to respond to nine items using a 5-point Likert format (1 = strongly disagree; 5 = strongly agree) to simple statements regarding their reading performance. For example, "I am a slow reader," "I have trouble finishing timed tests," and "I could do better on my exams if I had additional time." It takes approximately 1-2 minutes to complete the scale. Scores on the SEPTAR range from 9 to 45. Higher scores indicated lower confidence in reading and testing abilities. Adequate internal consistency reliability ($\alpha = .89$) was obtained in a previous study by Berger (2010). Berger (2010) also found that SEPTAR score was significantly correlated with reading speed (.41), reading comprehension (.39), and processing speed (.20).

Questionnaire on strategy use and perception of performance. Participants were asked to respond to a questionnaire regarding strategy use during the test (Appendix D). This questionnaire has not been standardized and its psychometric properties are unknown. It was developed based on previous research on test-taking strategies and reading comprehension tests (Daneman & Hannon, 2001; Farr et al. 1990). Questions examined whether participants engaged in more passage-first or question-first strategies. It also examined whether participants switched strategy use during the test.

Timed Test Anxiety Inventory (TTAI). The TTAI (Spielberger et al. 1980) is a self-reported measure of test anxiety. The measure contains 20 items that assess both worry and emotionality components of test anxiety. This measure assessed anxiety at different points during

testing (i.e., before during and after the test). For the current study, an abbreviated 5-item version

of the TTAI, plus an additional four items were used (Appendix E; Taylor & Deane, 2002).

Reported reliability estimates for the short five item TTAI were adequate (α =.87). For example,

"During tests I feel very tense" and "Timed exams make me particularly nervous." Responses

were measured on a 4-point Likert scale ranging from 1 (almost never) to 5 (almost always).

Scores ranged from 8 to 32 and higher scores indicate higher levels of anxiety. The original

TTAI has high reliability (α = .93) and validity estimates and correlated strongly with other

measures of test anxiety (Taylor & Deane, 2002). It should be noted that there is no

psychometric information on the four additional items. These items and the TTAI are exploratory

in nature. The TTAI has been used in a previous dissertation and was shown to have similar

internal consistency; however, no validity information is currently available (Berger, 2010;

Lewandowski et al., 2012; Lewandowski, Hendricks& Gordon, 2012).

English Proficiency Test. The Woodcock-Munoz Language Survey - Revised (WMLS -

R) was used to assess participants English language proficiency. It has been standardized and

normed on individuals aged 2 through 60 years. The WMLS-R is an individually administered

instrument and contains seven subtests, including Picture Vocabulary, Verbal Analogies, Letter

Word Identification, Dictation, Understanding Directions, Story Recall, and Passage

Comprehension. For this study, the WMLS-R screener was used. This screening measure

consisted of four subtests (i.e., Picture Vocabulary, Verbal Analogies, Dictation, and Letter-

Word Identification), which took approximately 25 minutes to administer. The WMLS – R has

demonstrated adequate internal consistency (.81 - .93) and split-half reliability (.76 - .97).

Additionally, there support for the validity of the Broad English Ability composite. The WMLS

– R Broad English Ability Composite has demonstrated moderate to large correlations with the

sections of the Wechsler Adult Intelligence Scale – Third Edition, the Wide Range Achievement

Test, and the Oral and Written Language Scales (.53 - .81)

English Background Survey (Appendix F). A structured interview was used to gather

more information about the participants' informal and formal English background. Participants

were asked about their age of English acquisition, age at which they began taking classes to learn

English as a second language, years they spent learning English as a second language, and the

percentage of time they spent speaking with their parents in English. This interview was created

by the researcher for the purposes of this study and as a result has no psychometric information.

The Adapted Author Recognition Test. The measure of print exposure being used was

the adapted version of the Author Recognition Test (ART; Stanovich & West, 1989; Appendix

G) developed by Acheson, Wells, and McDonald (2008). The measure was adapted to provide a

list of classic and current authors that would likely be familiar to current college students. The

measure contained 65 real authors and 65 foils, and 15 authors retained from the original ART.

Participants were required to read the list of names and determine which names were of real

authors. A derived score was calculated by subtracting the number of correct answers by the

number of foils selected. Pilot testing on 99 L1 students revealed a varied range of selection (4%

to 99%) for the real authors retained on the measure. On the original ART, Cronbach's alpha was

calculated for the number of author's correctly identified (Stanovich & West, 1989). Results

indicated an acceptable reliability coefficient of .84 for the original ART. Analyses involving the

adapted ART will be exploratory due its lack of psychometric data.

Procedures

All participants were administered *TestTracker* and the ART in groups of four in quiet

location. *TestTracker* took between 35 and 45 minutes to complete. The ART took between 5

and 10 minutes to complete. After the group administration, all participants were individually

assessed using the WMLS – R, which lasted between 20 to 40 minutes. Following the WMLS –

R, only ESL students received a 10 minute English background survey regarding their English

language experience.

Experimental Design and Analyses

An Independent Samples t-test was used to compare ESL students to native English

speaking students on reading and test taking variables. An ANCOVA was used to compare ESL

students and L1 students on self-perception variables to control for differences in reading

comprehension. Additionally, multiple regression analyses were run to compare what best

predicts performance for each group.

The primary design of this study was a two-group comparison design with ESL status (ESL

or non-ESL) as the between group variable. The primary dependent variables were reading, test-

taking, and perception variables as listed below. The reading measures were: reading speed,

reading comprehension (number correct, number attempted, percentage correct), vocabulary

(number correct, number attempted, percentage correct), and word recognition (number correct,

number attempted, percentage correct). The test-taking variables examined were strategy use and

navigation switches. Dependent variables of self-perceptions included SEPTAR total score and

TTAI total score. In addition to the main dependent variables Broad English Ability as measured

by the WMLS – R was included in the major analyses. Additional variables that were collected

but not utilized due to non-normality of distributions included the ART and time management

variables. Using an Independent Samples t-test or a Chi Square test, group differences between

ESL and L1 groups were analyzed on the first ten dependent variables. Additionally, an

ANCOVA was run examining group differences in SEPTAR and TTAI score with reading comprehension percentage correct as a covariate.

Correlation coefficients were calculated for all pair combinations of variables (11 variables), with the exception of strategy use, for both groups in order to assess whether relationships among variables differed between groups. Additional correlation coefficients were calculated for only the ESL group based on information provided by the English language background survey. The three variables included in these correlations were age of acquisition, age of first English class, and years in school to learn English. Additionally, multiple regression analyses were conducted for both groups to determine which variables predicted performance on reading comprehension for the ESL group. The dependent measure was the number of reading comprehension questions answered correctly. Predictor variables for both groups were vocabulary, word recognition, reading speed, navigation switches, test anxiety, and SEPTAR. For the ESL group additional predictors included age of English acquisition and Broad English Ability.

Results

Assessment for Violations of Assumptions

Exploratory data analyses were conducted to determine if the assumptions of parametric statistical tests were met. With the exception of the ART and the time variables, the quantitative variables in the study exhibited distributions close to normality without significant skewness or kurtosis. The ART variable was significantly positively skewed for the ESL group and therefore the information obtained from this measure was only used descriptively. Additionally, the time variables (passage time, response time, question time) exhibited non-normal distributions; therefore, those data were only used descriptively. A 90% Winsorization (scores below the

5th percentile were set at the 5th percentile and scores above the 95th percentile were set at the 95th percentile) was run on several of the variables (comprehension number attempted, comprehension number correct, vocabulary number attempted, vocabulary number correct, word recognition number attempted, reading speed, Broad English Ability, navigation switches) to reduce the impact of outliers. Lastly, Levene's test was run on all comparisons to examine the equality of variances between groups. Welch's correction was used to account for inflation of type I error rate due to unequal variance on the following variables: comprehension number correct, vocabulary number attempted, and Broad English Ability. For the ANCOVA statistical tests indicated adequate reliability of the covariate, adequate moderate correlations between the covariates, adequate linearity, and homogeneity of regression slopes.

Correlations

Correlations among Reading Variables. Correlations were calculated among the following variables for both ESL and L1 groups separately; reading speed, reading comprehension (number correct, number attempted, percentage correct), vocabulary (number correct, number attempted, percentage correct), word recognition (number correct, number attempted, percentage correct), SEPTAR, TTAI, Broad English Ability, and navigation switches. All correlations are reported in Table 8. Additional correlations were computed for the ESL group on the following variables: age of acquisition, age of first English class, and number of years in school to learn English. For both groups, all reading measures on *TestTracker* were significantly ($p <.01$) related to one another.

For the ESL group, reading comprehension (number correct) was significantly and positively correlated with all other reading speed variables. Reading comprehension number correct exhibited significant relationships with speed, vocabulary items answered correctly,

vocabulary accuracy (percentage correct), word recognition items answered correctly, word recognition accuracy (percentage correct), and reading comprehension accuracy (percentage correct). Additionally, reading speed was significantly and positively related to all reading measures on *TestTracker* except for accuracy for all reading measures. This indicates that those who read faster were not more accurate on the reading comprehension, vocabulary, or word recognition tasks. Lastly, for the ESL group, vocabulary and word recognition were significantly and positively related to one another. This indicates that ESL participants who answered more questions correctly on the reading comprehension portion also tended to read faster, have larger vocabularies, and have greater word recognition ability.

Reading comprehension accuracy was significantly related to vocabulary number correct, word recognition accuracy, vocabulary accuracy, and comprehension number correct. This indicates that individuals who were accurate on the reading comprehension measure tended to be accurate on the on the vocabulary and word recognition measures. Reading comprehension accuracy exhibited significant negative relationships with comprehension items attempted. This suggests that individuals who were more accurate attempted fewer comprehension items than those who were less accurate.

Similar relationships were found among reading variables for the L1 group. Again reading comprehension (number correct) was significantly and positively related to all other reading variables. Reading comprehension (number correct) was found to be moderately related to speed, vocabulary items answered correctly, vocabulary accuracy, reading comprehension accuracy, and word recognition items answered correctly. Also similarly to the ESL group, the L1 group reading speed was found to be related to vocabulary and word recognition items. However, the correlation between reading speed and vocabulary was slightly higher for the ESL

group, $r = .48$, $p < .01$, than the L1 group, $r = .34$, $p < .01$. For the L1 group vocabulary and word recognition were significantly related to one another. For both groups reading speed was not related to accuracy on any of the reading measure, which suggests that individuals who read quickly were not more accurate. Additionally, reading comprehension accuracy was related to accuracy on vocabulary and word recognition. This suggests that those individuals who were accurate on the reading comprehension measure were accurate on the vocabulary and word recognition measures. However, unlike the ESL group, reading comprehension accuracy was not significantly associated with reading comprehension items attempted for L1 participants.

The correlations among reading measures for both groups were similar to correlations obtained in two previous studies examining *TestTracker* in typical high school and college students (Berger, 2010; Lewandowski et al., 2012). Correlation coefficients on reading measures were similar for both the ESL and L1 participants. Overall, these results suggest that participants who answered more items correctly, not more accurately, on reading comprehension also exhibited faster reading speed and answered more items correctly on measures of vocabulary and word recognition for both ESL and L1 participants.

Correlations for self-perception variables. The self-perception measures (test anxiety and self-perception of performance on reading tests) were found to be significantly and moderately related to one another for both groups. Participants who reported that they had difficulty on timed tests of reading comprehension also reported higher test anxiety. Conversely, participants who reported they perform well on timed tests of reading comprehension reported lower levels of test anxiety. However, SEPTAR was not found to be significantly related to any of the reading variables for either group. Self-reported test anxiety was found to be negatively related to reading comprehension, $r = -.25$, $p < .05$, and vocabulary, $r = -.23$, $p < .05$, in the L1

group. For the L1 group, test anxiety was significantly related to reading comprehension number correct and vocabulary number correct. This indicates that L1 participants who reported high levels of test anxiety tended to perform worse on measures of vocabulary and reading comprehension. In the ESL group test anxiety was related to reading comprehension accuracy for the ESL group. This indicates that ESL students who reported lower levels of test anxiety tended to be more accurate on the comprehension section.

Correlations for navigation switches. Navigation switches (i.e., how often participants switched between passages, questions, and responses) was found to be significantly related to all reading variables for the ESL group but not for the L1 group. For the ESL group, navigation switches were found to be significantly and moderately related to reading comprehension, vocabulary, word recognition, and reading speed (Table 8). This indicates that for the ESL participants, those students who switched between passage, responses, and questions tended to be faster readers and perform better on tests of reading comprehension, vocabulary, and word recognition. For the L1 group, navigation switches was related significantly to reading comprehension number correct, and reading speed. However, reading comprehension accuracy was negatively related to navigation switches for the L1 group only, $r = -.29$. This indicates that L1 group participants who switched more tended to answer more reading comprehension items correctly and were faster readers; however they were slightly less accurate. Additionally, they did not necessarily perform better on the vocabulary and word recognition tests.

Correlations for Broad English Ability. Broad English Ability encompasses skills such as vocabulary, spelling and grammar, verbal reasoning, and word reading. Broad English Ability was a measure of overall English language proficiency, and it included four subtests from the WMLS – R. For both groups, Broad English Ability was found to be significantly related to all

reading variables, except for reading comprehension accuracy. Broad English Ability was significantly and moderately related to reading comprehension items answered correctly, vocabulary items answered correctly, vocabulary accuracy, word recognition items answered correctly, word recognition accuracy, and reading speed (Table 9). Similar relationships were demonstrated in the L1 group, especially between Broad English Ability and word recognition items answered correctly. Relationships between Broad English Ability and the other variables were significant and positive, with the exception of reading comprehension accuracy. The correlations in the L1 group among Broad English Ability and comprehension, vocabulary, and reading speed tended to be lower compared to the ESL group. This indicates that the relationship between Broad English Ability and many of the reading variables was stronger for students who speak English as a second language than those students who are native English speakers. Interestingly, Broad English Ability was found to be moderately and significantly related to navigation switches, $r = .40$, $p<.01$, only in the ESL group. This indicates that ESL participants with stronger English abilities demonstrated more navigation behaviors (i.e., switched between question, response, and answer choices) throughout the reading comprehension test.

Effort Testing

Participants were asked to report how much effort they put forth on the reading comprehension portion of *TestTracker* on a scale of 0% to 100%. Results indicated that both groups reported putting forth good effort (ESL $M = 85.10\%$, $SD = 11.42$, L1 $M = 88.38\%$, $SD = 10.94$) and that self-reported effort was not significantly different between groups, $F(1, 166) = -1.90$, $p = .06$.

Group Comparisons

Group Comparisons on Reading Variables. Both groups were compared using one-way ANOVA and effect size estimates were computed using Cohen's *d*. As stated previously, a 90% Winsorization was conducted on several of the variables (i.e., navigation switches, vocabulary, comprehension, reading speed, Broad English Ability, and word recognition attempted) to reduce the impact of outliers on the distribution. A Bonferroni's correction of .0036 was used as 14 multiple comparisons were conducted.

Group comparisons on all variables are summarized in Table 10. Large significant differences between groups were found on all of the reading measures. The L1 group read faster, $t(139) = -8.42, p <.001, d = 1.30$, answered more comprehension questions correctly, $t(139) = -7.71, p <.001, d = 1.20$, answered more vocabulary items correctly, $t(139) = -7.00, p <.001, d = 1.08$, and answered more word recognition items correctly, $t(139) = -6.62, p <.001, d = 1.02$, than the ESL group. Additionally, the L1 group attempted significantly more comprehension, $t(139) = -6.00, p <.001, d = .92$, vocabulary, $t(139) = -4.63, p <.001, d = 1.14$, and word recognition items, $t(139) = -3.10, p <.001, d = .47$. These differences were quite large for comprehension and vocabulary and moderate for the word recognition items. Lastly, the L1 group was significantly more accurate on the reading comprehension, $t(139) = -5.64, p <.001, d = .50$, vocabulary $t(139) = -7.48, p <.001, d = 1.15$, and word recognition measures $t(139) = -3.24, p = <.001, d = .87$. These differences were large for vocabulary and word recognition and moderate for comprehension.

Group Comparisons on Test Taking Measures. Test taking variables in the current study included navigation switches and their self-reported strategy use during the reading comprehension task. Time variables were not included in the analyses as they exhibited non-

normal distributions and are interdependent. Results revealed that groups did not differ on navigation switches, $t(139) = -1.66$, $p = .09$.

In addition to the navigation switches, participants were asked to report which one of five strategies (i.e., skimmed through the entire passage and then tried to answer each question, read the question and then went back to skim the passage to find the correct answer, read the question first and selected an answer based on an educated guess, read the question and then went back to read the entire passage, read the entire passage thoroughly and then tried to answer each question) they engaged in during the reading comprehension portion of *TestTracker*. Chi-square analyses were conducted and revealed no significant differences between groups in self-reported strategy use, χ^2 (1, $N = 168$) = 1.70, $p = .79$. The majority of students selected either one of two strategies: reading the entire passage thoroughly and then answering each question ($n = 81$, 48%) or reading the questions and then going back to skim the passage to find the correct answer ($n = 60$, 36%).

Group Comparisons on Self-Perception Variables. Table 10 displays the comparison information for both groups on the self-perception measures (i.e., SEPTAR and Test Anxiety). Again, a Bonferroni's correction of .0036 was used due to the number multiple comparisons. To compare the groups an ANCOVA was conducted with reading comprehension (percent correct) as a covariate, to control for ESL participants' reading ability. Reading comprehension was chosen as a covariate because both the SEPTAR and the TTAI required participants to read and respond to short statements. Thus, ESL students' reading abilities may have impacted their responses. The SEPTAR and TAI required the participants to read short statements and then respond using a Likert format. An ANCOVA was conducted to ensure that differences on these variables were not the result of differences in reading comprehension. The ANCOVA conducted

on self-reported test anxiety controlling for reading comprehension indicated that the groups did not differ on self-reported test anxiety, $t(139) = 3.11$, $p = .08$. However, there were significant group differences on the SEPTAR, $t(139) = 14.32$, $p<.001$. ESL students reported that they performed worse on timed tests of reading compared to the L1 group.

Group Comparisons on Broad English Ability and the Author Recognition Test. As expected, the L1 group performed significantly better than the ESL group on the English proficiency measure with a large difference observed, $t(139) =-1.05$, $p <.001$, $d = 1.55$. Additional information about print exposure was assessed using the adapted ART (Acheson, Wells, and McDonald, 2008). These data were not formally compared due to the ESL participants' extremely skewed distribution. Thirteen (16%) ESL participants did not know any authors, and 20 (24%)only knew one or two authors. This suggests that the ESL participants had been exposed to considerably less popular English print than the L1 participants (ESL $M = 5.37$, $SD = 5.04$, L1 $M = 11.25$, $SD = 6.28$).

Regression Analyses

Multiple regression analyses were conducted with each group separately to determine which variables were most predictive of reading comprehension performance. Predictors for the L1 group were reading speed, vocabulary, word recognition, navigation switches, test anxiety, and SEPTAR. Predictors for the ESL group were the same with the addition of age of English language acquisition, and Broad English Ability. The criterion variable for both groups was number of comprehension items answered correctly.

Results of the regression analyses were similar for both groups (Table 11 and 12). For the L1 group, the regression equation accounted for 56% of the variance in reading comprehension performance, $R^2 = .56$, $F(6, 77) = 16.39$, $p<.001$. However, only reading speed ($\beta = 0.23$, $p = $

.03) and vocabulary ($\beta = 0.49$, $p = <.001$) were significantly predictive of reading comprehension performance, when other variables were controlled. The same variables with the addition of Age of Acquisition and Broad English Ability accounted for 54% of the variance in reading comprehension performance for the ESL group, $R^2 = .52$, $F(8, 75) = 11.07$, $p<.001$. For the ESL regression, only vocabulary was significantly predictive of reading comprehension performance ($\beta = 0.38$, $p<.01$). These results suggests that vocabulary is the most important predictor for ESL students in the current study.

Discussion

As hypothesized, the ESL group performed significantly lower than the L1 group on measures of reading comprehension (correct, attempted, accuracy), reading speed, vocabulary (correct, attempted, accuracy) and word recognition (correct, attempted, accuracy). Contrary to the hypothesis ESL group did not report experiencing more test anxiety than the L1 group; however, they did report that they perceived themselves as having more difficulty in reading under timed conditions than the L1 group. The groups did not differ on self-reported strategy use or number of switches during the reading comprehension measure. The groups spent similar amounts of time looking at the passages, questions and response choices. Vocabulary was found to be a significant predictor of reading comprehension for the ESL group after controlling for other variables; whereas vocabulary and reading speed were significantly predictive for the L1 group after controlling for other variables.

Reading Speed

ESL and L1 college students differed significantly on the reading speed measure ($d = 1.30$). This was the largest difference observed in the current study. ESL participants on average read 165.1 words per minute, while the L1 college students read 299.1 words per minute.

Previous research has revealed reading rates for typical college students to be around 230 words per minute (Lewandowski et al., 2003; Lewandowski et al., 2012). It appears the average reading speed of the English speaking college students in this study was higher than demonstrated in previous research. However, even compared to previous research the ESL students in the current study were slower readers.

The differences in reading speed between ESL and L1 college students may be attributed to a variety of factors. Results for the ART indicated that ESL students had less familiarity with English print. Additionally, ESL students have less familiarity and exposure to formal English schooling compared to L1 students. It is possible that ESL students have weaknesses in the component processes that contribute to fluent reading (e.g., word recognition, vocabulary, word recognition, and phoneme awareness). Several of these weaknesses were demonstrated in the current study. ESL students performed poorer on measures of vocabulary and word recognition compared to L1 students. This may indicate that ESL students struggle word recognition English words in text, one of the most important skills required for fluent reading (National Reading Panel, 2000). Decoding requires the student to use their knowledge of letter-sound relationship to pronounce words in text. This requires a knowledge base of phonology and orthography for English words. The task in the current study required participants to access some aspects of orthography; however it did not examine participants' phonological abilities directly.

A large amount of reading research has been devoted to examining how orthographic and phonological processing relates to reading. There is much research to suggest that efficient orthographic and phonological processing of text is required for fluent reading (National Reading Panel, 2000, Seidenberg & McClelland, 1989). One reason many young children have difficulty reading is due to difficulties with phonological awareness. Phonological awareness refers to an

individual's ability to process the smallest units of sound in spoken language. The majority of ESL students have had significantly less exposure to spoken English language; as a result they may demonstrate weaknesses in phoneme awareness or a lack of print exposure. Additionally, an ESL student's primary language may impact their decoding and phoneme awareness. An ESL student's primary language may play a role in their ability to process both orthography and phonology in English. For example, someone attempting to learn English whose primary language is not alphabetic must develop an entirely new system for processing orthographic and phonological information. For these students their difficulty with reading may have less to do with English exposure and more to do with difficulty with coding orthographic and phonological information in text based on their primary language. In addition to impacting ESL students' ability to process phonological and orthographic information, lack of exposure likely impacts ESL students' sight word reading ability. Sight words are words that cannot be sounded out according to decoding rules (e.g., the). Students learn these words through repeated exposure. As stated previously, the current study did not examine ESL student's phonological abilities. Future studies should examine potential differences in oral decoding and phonological awareness performance between ESL college students and L1 college students. Overall, it appears that ESL student's difficulty with reading speed is not easily explained and is likely due to several factors.

The link between reading speed and reading comprehension is well documented in younger L1 readers (Fuchs, et al., 2001; Fuchs, Fuchs, & Maxwell, 1988). In older readers the ability to read text quickly and accurately may be especially important on timed tests, which are often HST (Jackson, 2005). For the L1 group, reading speed was significantly predictive of reading comprehension performance (total number correct); however, this was not true for the ESL students. It is possible that reading speed was not predictive of performance for ESL

students because of the shared variance among other variables (e.g., switches, broad English ability). It is also possible that faster reading speed did not necessarily lead to increased comprehension for ESL students. Reading speed was found to be positively related to all reading measures including the number of items answered correctly and attempted, except for measures of accuracy. This indicates that ESL students who read faster were able to access more of the test than those who did not but were not more accurate in their responding. Perhaps this suggests that faster reading speed does not compensate for poor vocabulary or comprehension abilities. Although a student may be able to read quickly this does not aid them in comprehension unless they have knowledge of the word meanings. It is also possible that the relationship between reading speed, items attempted, accuracy, and switches reflects a specific approach to the test. Those participants who read quickly attempted to answer as many items as they could regardless of how accurate they were. For the L1 students this was related to increased switches suggesting that they may have been switching between questions, passage, and response in an attempt to find the answers.

Although reading speed appears to differentiate between ESL and L1 students in the current study, results should be interpreted cautiously. The reading speed measure from *TestTracker* was a silent reading task and similar reading speed measures have been criticized for lacking adequate reliability. Despite this, differences between groups were as expected and other measures on *TestTracker* thought to be component processes of overall reading speed (i.e., word recognition and vocabulary) also differentiated between groups. Consistent with previous research, reading speed for both groups was found to be significantly related to reading comprehension performance and the number of reading comprehension items attempted. This suggests that individuals who read faster were able to answer more questions and access more of

that test than those that read more slowly. However, the relationship between reading speed and comprehension accuracy was weaker. This could suggest that factors other than reading speed are related to reading comprehension performance in ESL students. Reading speed does have direct implications for performance on timed tests, especially HST where accessing more of the test gives students an advantage.

Word Recognition

The current study revealed significant difference between ESL and L1 college students on the word recognition task. ESL students performed significantly worse than L1 students ($d =$ 1.02) as well as attempting significantly fewer items than L1 students ($d = 0.47$). The task in the current study is best described as a lexical decision task, rather than an oral pronunciation of words. Participants were asked to indicate if a word was a real or a fake word. Research has demonstrated that word recognition is related to reading comprehension in native English speakers as well as ESL students (Braze et al., 2007; Kato, 2009; Martino & Hoffman, 2002; Nassaji & Geva's, 1999; National Reading Panel, 2000; Seidenberg & McClelland, 1989).

One reason ESL and L1 students may have differed on this measure is a lack of English "print exposure" and therefore less familiarity with regular English letter combinations. L1 students over the course of their lifetime have been exposed to significantly more English text than the ESL students and as a result are more familiar with regular English letter combinations than ESL students. The L1 students were able to more quickly indicate the correct answer as a result of their increased print exposure. Although, there are very few studies that directly compare college ESL and L1 students, studies have documented that the regularity of letter combinations and frequency of English words impacts the speed and accuracy of word recognition for ESL students (Akamatsu, 2002; Wang & Koda, 2007).

Another reason ESL students may have performed more poorly on the word recognition measure was that ESL students read the words in this measure more slowly than L1 students and therefore took more time to make a determination. The most robust difference between groups in the current study was reading speed. This suggests that ESL students are at a large disadvantage when it comes to speeded tasks of reading. Time is a crucial factor on the word recognition task. The word recognition measure required the participants to complete as many items as possible in 2 minutes. Not surprisingly, performance on the word recognition measure was significantly related to reading speed and number switches on the reading comprehension portion for ESL students. This indicates that ESL students who read quicker and utilized an active approach to the reading comprehension test performed better on the word recognition task. Additionally, ESL students' vocabulary contributed to their word recognition performance. ESL students who had a larger vocabulary were better at quickly recognizing whether a word was a real word or a fake word. However, reading speed alone cannot explain differences in word recognition performance as ESL students were less accurate as well. It is likely that a combination of poor reading speed, less print exposure, and smaller vocabulary combined to negatively impact the ESL students' score.

Vocabulary

ESL students performed significantly poorer than L1 students on vocabulary ($d = 1.08$) and attempted significantly fewer items ($d = 1.14$). Additionally for ESL participants, vocabulary was the only variable that significantly predicted reading comprehension performance. Vocabulary was predictive of L1 students reading comprehension performance as well, which is consistent with previous research using *TestTracker* (Berger, 2010; Hendricks, 2010). The impact of vocabulary on reading comprehension is well documented in the English L1 as well as

the ESL literature (Alderson, 1984; Davis, 1942; Guo & Roehrig, 2011; Laufer, 1992; Qian, 1999; 2001; Stahl & Fairbanks, 1986). Research on English L1 children has demonstrated that the amount of vocabulary children are exposed to at home has a positive impact on their overall vocabulary development (Hart & Risley, 1995). Information from the current study indicated that the majority of ESL students (68%) predominately spoke with their parents in their native language. Additionally, qualitative and quantitative information suggests that the ESL participants' English academic experiences were varied and few participants were enrolled in primary and secondary schools where English was spoken all of the time. This seems to suggest that ESL students in the current study were exposed to significantly less vocabulary through their educational, family, and community experiences.

Unlike word recognition or reading speed, vocabulary requires knowledge of word meanings. Although ESL students may be able to sound out or decode an English word, if they do not have knowledge of the word meaning their comprehension is crippled. Often ESL students are behind their L1 counterparts in vocabulary. This is usually the result of less exposure and practice with the English language. However, the ESL students' vocabulary in their native language may also play a role. ESL students may be limited by their vocabulary in their primary language. If ESL students have never learned the equivalent word in their primary language they must learn the word in English with no connection or support from their primary language. Additionally, many words are culturally bound and are not easily translated. For example, the word ataoso in Central American Spanish means, "one who sees problems with everything." In this case there is not one English word that means the same thing, therefore a more complex semantic code needs to be developed. The results from this study underscore the impact of vocabulary on reading comprehension for both ESL and L1 students. After ESL

students have mastered phonological and orthographic decoding, vocabulary may be the main area to target for remediation to increase comprehension of text.

The relationship between vocabulary and reading comprehension makes intuitive sense. The more words a person understands while reading text, the more likely he or she is to understand the text as a whole. Additionally, vocabulary is likely related to other component processes (e.g., reading speed) that aide in comprehension. ESL students are arguably the most disadvantaged when it comes to English vocabulary. Exposure and practice with English vocabulary may be especially important for college ESL students who may be expected to demonstrate knowledge of increasingly more complex English words. These findings suggest that continued development and exposure to English vocabulary words, especially those relevant in a college setting, would be beneficial for all students and especially ESL students.

Reading Comprehension

Results from the current study revealed significant differences in reading comprehension between groups. ESL participants attempted fewer comprehension questions ($d = .92$), answered fewer questions correctly compared to the L1 participants ($d = 1.20$), and were less accurate ($d = .50$). This has direct implications for HST and timed in-class tests that require reading comprehension. This finding suggests that L1 participants were able to answer more questions and therefore access more of the test than ESL participants. This is likely the result of ESL participants' weaknesses in component areas that contribute to reading comprehension. ESL students read slower, had smaller vocabularies, and were less accurate than the L1 students. The combination of these weaknesses put ESL students at a distinct disadvantage on timed tests of reading comprehension compared to L1 students.

Additionally, results from the current study provide some evidence for what is most predictive of reading comprehension. For the L1 participants, reading speed and vocabulary were both found to be significantly predictive of reading comprehension performance, which is consistent with previous research (Beck, Perfetti, & McKeown, 1982; Berger, 2010; Davis, 1942; Hendricks, 2010; Jackson, 2005; McKeown, Beck, Omanson, & Perfetti, 1983; Medo & Ryder, 1993; National Reading Panel, 2000). For the ESL participants, only vocabulary was found to be significantly predictive of reading comprehension performance. This is not surprising given the well documented relationship between vocabulary and reading comprehension in ESL students (Guo & Roehrig, 2011; Laufer, 1992; Qian, 1999; 2001). None of the additional reading (i.e., reading speed, word recognition), self-perception (i.e., anxiety, self-perception of reading skills/ability), test taking (i.e., switches), or language variables (i.e., age of acquisition, broad English ability) were significantly predictive of reading comprehension. Although these variables did not predict reading comprehension performance, all of the variables with the exception of the self-perception variables were significantly and positively correlated with reading comprehension performance on *TestTracker*. Lastly, both regression models accounted for between 54% and 56% of the variance in reading comprehension, which leaves a substantial amount of unexplained variance. The relationships between these variables and reading comprehension on timed tests are complex, multi-faceted, and interdependent. Future studies may benefit from development of a more comprehensive model of reading comprehension on timed tests that more accurately portrays the relationships among variables that may impact ESL students comprehension (e.g., general knowledge, IQ, or amount of time spent reading English text).

Overall, these findings seem to suggest that vocabulary should be a major focus area for remediation in ESL students. Intervention specifically targeted to increase an ESL student's vocabulary may lead to increases in reading comprehension performance. In the current study ESL students' difficulties in reading comprehension were likely due to their collective weaknesses in vocabulary, reading speed, and word recognition. ESL students read the comprehension passages, questions, and response choices slower than the L1 students and understood less of what they were reading. Therefore ESL students were not able to attempt as many items as the L1 students, and on the items they did attempt, they were less accurate than the L1 students.

Test-Taking Strategy and Approach

The present study found no differences between ESL and L1 students on their self-reported test-taking strategy or navigation during the reading comprehension task. Although time management was not compared statistically, the average amount of time spent looking at passages, questions, and responses was very similar for both groups. All participants were asked to report which of five strategies they engaged in during the reading comprehension portion of *TestTracker*. There was no difference between groups in the type of strategy they reported engaging in. The vast majority of participants reported that they either read the entire passage thoroughly and then answered each question or that they read the questions and then went back to skim the passage to find the correct answer. In addition to self-reported strategy information, *TestTracker* kept track of how often participants switched from passage to question to response. Exploratory analyses revealed that students who reported that they read the question first and then skimmed the passage switched significantly more than students who reported that they read the entire passage first and then answered each question.

Previous studies have documented differences between students with learning disabilities, students with ADHD, and typical students in the number of navigation switches they make (Lewandowski et al., 2012; Berger 2010). These researchers found that students with learning disabilities and ADHD switched less often than typical students. This suggests that their approach to the reading comprehension portion may have been different than a typical college student. Previous studies also revealed that the top performers on the reading comprehension section switched more often than the lowest performers on the reading comprehension section. Results from the current study do not indicate that ESL students navigated the test differently than the L1 students. It appears that the differences in reading comprehension performance are not due to their test-taking behavior.

However, previous research using *TestTracker* has indicated that navigation style is related to overall reading comprehension performance. Specifically, students who switched more often tended to be faster readers and better at reading comprehension than those who did not (Lewandowski et al., 2012; Hendricks, 2010; Berger 2010). Interestingly in the current study for ESL and L1 students, individuals who were more accurate on reading comprehension were not faster readers. For the ESL students increased accuracy was related to fewer items attempted. This could indicate a general approach to the reading comprehension task. ESL students may have taken a slow but accurate approach or attempted to answer as many items as possible regardless of accuracy. For the L1 students increased accuracy on the reading comprehension portion was associated with fewer navigation switches. This seems to point to a similar slow but accurate approach to the reading comprehension task. Additionally, items on *TestTracker* become progressively harder. Therefore, it may have been beneficial to spend time answering the easier questions in the beginning correctly. One other study completed with *TestTracker* found

that the number of navigation switches was one of the best predictors of reading comprehension performance in typical college students, which seems to suggests that an active navigation style leads to increased number of comprehension items correct (Hendricks, 2010). Consistent with previous research ESL and L1 students who switched more often tended to do better and attempt more items on all reading measures. This seems to indicate that the combination of being able to read quickly and actively navigate the test is an effective strategy in approaching the reading comprehension on *TestTracker* and potential timed tests of reading comprehension. Although this strategy may be effective on timed tasks where the number of items completed varies depending on the speed of the test taker, this is not necessarily a more accurate approach to the test.

Self-Perception of Reading Speed

The current study found significant differences between groups in their perception of their performance on timed tests of reading. ESL participants perceived their test-taking abilities to be significantly poorer than L1 participants. Little research exists examining self-efficacy and self-perception as it relates to reading in a second language. Preliminary results seem to suggest that there may be a link between better self-efficacy and reading ability in English (Tercanlioglu, 2004; Yamashita, 2004). However, evidence in this area is still emerging. One previous study using *TestTracker* found that students with ADHD perceived themselves as having poorer reading abilities than a control group despite the fact they did not perform differently on the reading comprehension task (Lewandowski et al., 2012). Another study with *TestTracker* found that students with learning disabilities reported similar confidence in their reading abilities compared to a control group despite performing more poorly on the reading comprehension task (Berger, 2010). These results seem to indicate that students with ADHD and learning disabilities

do not have accurate perceptions of their performance on timed tests of reading, which may be a result of their disabilities or schooling experiences. In the current study, ESL students appear to report their difficulties on reading tasks accurately suggesting that they too are aware of the limitations that they face on tests of English reading.

Test Anxiety

The current study found that ESL and L1 students reported similar levels of test anxiety. This finding was contrary to my hypothesis that ESL participants would report higher levels of test anxiety than L1 students. The majority of studies examining anxiety in the ESL population examined the impact of language anxiety on English language proficiency and opportunities for practice. Language anxiety refers to anxiety experienced by non-native speakers when learning or using a foreign language. Several studies have documented the negative impact of language anxiety on language proficiency (Ariza, 2002; Perales & Cenoz, 2002; Sparks et al., 2009). It seems intuitive that ESL students would be at increased risk for test anxiety because English is their second language. However, test taking is an individual activity whereas speaking in one's non-native language involves communication with another person, which may lead to increased anxiety.

In the current study, ESL participants reported lower confidence than controls in their reading and test-taking abilities; therefore, it is somewhat surprising that they did not report higher levels of test anxiety. It is possible that participants in the present study did not feel anxious while completing these tasks and that this impacted their responses on the TTAI. The reading comprehension section on *TestTracker* only took 20 minutes to complete and students were aware that their performance did not impact their grades. Also, it is possible that test anxiety does not differentially affect ESL and L1 students.

Limitations

When considering the implications of these finding some threats to internal and external validity should be taken into account. One limitation had to do with the heterogeneity of the ESL sample. Participants came from a variety of cultural, educational, and linguistic backgrounds. Although this sample may be representative of ESL college students in the Northeastern United States, results of this study should be generalized with caution. In the current study, the majority of participants were from China, South Korea and Puerto Rico. There were very few ESL participants who were raised within the United States. Additionally, these ESL students were currently enrolled at a competitive private university and therefore must have scored well on their HST admission test and the majority of participants reported coming from an affluent background. This current sample may not be representative of all ESL students.

Additionally, there is some research to suggest that an ESL student's native writing systems (e.g., logographic writing system, syllabic writing systems, and alphabetic writing system) impact their reading development (Muljani, Koda, & Moates, 1998; Wang & Koda, 2007). All ESL participants were grouped together in the current study, regardless of primary language, in an attempt to examine a representative group of ESL college students. In the current study, participants reported 17 different first languages spoken. The demographics of the participants may aid the ecological validity of the sample but may limit the external validity of the current results.

Another consideration was participants' motivation to perform with a strong effort. Participants may not have been motivated to perform optimally during the study for a variety of reasons. Although participants were instructed to try their best and treat it as though it were the SAT (Appendix A), the conditions were not the same as a high stakes tests. Additionally,

participants were aware that their performance did not affect their grade in the course or overall GPA. The lack of incentives or high stakes realism may have resulted in some participants not trying their best. In the same vein, ESL participants may not be familiar with the SAT. In consideration of this potential limitation, attempts were made to measure effort and remove participants who were not putting forth reasonable effort. However, overall self-reported effort for both groups was considered adequate and was not significantly different (ESL 85.10%, L1 88.38%). Despite the attempt to verify good effort, student motivation may have been affected by the lack of incentives combined with the lengthy and challenging tasks.

Another limitation involved the measures on *TestTracker*, which must be considered to be in the developmental phase. The tasks on this online battery are not the same as standardized, commercial tests. They do not have the extent of psychometric evidence as does the Woodcock Johnson III Tests of Achievement, for example. The tasks (i.e., reading speed, word recognition, vocabulary, and reading comprehension) on *TestTracker* were created based on commercial standardized tests such as the Nelson Denny Reading Test, and actually have similar psychometric properties. However, the research on *TestTracker*'s psychometric properties is relatively sparse at this time. There is some evidence for the validity and reliability of the measures on *TestTracker*. Lewandowski et al. (2012) found that the various reading tasks on *TestTracker* correlated with various commercial reading measures (between .25 and .61). Additionally, Berger (2010) found internal consistency reliability estimates of .80, .81, and .86 for the comprehension, vocabulary, and word recognition tests, respectively. More research needs to be conducted examining the psychometric properties of the various reading measures on *TestTracker*.

In summary there are several limitations that constrain the generalization and interpretation of results. To the extent possible, steps were taken to minimize some of these limitations. Also, there is some evidence of the reliability and validity for the reading measures on *TestTracker*, and results from the current study seem to add to the validity evidence (i.e., measures that should relate to one another do, relationships are similar to what has been reported in other studies). If the measures on *TestTracker* have adequate reliability and validity and were able to identify specific weakness for ESL students, the next step would be to target those areas for remediation and intervention. Despite these limitations, there were robust findings that seem to extend the literature on ESL college students and test taking behaviors.

Directions for Future Research

The current study presents several possible avenues for future investigations. First, future research should focus on administering *TestTracker* to larger and more specific groups of ESL students. For example, using *TestTracker* to investigate potential differences among ESL college students raised within the United States, native English speaking college students, and ESL international college students. Another potentially interesting investigation would-be to compare select groups of ESL college students based on their writing systems (e.g., logographic writing systems and syllabic writing systems).It might be interesting to examine ESL students' test taking abilities at different English proficiency levels (i.e., high English proficiency vs. low English proficiency) and years of education (i.e., freshman, sophomores, juniors, and seniors. Also, administering *TestTracker* to ESL high school students may provide valuable information regarding weaknesses in ESL students that may not be college bound. These studies, regardless of the results, would contribute to the literature regarding ESL students and test taking.

Individuals who are truly bilingual may have advantages in areas like executive processing and creativity (Hilchey & Klein, 2011). The current study indicated that there were some ESL college students that have difficulty with reading comprehension and who likely required support and remediation in order to be successful in college. Future research could focus on measures for identifying ESL college students who might be at risk for reading comprehension difficulties. Few studies have examined ESL students' component skills in areas like phoneme awareness, oral reading fluency, and measures of vocabulary development. Additionally, few studies have examined how difficulties with component skills predict reading comprehension difficulties in ESL college students. This research would extend our understanding of how to identify ESL students who might be considered at risk. These findings would help inform universities which students require remediation and support and in what areas.

Other studies could examine the most effective ways to support ESL students on college campuses. Specifically studies examining appropriate interventions or accommodations for ESL college students. It would be especially interesting to examine the efficacy of a comprehensive vocabulary and/or reading speed intervention to determine if gains in reading vocabulary or reading speed lead to commensurate gains in reading comprehension. Research examining the appropriateness of test accommodations for school aged ESL students has revealed that use of English language dictionaries and glossaries were both valid and effective accommodations for HST (Abedi et al., 2004; Kieffer et al., 2009). There is some support that ESL students benefit from modifying test items to reduce construct irrelevant complexity by making sentences less complex and including more high frequency words. Additionally, extended time may be an

appropriate intervention given ESL students' slower reading speed. It would be interesting if future studies examined the appropriateness of these accommodations for ESL college students.

Additionally, it may be beneficial to examine areas related to test-taking that have been well researched in the L1 literature but lack a research base in the ESL literature namely, the self-perception variables examined in the current study (i.e., test anxiety, and self-perception of performance on timed tests of reading). The current study found that ESL students reported significantly lower confidence in their ability to take timed tests of reading compared to L1 students. Self-efficacy as it relates to high stakes tests and collegiate performance in ESL students should be examined further. Additionally, test-anxiety is a relatively well research concept in the L1 college literature and it is virtually absent in the ESL college literature. Research has demonstrated that test anxiety impacts performance. HST may be especially anxiety provoking as many important decisions rely on the outcome. Additionally, ESL students may be at risk for developing test-anxiety especially if they have lower confidence in their test taking abilities.

Another interesting avenue of research could be to compare ESL students' performance on timed versus untimed measures of reading comprehension. In the current study, the reading comprehension measure was timed. Additionally, the reading comprehension measure was designed to add time pressure. The ESL students in the current study did not attempt nearly as many items; however, they were only slightly less accurate than L1 students. It would be interesting to examine whether removing the timed component on tasks lessened the gap in performance between ESL and L1 college students.

Lastly, more research needs to be devoted to developing a comprehensive model of reading comprehension for older ESL college students. Currently, research is emerging regarding

the reading development of younger ESL students. However, there is virtually no research examining comprehensive models of reading comprehension in college ESL students. Developing a better predictive model of reading comprehension for older ESL students will lead to better understanding of the various components processes involved in reading comprehension at a high level. Understanding these processes will lead to better available strategies and interventions for increasing reading comprehension in these students.

General Conclusions

Despite limitations, the findings of the present study extend the limited research examining test-taking and reading abilities of college ESL students. Results revealed significant and robust differences in test-taking performance but not in behavior. ESL students' performance was significantly lower than L1 students on reading comprehension, the main variable assessed on high stakes exams as well as an important variable for collegiate success. Additionally, ESL students performed significantly lower on measures of vocabulary, reading speed, and word recognition. Compared to L1 students, ESL students attempted significantly less items on all reading measures (e.g., word recognition, vocabulary, and reading comprehension). The most important factor impacting ESL student performance was vocabulary. ESL students combined weaknesses in vocabulary and reading speed put them at a disadvantage compared to L1 students. Although ESL students presented with weaknesses in all areas related to reading comprehension, they did not appear to take tests differently than L1 students.

It should be noted that the sample in the current study was an extremely heterogeneous group demographically and in their performance on many of the dependent measures. It appeared that there were some students who might require more support, practice, or English exposure in order to be successful. These ESL students might benefit from interventions and

accommodations designed to address their weaknesses. However, research should be conducted in order determine the best way to support (e.g., accommodations, interventions, acculturation aide, or increased exposure to English) ESL students who might be at risk for reading comprehension difficulties in college. Additionally programs similar to *TestTracker*, which profiles an individual's specific academic and test-taking areas of weakness, may be able to provide specific individual feedback to students regarding their standardized test performance. With the increasing globalization of American universities, the time is now to better assess, remediate, and accommodate those ESL students who struggle with test taking in their second language.

Appendix A
RAND's Conceptual Model for Reading Comprehension

RAND MR1465-1

Sociocultural
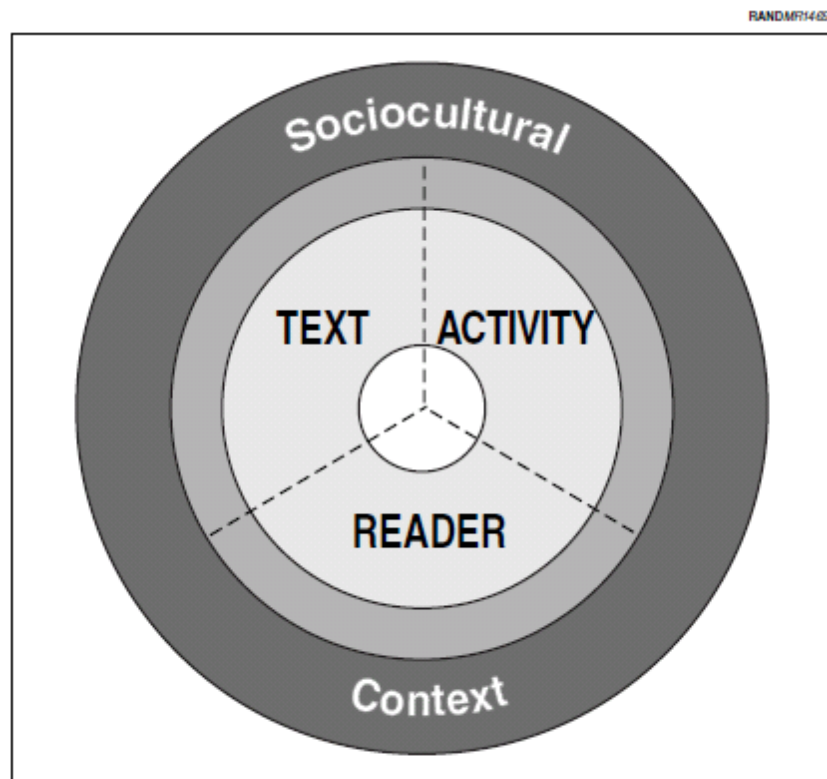
TEXT | ACTIVITY

READER

Context

Figure 2.1—A Heuristic for Thinking About Reading Comprehension

(Source: RAND Reading Study Group. (2002). Reading for understanding: Toward an R&D program in reading comprehension. Santa Monica, CA: RAND.)

Appendix B
Demographic Questionnaire

1. Age: _____ years, _____ months

2. Gender: M   F

3. Year in school:
   High School Freshman
   High School Sophomore
   High School Junior
   High School Senior
   1st Year College (Freshman)
   2nd Year College (Sophomore)
   3rd Year College (Junior)
   4th Year College (Senior)
   5th Year College or more

Estimated Grade Point Average in high school: _____

5. Estimated Percent Grade Point Average in high school (0-10) _____

6. SAT Score (Verbal):   _____

7. SAT Score (Math): _____

8. Ethnicity: (check all that apply)
African American
Asian
Caucasian
Hispanic
Native American
Other

9. English is my first language   Y   N

10. Do you currently receive disability-related test-taking accommodations: Y   N

11. If yes, what accommodations and for what disability:

12. Permanent state of residence: (able to select from a list of the 50 states/Canada/Other)

13. Have you been professionally diagnosed with: (check all that apply)
        ADHD/ADD

       Anxiety
       Depression
       Learning Disability in Math
       Learning Disability in Reading
       Learning Disability in Writing
       Vision Problems that Require Test Accommodations
       Arm/Hand Injury Affecting Computer Use
       Other Medical Disability (Diabetes)
       None

14. Mother's highest level of education (optional)

15. Mother's occupation: (optional)

16. Father's highest level of education: (optional)

17. Father's occupation: (optional)

Appendix C
Self-Evaluation of Performance on Timed Academic Reading, Revised Version
(SEPTAR)

Please rate the following items using the five-point scale described below:

#	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	I am a slow reader.	1	2	3	4	5
2	I have trouble finishing timed tests.	1	2	3	4	5
3	My reading speed negatively affects my ability to do well on exams.	1	2	3	4	5
4	I finish exams early.	1	2	3	4	5
5	I am able to pace myself appropriately on timed exams.	1	2	3	4	5
6	I could do better on my exams if I had extra time.	1	2	3	4	5
7	I need to read things over and over again to be able to understand them.	1	2	3	4	5
8	I would do better on exams if I were faster.	1	2	3	4	5
9	My reading speed is adequate for exams.	1	2	3	4	5

Appendix D
Self-Evaluation of Strategy Use and Perceived Performance

What percentage of the questions (that you answered) do you think you answered correctly?
_____%

On the first comprehension passage, which strategy best describes the method you used?
      Read the entire passage thoroughly and then tried to answer each question
      Skimmed through the entire passage and then tried to answer each question
      Read the question(s) and then went back to read the entire passage
      Read the question and then went back to skim the passage to find the correct answer
      Read the question first and selected an answer based on prior knowledge
      Read the question first and selected an answer based on an educated guess

Did you change this strategy after the first passage?
      Yes
      No

If yes, which strategy did you choose next?
      Read the entire passage thoroughly and then tried to answer each question
      Skimmed through the entire passage and then tried to answer each question
      Read the question(s) and then went back to read the entire passage
      Read the question and then went back to skim the passage to find the correct answer
      Read the question first and selected an answer based on prior knowledge
      Read the question first and selected an answer based on an educated guess

Do you feel that the approach you used in taking this test was similar to how you normally
    take high-stakes reading comprehension tests (i.e., SAT)?   Y   N

Please evaluate your level of effort on the reading tasks (100%=maximum effort):____%

Appendix E
Timed Test Taking Anxiety Inventory (TTAI)

A number of statements which people have used to describe themselves are given below. Read each statement and then provide a number to indicate how you *generally* feel. Use "1" for "almost never," use "2" for "sometimes," "3" for "often," and "4" for "almost always."

#	Item	Almost Never	Sometimes	Often	Almost Always
1	During tests I feel very tense.	1	2	3	4
2	I wish examinations did not bother me so much.	1	2	3	4
3	I seem to defeat myself while working on important tests.	1	2	3	4
4	I feel very panicky when taking an important test.	1	2	3	4
5	During examinations, I get so nervous that I forget facts that I really know.	1	2	3	4
6	Timed exams make me particularly nervous.	1	2	3	4
7	I worry about not having enough time to complete a standardized test (e.g., SAT).	1	2	3	4
8	My nervousness disrupts my thinking and costs me time on exams.	1	2	3	4
9	On the comprehension test today I felt nervous about how I would perform.	1	2	3	4

Appendix F

Interviewer: *Now I am going to ask you some questions about your English language experiences. Please let me know if there is anything that I say or that you read that you do not understand and I would be happy to help explain it to you. Please answer each question as honestly and accurately as you can. I am going to be asking you to estimate time, if you do not remember the exact amount of time please estimate.*

1. What is your native language? _____

2 What other languages do you speak? _____

3. What country or countries did you grow up in? _____

4. What language or languages did you frequently hear in [insert country they grew up in]? _____

5. With which race do you identify? _____

(After they have identified if it does not fit into one of these categories ask them to select one of the five/six categories below and circle that selection)

    Native American or Alaskan Native
    White
    Black
    Latino
          Hispanic origin
          Non Hispanic origin
    Asian or Pacific Islander

Age of Acquisition:

6. How old were you (year and month) when you first began hearing or learning English on a regular basis? _____

7. How old were you (year and month) when you first began taking classes to learn English as a second language? _____

English Exposure:

    How many years have you learned English in school (Gradman and Hanania, 1991)? _____

    When you were growing up, what percentage of the time would your parents or guardians speak in English? _____

    Currently, what percentage of the time do you speak with your parents in English?

(Adapted from Acheson et al. 2008):

    How many <u>hours</u> a week do you spend reading textbooks:

0h	2h	3h	4h	5h	6h	+7h

    2. How many <u>hours</u> a week do you spend reading academic material other than textbooks:

0h	2h	3h	4h	5h	6h	+7h

    3. How many <u>hours</u> a week do you spend reading magazines in English:

0h	2h	3h	4h	5h	6h	+7h

    How many <u>hours</u> a week do you spend reading newspapers in English:

0h	2h	3h	4h	5h	6h	+7h

    5. How many <u>hours</u> a week do you spend reading emails in English:

0h	2h	3h	4h	5h	6h	+7h

6. How many <u>hours</u> a week do you spend reading Internet media (not including emails in English :

| 0h | 2h | 3h | 4h | 5h | 6h | +7h |

How many <u>hours</u> a week do you spend reading Fiction books in English for pleasure (not including books assigned for class):

| 0h | 2h | 3h | 4h | 5h | 6h | +7h |

How many <u>hours</u> a week do you spend reading Non-fiction books/special interest books in English

| 0h | 2h | 3h | 4h | 5h | 6h | +7h |

5. What other things do you spend time reading? _____

Total Informal English Exposure: _____

Appendix G

Author Recognition Test
Subject Number:_____ Score: C_____I_____C-I_____

Below is a list of names. Some of them are authors of books, and some of them are not. Please put a check mark next to the ones that you know for sure are authors. There is a penalty for guessing, so you should check only those names about which you are absolutely certain. Thank you.

___Patrick Banville	___Harry Coltheart	___Virginia Woolf	___Tony Hillerman
___Kristen Steinke	___Gary Curwen	___John Landau	___Amy R. Baskin
___Ernest Hemingway	___Herman Wouk	___Toni Morrison	___James Clavell
___Clive Cussler	___Geoffrey Pritchett	___Harriet Troudeau	___Salmon Rushdie
___Hiroyuki Oshita	___Ray Bradbury	___Roswell Strong	___Maryann Phillips
___Kurt Vonnegut	___Jay Peter Holmes	___J.R.R. Tolkien	___Scott Alexander
___Anne McCaffrey	___Christina Johnson	___Margaret Atwood	___Ayn Rand
___Elinor Harring	___Jean M. Auel	___Seamus Huneven	___Alex D. Miles
___Sue Grafton	___Judith Stanley	___Harper Lee	___Margaret Mitchell
___Lisa Woodward	___Gloria McCumber	___Chris Schwartz	___Leslie Kraus
___David Harper Townsend	___James Joyce	___Walter LeMour	___Ralph Ellison
___Anna Tsing	___Robert Ludlum	___Alice Walker	___Sidney Sheldon
___T.C. Boyle	___Larry Applegate	___Elizabeth Engle	___ Brian Herbert
___Jonathan Kellerman	___Keith Cartwright	___T.S. Elliot	___Sue Hammond
___Cameron McGrath	___Jackie Collins	___Marvin Benoit	___Jared Gibbons
___F. Scott Fitzgerald	___Umberto Eco	___Joyce Carol Oates	___Michael Ondaatje
___A.C. Kelly	___David Ashley	___Jessica Ann Lewis	___Thomas Wolfe
___Peter Flaegerty	___Jack London	___Nelson Demille	___Jeremy Weissman
___Kazuo Ishiguro	___Seth Bakis	___Arturo Garcia Perez	___Willa Cather
___Jane Smiley	___Padraig O'seaghdha	___S.L. Holloway	___J.D. Salinger
___James Patterson	___E.B. White	___John Irving	___ Antonia Cialdini
___Martha Farah	___Giles Mallon	___Stephen Houston	___ Lisa Hong Chan
___Craig DeLord	___Raymond Chandler	___Marcus Lecherou	___Samuel Beckett
___Nora Ephron	___Isabel Allende	___Valerie Cooper	___Beatrice Dobkin
___Ann Beattie	___Amy Graham	___Tom Clancy	___Wally Lamb
___Stewart Simon	___Marion Coles Snow	___Vladimir Nabokov	___Katherine Kreutz
___Danielle Steel	___George Orwell	___Pamela Lovejoy	___James Michener
___Dick Francis	___Maya Angelou	___Vikram Roy	___William Faulkner
___Ted Mantel	___Bernard Malamud	___Saul Bellow	___Isaac Asimov
___I.K. Nachbar	___John Grisham	___Stephen King	___Lindsay Carter
___Judith Krantz	___Erich Fagles	___Elizabeth May Kenyon	___Paul Theroux
___Thomas Pynchon	___Walter Dorris	___Frederick Mundow	___Francine Preston
___Wayne Fillback	___Gabriel Garcia Marquez		

Table 1

Participant Removal Table

_____

| Total participants who speak English as a second language (L2) = 98 | Total students who are native English speakers (L1) = 136 |

↓ ↓

Number of Participants Removed for:
- Learning Disability (n = 1)
- Anxiety (n = 2)
- Depression (n = 1)
- Language Proficiency

Number of Participants Removed for:
- Learning Disability (n = 4)
- Anxiety (n = 8)
- Depression (n = 1)
- Language Proficiency

↓ ↓

| Total participants remaining (L2) = 84 | Total participants remaining (L1) = 116 |

Table 2

Categorical Sample Demographics

n = 168	ESL (*n* = 84)			Non-ESL (*n* = 84)	
	n	% of sample		*n*	% of sample
Gender					
Male	36	42.9		34	40.5
Female	48	57.1		50	59.5
Race					
Caucasian	3	3.5		54	64.3
Asian	55	65.5		3	3.6
African American	1	1.2		12	14.3
Hispanic	16	19.0		5	6.0
Mixed	-	-		1	1.2
Native American	-	-		1	1.2
Other	9	1.8		8	9.4
Year in School					
Freshman	41	48.8		35	41.7
Sophomore	11	13.1		16	19.0
Junior	13	15.5		11	13.1
Senior	17	2.2		21	25.0
5th Year or More	2	2.4		1	1.2

Table 3

Demographics Continuous Variables

_____

| | ESL (*n* = 84) | | Non-ESL (*n* = 84) | | |
Measure	*M*	*SD*	*M*	*SD*	*p*
Age (years)	20.36	1.80	20.12	1.15	.286
SES estimate	51.46	13.44	5.81	1.78	.739
GPA	3.21	.45	3.19	.48	.892
SATV	552.73	91.15	583.50	85.26	.115
*SATM	673.61	85.26	609.52	77.27	.001
Self-Reported Effort	85.10	11.42	88.38	1.94	.059

Note. SES = socioeconomic status; GPA = grade point average. SES estimate calculated based on the 4 factor Hollingshead formula (Hollingshead, 1975).Based on missing data, sample sizes by variable are different as follows: Age (84 ESL, 84NESL), SES estimate (80ESL, 80NESL), GPA (53 ESL, 72NESL), SATV (33 ESL, 40 NESL), SATM (36 ESL, 42 NESL). Welch's correction was used for Age due to heterogeneity of variance. A Bonferroni's correction of .01 for significance. * = *p*<.01

Table 4

ESL Demographics – First Language Spoken

_____

First Language Spoken	*n*	% of sample
Albanian	1	1.2
Arabic	2	2.4
Chinese	33	39.3
Japanese	1	1.2
Korean	17	2.2
Polish	1	1.2
Portuguese	1	1.2
Spanish	17	2.2
French	1	1.2
Swahili	1	1.2
Thai	3	3.5
Tibetan	1	1.2
Turkish	1	1.2
Ukrainian	1	1.2
Urdu	1	1.2
Vietnamese	1	1.2
Yoruba	1	1.2

Table 5

ESL Demographics – Home Country

_____

Home Country	*n*	% of sample
Albania and the United States	1	1.2
China	20	23.8
China and Indonesia	1	1.2
China and Singapore	1	1.2
China and the United States	3	3.6
Dominican Rep.	1	1.2
Japan	1	1.2
Kenya	1	1.2
South Korea	9	1.7
South Korea and Canada	1	1.2
South Korea and China	2	2.4
South Korea and the United States	4	4.8
Malaysia	1	1.2
Nepal and the United States	1	1.2
Nigeria	1	1.2
Pakistan	1	1.2
Peru and the United States	1	1.2
Poland and the United States	1	1.2
Portugal	1	1.2
Puerto Rico	12	14.3
Puerto Rico and the United States	1	1.2
Saudi Arabia	2	2.4
Taiwan	3	3.6
Thailand	3	3.6
Turkey and the United States	1	1.2
Ukraine	1	1.2
United States	7	8.3
United States and Spain	1	1.2
Vietnam	1	1.2

Table 6

Descriptive Statistics for English as a Second Language Student Interview

_____

	ESL (*n* = 84)		
	_____		
Measure	*M*	*SD*	range
_____			
Age of Acquisition (year)	8.31	3.87	.08 – 18.00
Age of First English Class (year)	8.30	3.43	2.00 - 17.00
Years in School	1.98	3.58	4.00 – 18.00
Time Speaking with Parents- Past (%)	1.38	2.05	.00 – 10.00
Time Speaking with Parents-Present (%)	15.58	26.72	.00 – 95.00
Number of Languages Spoken	2.30	.56	2.00 – 4.00

Table 7

TestTracker Measures with Time Breakdown

Task	Time (min)
Informed Consent	-
General directions for *TestTracker*	-
Directions for the reading speed task	-
Reading speed task	-
Delayed recall question from reading speed task	-
Directions and example item for comprehension task	-
Reading comprehension task	20
Brief strategy and effort questionnaire	-
Directions and example item for vocabulary task	-
Vocabulary task	3
Directions and example item for word recognition task	-
Word Recognition task	2
Demographic questionnaire	1-2
SEPTAR task	1
TTAI	1-2

Table 8

Correlations (for the entire sample)

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. Comprehension # Correct	---	.83**	.26*	.66**	.63**	.28**	.55**	.36**	.38**	.47**	-.10	-.06	.45**	.58**
2. Comprehension # Attempted	.89**	---	-.27*	.50**	.58**	.10	.45**	.36**	.19	.42**	-.12	.08	.55**	.38**
3. Comprehension % Correct	.32**	-.12	---	.28*	.06	.37**	.19	.01	.33**	.10	.06	-.23*	-.15	-.20
4. Vocabulary # Correct	.67**	.58**	.21	---	.76**	.63**	.57**	.31**	.47**	.48**	-.01	-.19	.42**	.67**
5. Vocabulary # Attempted	.52**	.53**	.01	.78**	---	-.01	.65**	.59**	.16	.47**	-.10	.12	.45**	.48**
6. Vocabulary % Correct	.39**	.23*	.34**	.59**	-.01	---	.10	-.23*	.55**	.21	.02	-.13	.09	.44**
7. Word recognition # Correct	.43**	.37**	.15	.52**	.56**	.12	---	.83**	.32**	.29**	-.01	-.03	.46**	.51**
8. Word recognition # Attempted	.37**	.40**	-.02	.43**	.58**	-.07	.89**	---	-.25*	.13	.08	.07	.36**	.19
9. Word recognition % Correct	.21	.03	.38**	.29**	.02	.46**	.32**	-.12	---	.05	-.08	-.13	.03	.40**
10. Speed	.48**	.54**	-.08	.34**	.32**	.15	.26*	.28*	.05	---	-.16	-.16	.52**	.40**

11. SEPTAR	-.21	-.19	-.07	-.14	-.18	.05	-.01	.11	-.08	-.03	---	.44**	-.10	.04
12. Test Anxiety	-.25*	-.18	-.19	-.23*	-.17	-.11	-.08	-.05	-.13	.11	.52**	---	-.04	-.15
13. Switches	.33**	.49**	-.29**	.13	.11	.08	.14	.16	.03	.55**	.05	-.03	---	.32**
14. Broad English	.64**	.39**	.21	.58**	.35**	.49**	.47**	.29**	.40**	.27*	-.05	.00	.17	---

Note. ESL correlations are above the diagonal and L1 correlations are below the diagonal, *<.05, ** <.01

Table 9

Correlations (for English as a Second Language group)

Variable	Comprehension # Correct	Reading Speed	Comprehension #Attempted	Vocabulary # Correct	Vocabulary #Attempted	Word Recognition #Correct	Word Recognition #Attempted	SEPTAR	Test Anxiety	Broad English Ability
Age of Acquisition	-.32**	-.25**	-.14	-.41**	-.36**	-.32**	-.11	.10	-.03	-.44**
Age of first class	-.22**	-.30**	-.07	-.35**	-.20	-.20	-.03	.16	.03	-.39**
Years in School	.27*	.24	.13	.40**	.32**	.21	.10	-.16	-.19	.35**

Note. * *p*<.05, ** *p*<.01

Table 10

Group Differences on Variables

Measure	ESL (*n* = 84)		Non-ESL (*n* = 84)			
	M	*SD*	*M*	*SD*	*t*	*d*
Speed* (words per minute)	165.1	(49.9)	299.1	(48.6)	-8.42	1.30
Comprehension* (# attempted)	23.0	(7.0)	29.9	(7.9)	-6.00	.92
Comprehension* (# correct)	16.5	(4.7)	23.5	(6.8)	-7.71	1.20
Comprehension* (% correct)	72.5	(14.8)	78.8	(10.4)	-5.64	.50
Vocabulary* (# attempted)	28.4	(8.3)	37.0	(6.7)	-4.63	1.14
Vocabulary* (# correct)	17.5	(6.8)	24.6	(6.4)	-7.00	1.08
Vocabulary* (% correct)	81.5	(8.4)	89.9	(5.9)	-7.48	1.15
Word Recognition* (# attempted)	53.8	(9.8)	58.0	(8.1)	-3.10	.47
Word Recognition* (# correct)	43.6	(8.7)	52.1	(8.0)	-6.62	1.02
Word Recognition* (% correct)	61.9	(14.2)	73.0	(11.0)	-3.24	.87
Navigation Switches	261.0	(64.2)	277.7	(67.9)	-1.66	.25
English Ability* (standard score)	92.3	(12.6)	108.8	(8.2)	-10.05	1.55

TTAI (mean score)	2.0	(5.8)	17.5	(7.1)	2.45	.39
SEPTAR (mean score)	29.5	(3.6)	27.3	(3.8)	3.92	.59

Note. Bonferroni's correction of .0036 was used., * *p*<.001

Table 11

ESL Multiple Regression for Reading Comprehension Score

_____

Variable	*B*	SE *B*	β	*t*	*p*
Reading Speed	-.189	5.006	.124	1.235	.221
Vocabulary**	.260	.084	.376	3.093	.003
Word Recognition	.094	.056	.174	1.684	.096
Switches	.006	.007	.081	.812	.419
Anxiety	.089	.074	.110	1.200	.234
Age of Acquisition	.035	.111	.028	.311	.757
Broad English Ability	.070	.042	.187	1.672	.099
SEPTAR	-.134	.119	-.101	-1.121	.266

Note. $R^2 = .54$ (*p* < .001)   *p* < .05, ** *p* < .01

Table 12

L1 Multiple Regression for Reading Comprehension Score

Variable	*B*	SE *B*	*β*	*t*	*p*
Reading Speed*	.032	.014	.226	2.268	.026
Vocabulary**	.518	.100	.493	5.284	.000
Word Recognition	.069	.075	.082	.921	.360
Switches	.013	.009	.130	1.408	.163
Anxiety	-.111	.089	-.116	-1.244	.217
SEPTAR	-.135	.158	-.077	-.852	.397

Note. R^2 =.56 ($p < .001$)   *$p < .05$, ** $p < .01$

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Graduate Tuition Scholarship, Syracuse University, 2008-2013
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Brine Award for excellence in Academics and Service, University of Redlands, 2007
Psi Chi National Honor Society President, University of Redlands, 2006-2008
Dean's List, University of Redlands, 2004-2008
University Grant, University of Redlands, 2004-2008
President's Scholarship, University of Redlands, 2004-2008
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