CONTRIBUTIONS OF ORAL LANGUAGE, PROBLEM-SOLVING, AND READING ATTITUDES TO YOUNG ADOLESCENTS' SILENT READING COMPREHENSION

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A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Speech and Hearing Sciences

Chapel Hill
2010

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ABSTRACT

Contributions of Oral Language, Problem Solving, and Reading Attitudes to Young Adolescents' Silent Reading Comprehension

The purpose of this investigation was to determine the unique and combined contribution of components of oral language, problem solving, and reading attitudes to silent reading comprehension in a group of young adolescents with varying skill in silent reading comprehension. Sixty young adolescents in grades six through eight were selected to participate in a multicomponent assessment that included measures of general and advanced oral language, problem solving, academic and recreational reading attitudes, and silent reading comprehension. Given that a substantial portion of reading comprehension difficulties among young adolescents resides across and within component areas in contrast to younger readers who predominately struggle with word identification skills, the focus of this investigation was to examine students' performance in areas other than word identification skills.

Correlation analyses revealed a statistically significant relationship, ranging from weak to strong, between each of nine components and silent reading comprehension ability. Measures of advanced oral language, specifically ambiguous lexicon and inferencing, shared the strongest relationship with silent reading comprehension. The strength of the relationships between the remaining component skills and silent reading comprehension ranging from strongest to weakest were general oral language, reading attitudes, and problem solving. While the problem solving measures had the lowest correlation to silent reading

comprehension, they were also weakly correlated with each of the other predictor variables suggesting a unique contribution of problem solving to silent reading comprehension that was confirmed by a multiple linear regression.

Additional analyses were conducted to determine the ability of a linear combination of component skills to predict silent reading comprehension. The results of the multiple linear regression analyses indicated that although a model that included all nine variables accounted for the largest amount of variance in silent reading comprehension ability (76%), a model consisting of only five of the variables still accounted for 74% of the variance in silent reading comprehension. Thus, the five variable model that included the specified measures of syntax, ambiguous lexicon, inferencing, planning, and attitudes towards recreational reading was positively correlated and significantly predictive of silent reading comprehension ability. As a final step, the linear equation for the five variable model was plotted against the measured values for silent reading comprehension equation for prediction of silent reading comprehension. The results of this comparison confirm that the five variable prediction model demonstrated a strong, positive correlation with measured silent reading comprehension scores.

The results of this study suggest that components other than word identification skills do substantially contribute to silent reading comprehension ability. Specifically, the combination of syntax, lexical ambiguity, inferencing, planning, and student attitudes toward recreational reading accounted for 74% of the variance in silent reading comprehension ability for the 60 young adolescents in this study. Given the significant relationships identified between these five components and silent reading comprehension, it is important for researchers, educators, related specialists, and parents interested in adolescent literacy to

consider these areas as potential parts of what is necessary for successful silent reading comprehension.

ACKNOWLEDGEMENTS

I would like to take this opportunity to acknowledge and extend my sincerest gratitude to the many individuals who have made the completion of this dissertation possible. In particular, I would like to thank my mentor, Dr. Karen Erickson. From the very beginning, Dr. Erickson provided mentoring experiences that extended my knowledge of adolescent literacy, research design, implementation, management, and statistical analyses. In addition, Dr. Erickson spent a great deal of time supporting my professional development as a writer and through multiple processes allowed me to experience many moments of success. I also wish to thank each of the members of my dissertation committee for sharing their time, expertise, and wisdom including Dr. Crais, Dr. Patsy Pierce, Dr. Leigh Hall, and Dr. Thomas Layton. Each one of these individuals were invested in my academic and professional career and provided numerous forms of support over the years.

I am grateful to the Center for Literacy and Disability Studies for the wide variety of research opportunities and resources made available to me throughout this academic program. Funding, design and implementation of research projects, leadership opportunities, and materials were all provided during the course of my studies. I appreciate the assistance of Lisa Amundson for her help during the screening process and Hillary Harper for her participation in a reliability check of the data. A special thank you is extended to all of the students, staff, and families at the research site for their participation in the study. The staff at the research site went above and beyond to support the completion of this dissertation including providing a dedicated quiet space and resources.

I wish to thank my friends and family for their continual love and support throughout this entire process. In particular, I want to thank my in-laws, sisters, brother, grandmother, and extended family members who often reminded me to "just keep swimming." To my two children, Andrew and Kimberly, I especially want to thank each of you for generously giving up some of our time and experiences together so that I could pursue this goal. Finally, I extend my deepest gratitude to my husband, Scott, whose unwavering confidence in my abilities and respect for my passion provided me with every opportunity available. I could not have achieved this goal without your first leap of faith….I love you.

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CHAPTER 1

Introduction

Widespread efforts have been directed toward addressing the reading achievement needs of our nation's youngest readers, yet less attention has been given to the persistence of poor reading achievement among adolescents. It is only recently that the topic of adolescent literacy has received the wide spread attention and resource allocation required to consolidate research efforts and forward a comprehensive understanding of poor reading achievement among adolescents. The inability to independently read and comprehend multiple forms and levels of academic-based text has been cited as one of the primary reasons why large groups of adolescents struggle with successful, silent reading comprehension (Carnegie Council on Advancing Adolescent Literacy [CCAAL], 2010; Fang, 2008). Silent reading comprehension, a complex mental interplay between a reader and a writer, requires a reader to integrate background knowledge, various language and cognitive skills, and affective influences to successfully form a cohesive, text-based understanding. A *substantial* amount of the reading that occurs within the upper grades curriculum is silent reading as opposed to oral reading or listening to others read aloud. Successful, silent reading comprehension therefore is a critical component of academic achievement among adolescents.

As described, silent reading comprehension is a complex process consisting of several whole-parts or components that are integrated to support a reader's ability to gain meaning from text. Existing research has found significant relationships between individual,

underlying components and silent reading comprehension among groups of adolescents (e.g., Nation, Clarke, Marshall, & Durand, 2004). Current research directions, however, are moving towards a cross-disciplinary examination of multiple components underlying silent reading comprehension. This form of investigation is of particular relevance given that a substantial portion of reading comprehension difficulties among adolescents resides across and within component areas in contrast to younger readers who predominately struggle with word identification skills (Biancarosa & Snow, 2004). Efforts to determine the most significant contributors to young adolescents' difficulties with silent reading comprehension can be found across several disciplines including education, neuropsychology, and speech-language pathology. Based on a careful review of the literature, three primary whole-parts or components appear to be of particular importance to successful, silent reading comprehension and include components of general and advanced oral language, problem solving, and students' attitudes toward reading. Given the importance of successful, silent reading comprehension to academic achievement in the middle and upper grades the primary purpose of the current investigation was to determine the existence and strength of relationships between components of oral language, problem solving, and students' attitudes toward reading and silent reading comprehension in a group of young adolescents.

Persistence of Poor Reading Achievement of Young Adolescents

According to the most recent report from the National Assessment of Educational Progress (NAEP), approximately 67.5% of our nation's young adolescents in grades 4 through 8, read at or below a basic level of understanding. Reading abilities at or below a basic level of competence are not only insufficient for meeting or exceeding grade-level standards, but more importantly preclude engagement in literacy activities that are essential

for successful and independent living. Poor reading achievement among our nation's adolescents has been a lengthy and persistent pattern for well over 30 years (NAEP, 2008). Significant strides in the identification of the underlying sources of young adolescents' struggles with successful, silent reading comprehension must be made at if we are to ameliorate the persistent pattern of poor reading achievement. Efforts to determine the most significant contributors to young adolescents' difficulties with silent reading comprehension can be found across several disciplines including education, neuropsychology, and speech-language pathology. Based on the information gathered from the existing literature across these three disciplines, the current study implemented a multicomponent assessment protocol to examine the relationships between components of oral language, problem solving, and reading attitudes and silent reading comprehension ability.

Oral Language and Silent Reading Comprehension

At a basic level, oral language can be thought of as the speaking and listening abilities necessary for effective communication. From a broader perspective, oral language consists of five components of language including phonology, morphology, syntax, semantics, and pragmatics. Within this broad perspective, the current study examined several components of oral language in relation to silent reading comprehension ability in a group of young adolescents. One significant reason why components of general and advanced oral language were included in the study assessment protocol is the strong relationship between oral language and reading demonstrated in the extant literature (Botting & Adams, 2005; Cain, Oakhill, & Bryan, 2004; Cain, Oakhill, & Lemmon, 2004; Catts, Adlof, & Weismer, 2006; Catts, Hogan, & Fey, 2003; Cutting & Scarborough, 2006; Dunst, Trivette, & Hamby, 2007; Nation, Adams, Bowyer-Crane, & Snowling, 1999; Nation, Clarke, Marshall, & Durand,

2004; Nation & Snowling, 2004; National Early Literacy Panel, 2008, NICHD, Early Child Care Research Network, 2005; Share & Leikin, 2004; Scarborough, 2005). Several retrospective studies have reported that for adolescents, who at an early age were identified with deficits in components of oral language, later demonstrated moderate to significant difficulties with reading comprehension related to ongoing deficits in areas of oral language (Catts, Adlof, & Weismer 2006; Stothard, Snowling, Bishop, Chipchase, & Kaplan, 1998). The possibility of ongoing or unidentified difficulties with components of general and/or advanced oral language as well as the need for more information regarding young adolescents in Grades 6 through 8, led to the inclusion of several measures of oral language in the study assessment protocol to examine their relationship to silent reading comprehension ability.

Problem Solving and Silent Reading Comprehension

Components of problem solving such as planning ability are used in concert, along with other skills such as oral language, for efficient processing and comprehension of written texts (Westby, 2005). Relative to the components of oral language addressed in the current study, planning ability has recently emerged as a component of investigational interest in relation to young adolescents' silent reading comprehension (Cutting, Materek, Cole, Levine, & Mahone, 2009; Semsa, Mahone, Levine, Eason, & Cutting, 2009). The ability to engage in different forms of strategic planning before, during, and after reading are essential problem solving skills necessary for self-regulation in the process of successful, silent reading comprehension. Unfortunately, the area of the brain that is responsible for initiating and allocating problem solving skills is undergoing a process of development and fine-tuning during the period of young adolescence (Blakemore & Choudhury, 2006; Giedd, 2004; Giedd

et al., 1999; Thatcher, 1991). As a result, there is a possibility for a misalignment between the *demands* on problem solving necessary for successful, silent reading comprehension and the developmental *capabilities* of young adolescents to allocate such skills. This potential misalignment is the impetus for addressing problem solving in many widely used approaches to comprehension instruction (Baumann, Seifert-Kessell, & Jones, 1992, Ogle, 1992; Palincsar & Brown, 1984).

Attitudes Toward Reading and Silent Reading Comprehension

The feelings or attitudes expressed by students towards their engagement in various forms of reading are another area of potential contribution to young adolescents' success or struggles with silent reading comprehension. Existing research suggests that in addition to skill-based influences, the way a student feels towards engaging in recreational or academic reading experience can influence their self-perceptions as readers, their transactions with text (Hall, 2006), as well as the level of motivation to participate in concurrent and future reading experiences (Guthrie & Wigfield, 2000). While trends in the existing literature on reading attitudes point to a declining attitudes toward reading as grade levels rise, gender differences, and ability differences related to silent reading comprehension ability (McKenna, Kear, & Ellsworth, 1995; MacMillan, Widaman, Balow, Helmsley, & Little, 1992; Wallbrown, Vance, & Prichard, 1979), there are some reports of notable exceptions among populations of both struggling (Lazarus & Callahan, 2000) and gifted students (Anderson, Tollefson, & Gilbert, 1985; Martin, 1984). For example, while findings from existing literature support a general trend for the existence of a strong relationship between reading ability and attitudes toward reading, Lazarus and Callahan (2000) found that for students identified with learning disabilities who received extra support in reading instruction, reported more positive attitudes

toward reading for both recreational and academic reading than their peers with and without disabilities. Thus, it is important not to make automatic assumptions regarding students' attitudes toward reading based solely on perceptions in terms of ability level or special identification. Clearly there is a relationship between attitudes toward reading and silent reading comprehension ability; however, there is not yet a clear understanding of the contribution of reading attitudes relative to other skills including oral language and problem solving.

Summary

Individual and combined components of oral language, problem solving, and attitudes toward reading have been found to have a significant relationship to silent reading comprehension ability when they are investigated individually. The current investigation used existing literature across several disciplines including education, neuropsychology, and speech-language pathology to identify the most salient contributors to silent reading comprehension ability and combined them in a multicomponent assessment protocol in order to better understand their relative contribution to silent reading comprehension ability.

The purpose of this study was to determine the strength of relationships that existed between nine components of oral language, problem solving, and attitudes toward reading in a group of 60 young adolescents in grades six through eight. In addition, the relative contribution of each of the components in predicting silent reading comprehension ability was assessed via a linear combination of components of oral language, problem solving, and reading attitudes. The information gained from the current investigation will contribute to a better understanding of the underlying components related to silent reading comprehension in young adolescents, and it holds the potential to inform both assessment and intervention in the future.

CHAPTER 2

Review of the Literature

More than eight million adolescents attending our nation's public schools in grades 4-12 read at levels lower than expected (Biancarosa & Snow, 2004). Recent findings from the National Assessment of Educational Progress (NAEP, 2009) demonstrate that 67% of our nation's students in fourth grade and 68% of students in eighth grade perform at or below a *basic* achievement level in reading. Since *basic* is defined as, "partial mastery of the prerequisite knowledge and skills that are fundamental for proficient work at a given grade," (pg. 6, NAEP, 2007) NAEP results suggest these young adolescents are ill-prepared for negotiating the daily text-based literacy activities they encounter in school. In addition, long-term trends in reading achievement (NAEP, 2009) indicate that despite our best efforts to improve reading achievement for all, there have been no significant gains in young adolescents' reading achievement for well over thirty years (Rampey, Dion, & Donahue, 2009). Ameliorating the persistence of poor reading achievement among young adolescents requires careful investigation of the underlying sources for their difficulties.

Persistence of Poor Reading Achievement among Young Adolescents

As evidenced by the NAEP's long-term trends report, adolescents' struggles with reading achievement are not a new phenomenon. In fact, for decades, educators and researchers have been concerned with the reading achievement of our nation's adolescents, yet this topic has only recently received widespread national attention (Jacobs, 2008).

Historically, the reading achievement of young adolescents has been neglected due in part to an overemphasis on the prevention of early reading difficulties in young children in kindergarten through third grade. For example, in 2000, the National Reading Panel ([NRP], NICHD, 2000) released its' report, *Teaching Children to Read*, based on a selected review of literacy research related to "the critical skills, environments, and early developmental interactions that are instrumental in the acquisition of beginning reading skills" (p.1-1). The NRP's review resulted in implications for reading instruction and suggestions for future research directions that galvanized national attention to the needs of our nation's youngest readers. The reading achievement needs of our nation's older readers, however, are just beginning to receive the amount of attention and initial forms of support that are necessary to break the persistence of their poor reading achievement.

Popular misconceptions about the underlying skills required for reading and the duration of reading instruction are additional reasons why young adolescents' struggles with reading achievement have been given less national attention. For instance, in its report, the National Reading Panel (NICHD, 2000) identified five critical skill areas are that are essential to the development of beginning reading: phonemic awareness, phonics, fluency, vocabulary, and comprehension. While early skill instruction in the five critical areas is essential to the reading achievement of young children, this is not enough to support young adolescents' independent ability to successfully comprehend advanced forms of text (Carnegie Council on Advancing Adolescent Literacy [CCAAL], 2010; Fang, 2008). The array and intensity of differentiated skills (i.e., literacy demands) necessary to independently comprehend text change in prominence and advance as students progress throughout the grades (CCAAL, 2010; Fang, 2008). The literacy demands required in the intermediate and

advanced grades necessitate knowledge and skills related to integrating various sources of information, engaging in critical thinking, and applying information to listening, speaking, reading, and writing activities. Without appropriate identification of the underlying contributors to poor reading achievement and subsequent design of instructional supports to ameliorate difficulties, many young adolescents, armed only with basic literacy knowledge and skills acquired during the elementary grades, will continue to perform at or below basic levels of reading.

Students who perform at or below a basic level of reading are at a significant disadvantage relative to their peers with advanced skills as the increased demands of a technological, progressive global community necessitate advanced literacy abilities. Without these advanced skills, students limit their learning potential, fail to seek or retain post-secondary education, and miss opportunities to pursue a secondary education that can result in competitive wages (Biancarosa & Snow, 2004; CCAAL, 2010; Heller & Greenleaf, 2007). With such high personal and socio-economic costs, it is important to investigate the underlying contributions to language learning and begin to break the persistent pattern of poor reading achievement among our nation's young adolescents.

Defining the Population and Reading Ability

Preceding a review of the important components underlying silent reading comprehension, a description of young adolescents and types of reading ability will serve to provide some background information on the population of interest. Students between the ages of 10 to 15 years old are generally referred to as young adolescents, a developmental phase between childhood and adulthood. While adolescent is used to refer broadly to students in grades four through twelve, young adolescents are in grades four to eight (Heller

& Greenleaf, 2007; McCombs, Kirby, Barney, Darilek, & Magee, 2005; National Governors Association Center for Best Practices, 2005). Young adolescence is a period of marked development and change that spans across several domains including physical, cognitive, psycho-social, and moral (Caskey & Anfara, 2007). In addition, young adolescents continue to develop and refine their understanding and use of advanced language forms such as figurative language (Nippold,1998; Nippold & Duthie, 2003; Nippold, Hegel, Uhden, & Bustamante, 1998; Nippold & Taylor, 2002; Nippold, Uhden, & Schwarz, 1997). Within the same developmental period, young adolescents simultaneously encounter significant literacy-related challenges (CCAAL, 2010). An understanding of the developmental changes experienced by young adolescents provides useful information regarding the range of individual student learning capacities.

There are numerous ways in which reading ability has been described throughout the literature. Here the terms *struggling readers* and *readers with difficulties* are used to describe students who for one or more reasons fail to achieve expected or proficient levels of reading. Students referenced as *poor comprehenders* are those with low levels of reading comprehension despite possessing adequate decoding ability (Cain & Oakhill, 2007). In contrast, the term *good comprehenders* refers to students who demonstrate at or above grade level performance in silent reading comprehension. Additional terms for reading ability such as those specified by authors or relating to official disability identification are used in reference to specific investigations throughout the review.

Given this shared understanding of the target population and the significant issue of persistent, poor reading achievement among young adolescents, a review of the components underlying successful silent reading comprehension will follow. By first establishing an

understanding of *what* components are necessary, we can then examine *how* different groups of young adolescents struggle to read with silent comprehension, and conclude with a brief discussion of the utility of high-stakes assessments in the identification of deficits within component areas.

Components Underlying Successful Silent Reading Comprehension

The Whole-to-Part model (WTP) of the components underlying silent reading comprehension (Cunningham, 1993) serves as the theoretical basis for this study. The Whole-to-Part model asserts that success with silent reading comprehension requires the integrated processing of three primary, ability components or parts: (a) word identification; (b) language comprehension; and (c) whole-text print processing. Each part can also be viewed as an independent whole and consists of its own parts as seen in Figure 2.1.

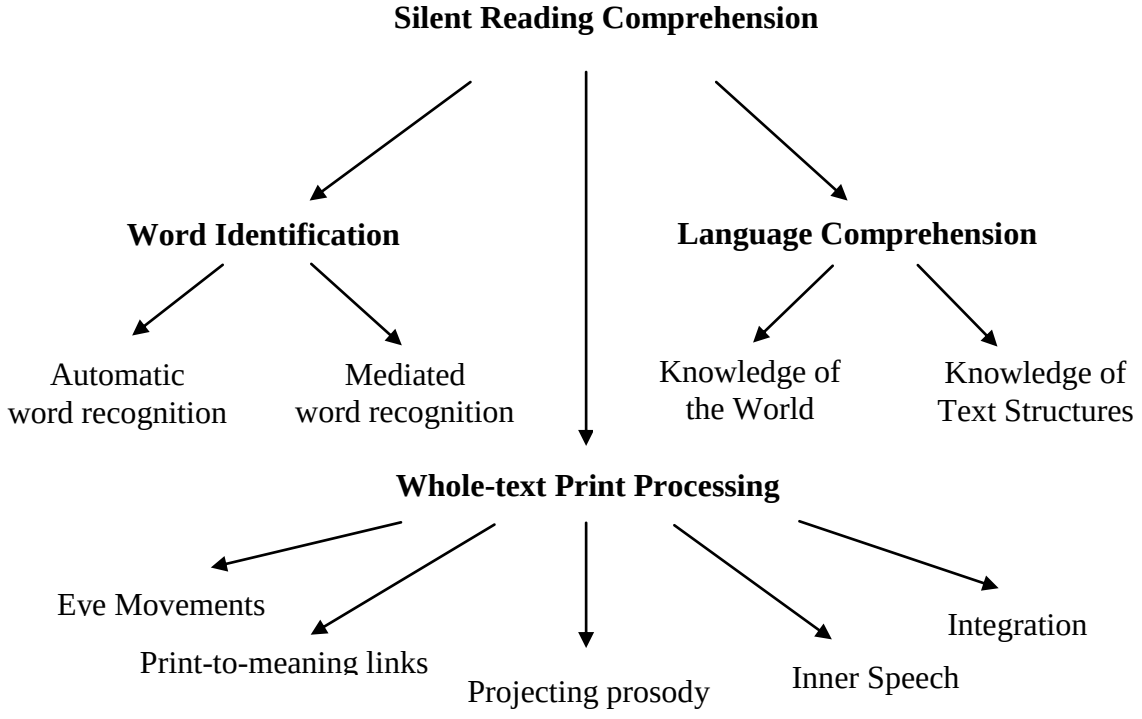


Figure 2.1. Whole-to-Part Model of Silent Reading Comprehension (Cunningham, 1993)

Successful silent reading comprehension necessitates efficient abilities in and integration of each of the whole-parts. Based on the descriptions provided by Cunningham (1993) and Erickson, Koppenhaver, and Cunningham (2006), each of the whole-parts are described.

Word Identification

Within the WTP model, word identification is recognized as an integral and necessary part of silent reading comprehension. In silent reading comprehension, word identification for both familiar and unfamiliar words consists of constructing print-to-sound links in order to translate printed words into pronunciations (Erickson, Koppenhaver, & Cunningham, 2006). The translation of printed words into pronunciations is distinct from other forms of word reading where translations from print or pronunciations are linked to meaning (Cunningham, Koppenhaver, Erickson, & Spadorica, 2004). Print-to-sound links or phonological processing can be automatic or mediated.

Automatic word identification refers to the instantaneous access to a phonological representation without conscious cognitive attention to the process (Cunningham, 1993). Automatic word identification increases the number of words that become part of a reader's sight word vocabulary. However, due to the immense volume of words and inherent limitations on memory storage, not all words encountered in connected text can be automatically accessed. *Mediated word identification* become necessary when a reader encounters an unfamiliar word and must intentionally access knowledge of letter-sound links to form a phonological representation (Cunningham, 1993); a process referred to as decoding. The ability to decode unfamiliar words supports efficiency in learning how to recognize more words with automaticity (Ehri, 1992). Word identification, both automatic and mediated, is an important whole-part in silent reading comprehension. While an

estimated 10% of the adolescent population struggle with persistent difficulties related to word identification (Curtis, 2004; Moats, 2001), most adolescents have acquired the requisite word identification skills necessary to comprehend primary grade level texts (Biancarosa & Snow, 2004). Investigation of whole-parts other than word identification are essential in determining underlying causes of poor reading achievement among the remaining, vast majority of young adolescents who struggle with successful, silent reading comprehension but can read individual words.

Language Comprehension

In the WTP model, language comprehension represents the integration of two parts, knowledge of the world and knowledge of text structures. *Knowledge of the world* or prior knowledge refers to the background experiences and familiarity that a reader accesses and applies to topics encountered in text. Prior knowledge consists of a reader's prior experiences including expectations and uses of language for constructing meaning. In silent reading comprehension, prior knowledge supports a readers' ability to differentiate between relevant and irrelevant information (Langer, 1984), as well as to generate cohesive, plausible inferences from implicit information (Pearson, Hansen, & Gordon, 1979). Therefore, knowledge of the world provides readers with the resources and experiences that, when accessed, can aid in the comprehension of new information. The importance of prior knowledge to reading comprehension ability was recently cited in the NRP summary as "the data suggest that text comprehension is enhanced when readers actively relate the ideas represented in print to their own knowledge and experiences and construct mental representations in memory" (NICHD, 2000, pg. 14).

Several investigations have revealed significant relationships between prior knowledge and level of text comprehension (Langer, 1984; Pearson, Hansen, & Gordon, 1979; Snider, 1989). Further, interventions designed for developing prior knowledge have been shown to be effective in increasing text comprehension among groups of young adolescents (Langer, 1984; Snider, 1989). In order to successfully gain meaning from connected text, young adolescents are expected to use their prior knowledge of topics or content as a bridge for learning new information. Knowledge of the world alone, however, is insufficient to support the processing of multiple forms and levels of written text. To independently process a wide variety of text, young adolescents also need *knowledge of text structures,* including the ability to understand how text can be structured or patterned through order, cohesive devices, and form (Frank, Grozzi, & Stanfield, 2006). In silent reading comprehension, knowledge of text structures provides readers with a set of shared expectations between reader and writer based on prior knowledge and syntactic signals within text necessary for integration of ideas across sentences. Syntactic signals vary according to text form, but nonetheless are quite useful in supporting readers' navigation of sentences and cohesion across paragraphs.

Two common forms of text structure encountered by young adolescents are narrative and expository. Narrative text structure generally consists of story grammar or key informational elements such as characters, setting, plot, and conclusion. Readers who are familiar with story grammar can access this information to support their comprehension of connected text. For instance, in *Tuck Everlasting* (Babbitt, 1975) a common narrative read by young adolescents, the author uses semantic clues for providing readers with information related to time period. It is up to readers to access semantic clues such as descriptions of

clothing (e.g., high-buttoned shoes and petticoats) and transportation (e.g., travel by horse and wagon) and to recognize that such signals indicate a need to generate plausible inferences regarding the time period. Expository text structures use different forms of syntactic cues to convey complex and often content-specific information as in the case of problem-solution. Syntactic clues within expository text structures are often provided to convey information as well as to elicit anticipated reactions or thinking processes from readers as emphasized in the following example:

> *Farmer Brown has 12 animals on his farm. He has cows, pigs, and horses. What are all of the possible combinations he could have?*

In the preceding example, there are some syntactic clues used within the word problem that provide information to the reader as well as assume expected knowledge and action. First, the phrase *possible combinations* in the context of a math problem should signal a need to access and apply a mathematical formula. The mention of the number of animals on the farm, *12*, provides a clue as to the total or finite number of animals. Further, the inclusion of *cows, pigs, and horses* should clue a reader to the existence of three separate animal types. Finally, the use of the pronouns *his* and *he* within the word problem assumes that a reader understands that these forms refer to Farmer Brown given the context.

As illustrated, both knowledge of the word and knowledge of text structures are integral parts of being able to read silently with successful comprehension. With limitations in either knowledge of the world or knowledge of text structures, readers may be unable to independently process a variety of text forms for comprehension (Erickson, Koppenhaver, & Cunningham, 2006). For instance, some students may over rely on the stronger knowledge area (e.g., knowledge of the world) to compensate for limitations in the other, but over time

as texts become more complex, their level of processing is at or below a surface level. Thus, many young adolescents with inequitable integration of both knowledge of the world and knowledge of text structures may fail to achieve deeper levels of comprehension.

Whole-Text Print Processing

Whole-text print processing consists of several subcomponents or parts that are not included under word identification or language comprehension. Specifically, whole-text print processing involves a set of coordinated, cognitive-based skills including eye movements, print-to-meaning links, projecting prosody, inner speech, and integration. A description of each of the parts subsumed under whole-text print processing follows.

Eye movements

Successful silent reading requires readers to use eye movements to scan across and down pages of text (Erickson, Koppenhaver, & Cunningham, 2006). The eye movements required for silent reading comprehension are not the same as the eye movements necessary for mediated word identification (Rayner & Pollatsek, 1989). Eye movements (i.e., saccades) assist in the efficient process of scanning across and down pages of text. Brief pauses in eye movements (i.e., fixations) and backward tracking or regressions signals the need to acquire new information (Rayner, Liversedge, White, & Vergilino-Perez, 2003), as is required when determining the referent for a pronoun. In addition, recent evidence suggests that the eye movements required for processing connected text also aid in the activation of prosodic features at the word-level (Ashby, 2006). Thus, eye movements during reading are more than motoric or behavioral. Eye movements during silent reading serve to mediate the cognitive processes involved in the acquisition and integration of information from print (Rayner et al., 2003).

Print-to-meaning links

During silent reading of connected text, readers phonologically recode most of the words they encounter (Erickson, Koppenhaver, & Cunningham, 2006). Phonological recoding is the process of constructing print-to-sound-to-meaning links (Share, 1995). Phonological recoding serves to mediate access to meaning when readers encounter low-frequency words (McCusker, Hillinger, & Bias, 1981). When readers come across high-frequency or familiar words however, direct print-to-meaning connections can be accessed without the use of phonological recoding. Print-to-meaning links, both direct and indirect through sound, are necessary to the construction of text-level comprehension.

Projecting prosody

The ability to read silently with comprehension not only depends on accurate word identification and appropriate rate, but also on prosody or reading with intonation and expression. During oral or silent reading, skilled readers apply prosodic features such as intonation, stress, and duration to word structures and words embedded in text. The natural rhythms characteristic of typical speech are formed by the use of prosodic features. Projecting prosody during silent reading aids in the retention of information stored in short-term memory and integration of text-level information for comprehension. Growing evidence suggests that skilled readers form prosodic representations of word forms to help them actively make sense of the text (Ashby, 2006; Ashby & Clifton, 2005; Ashby & Rayner, 2004). Specifically, prosody supports text comprehension by increasing the efficient and fluid recognition of word structures in order to allow attention to be directed at constructing integrated meaning.

Inner Speech

The subvocal phonological recoding of words and monitoring that occurs during silent reading comprehension is referred to as inner speech. In typical development, inner speech is believed to be the end result of children's transition from spoken or overt language forms to covert dialogue (Vygotsky, 1978). In silent reading comprehension, inner speech supports the transient storage of a phonological representation in working memory, mediates identification of unfamiliar words through the chunking of information into meaning units (Ehrich, 2006), and integrates information from connected text (Daneman & Newson, 1992). Inner speech is also used as a mechanism for self-regulated, problem solving during online monitoring of silent reading comprehension.

Integration

Integration within whole-text print processing represents the orchestrated, simultaneous processing of eye movements, print-to-meaning links, projecting prosody, and inner speech (Erickson, Koppenhaver, & Cunningham, 2006). Word identification and the construction of meaning through language comprehension work in concert with the integration of the processes in print processing beyond word identification to achieve successful silent reading comprehension.

The WTP model provides a framework for understanding the multiple whole-parts that are necessary for successful silent reading comprehension. Consistent with the NRP's report, the WTP model includes components from each of the five critical skills areas essential to the development of silent reading comprehension. The WTP model extends beyond the five critical areas, however, to incorporate knowledge of the world and knowledge of text structures, as well as, whole-text print processing as necessary components

of successful silent reading comprehension (Erickson, Koppenhaver, & Cunningham, 2006). Inclusion of whole-text print processes contributes to the uniqueness of the WTP model from other models of silent reading comprehension that consider only word identification and language comprehension (e.g., Hover & Gough, 1990). The language comprehension and whole-text print processing components within the WTP model are particularly appropriate as the theoretical basis for this study given that significantly more young adolescents who struggle with silent reading comprehension demonstrate difficulties within these two whole-parts more so than in the area of word identification (Biancarosa & Snow, 2004). The consideration of each of the whole-parts when examining students' struggles with silent reading comprehension, underscore why broad assessments of reading are insufficient as diagnostic indicators of the relationships between the whole-parts and lends support to the use of a multi-component assessment to investigate the relationship between silent reading comprehension ability and component areas in young adolescents.

Connections between Oral language and Silent Reading Comprehension

Literacy achievement in middle school is highly dependent on students' efficient use of oral language as Falk-Ross (2007) asserts, "a strong language base is the *lifeblood* which keeps the system of learning fluid" (pg. 74, emphasis added). The ability to read silently with comprehension is grounded in a strong foundation of oral language. Oral language is a collection of expressive and receptive abilities involving the five primary domains of language including phonology, semantics, morphology, syntax, and pragmatics (Catts & Kamhi, 2005). Each language domain has a unique and reciprocal connection to silent reading comprehension. The nature of this connection is dynamic and is influenced by skill development and grade-related literacy demands. There are significant literacy-related

demands on oral language skills as many of the text forms young adolescents encounter in the middle grades are laden with higher-level, semantically-based language forms including content-specific vocabulary (Anderson & Nagy, 1991), morphologically-based relationships (Nagy & Anderson, 1984) and figurative language (Nippold, 1998). Given such literacy-related demands on language competence, it is important to have a solid understanding of the connections between these components of oral language and silent reading comprehension if we are going to improve poor reading achievement in young adolescents.

Five Components of General Oral Language and Reading

Phonology is the study of the sound system of a language and the rules that govern sound combinations (ASHA, 1993; Owens, 1996). One subcomponent of phonology critical to early reading development is phonological awareness, which is the ability to attend to sound structures of words independent of meaning. Phonemic awareness, a component of phonological awareness, is the knowledge that spoken words are made up of individual sounds or phonemes and the ability to blend, segment, delete, and manipulate these sounds to create new words. A recent review of published research relating to the relationship between emergent literacy skills and later conventional literacy outcomes identified phonological awareness as one of six emergent literacy skills, primarily code-related, that have the strongest and most consistent predictive value relative to later conventional literacy success (Dunst, Trivette, & Hamby, 2007; National Early Literacy Panel [NELP], 2008; pg. 67). Phonemic awareness supports the development of using sound-symbol relationships to identify words (Ehri & McCormick, 2004). While aspects of phonology are important to early connections between oral language and beginning level reading comprehension, these skills are less predictive of young adolescents' reading achievement. Because a majority of

young adolescents have acquired the basic decoding skills necessary to successfully comprehend a variety of text forms encountered in the primary grades (Biancarosa & Snow, 2004), phonology has less dominance than other aspects of oral language in their connection to silent reading comprehension.

Semantics

Semantics is the study of the meaning or interpretation of words. Semantic knowledge or word knowledge is essential for successful silent reading comprehension as words embody important messages and ideas. Word knowledge includes the ability to recognize word meanings, integrate words with other forms of knowledge, and apply words to familiar and novel contexts to support the construction of meaning from connected text (Nagy & Scott, 2004). Adolescents, particularly between the ages of 10-18 years of age, encounter, successfully learn, and store the meanings of approximately 8-10 new words per day (Nagy & Herman, 1987). This rapid rate of growth in vocabulary adds approximately 3,000 new words annually to each student's reading vocabulary (Nagy & Herman, 1987; White, Power, & White, 1989). A large portion of vocabulary development during the adolescent years occurs as a result of incidental learning through independent reading (Anderson & Nagy, 1991; Baumann & Kameenui, 1991; Cunningham & Stanovich, 1998; Miller & Gildea, 1987). Reading with automaticity (i.e., fluency) directly supports a readers' ability to focus on the construction of meanings from words within connected text (Baker, Simmons, & Kameenui, 1998; Blachowicz, Fisher, & Watts-Taffe, 2005; Nagy & Scott, 2004; NRP, 2000; Rayner, et al., 2001).

Morphology

Morphology is the study of the structure of words and elements that are necessary for making meaning. Morphological awareness, knowledge of the smallest units of meaning in words such as roots, bases, and affixes, first begins to develop in preschool children (Bowerman, 1982; Clark, 1982), continues throughout adolescence (Anglin, Miller, & Wakefield, 1993) and into early adulthood (Mahony, 1994). The ability to recognize and manipulate morphemes to support learning of word meanings is significantly related to reading comprehension in children (Carlisle, 2000) and young adolescents (Carlisle, 2000; Larsen & Nippold, 2007; Mahony, 1994).

The connection between morphology and silent reading comprehension becomes especially important for young adolescents because many of the word structures they encounter in narrative and expository texts are morphologically complex and include multisyllabic forms. During the same period of time, young adolescents are introduced to large amounts of new vocabulary specific to content areas (CCAAL, 2010; Larsen & Nippold, 2007). Although students can acquire a large amount of vocabulary through wide, independent reading (Nagy & Anderson, 1984) and repeated exposure (Nagy & Scott, 2000), the sheer number of novel words encountered makes it impossible for students to commit all relevant vocabulary to memory or for teachers to effectively provide direct instruction on word meanings. An alternative to constructing meaning directly from multisyllabic words is to deconstruct such words into their smallest forms of meaning; a technique referred to as morphological analysis or morphological problem solving (Anglin, 1993). Morphological problem solving contributes to students' silent reading comprehension, increases the breadth

of sight-word vocabulary, and enables more fluent reading, both silent and oral, of longer more complex sentences.

Syntax

Syntax refers to the structural form and rules that govern the order of language necessary for comprehension in speaking, listening, reading, and writing. In silent reading comprehension, syntax is important to the integration or coherence of ideas across texts. Knowledge and application of syntactic rules allow readers to manipulate and combine words to form longer, meaningful units. Reduction of meaningful units or chunks of information reduces the workload on short-term memory and increases comprehension of ideas across text. Investigations of syntactic development among typically developing populations suggest gradual growth beginning early in young children, continuing throughout adolescence (Nippold, Mansfield, Billow, & Tomblin, 2008; 2009) and extending into early adulthood (Nippold, Hesketh, Duthie, & Mansfield, 2005).

Despite ongoing development of syntactic competence, young adolescents are expected to engage with syntax in sophisticated ways through transactions with text. The use of syntactic features such as nominalizations or turning verbs into nouns in the context of a sentence, are often embedded within texts as a means of condensing information while simultaneously prompting readers to think in more abstract ways (Fang, 2006; Unsworth, 1999). For example, consider the following sentence: Across North Carolina, farmlands are threatened by urbanization. The first noun groups, North Carolina and farmlands, are easy to recognize as common place things, but the word urbanization presents a more abstract concept of a thing. Nominalization requires readers to restructure the clauses into familiar, simple structures and therefore increase the demands on students' linguistic flexibility. The

incorporation of frequent nominalizations and content words provides readers with a great deal of information compacted in shortened, highly structured chunks of information. Learning in this manner can move some students beyond surface level thinking to more critical and abstract forms of reasoning (Fang, 2006). However, for young adolescents who struggle with general oral language, texts that use such language forms can severely challenge or limit their silent reading comprehension (Fang, 2006, 2008; Hubisz, 2000; Unsworth, 1999).

Pragmatics

Pragmatics is the combination and integration of all of the domains of language for functional and social use. Pragmatic awareness is important to silent reading comprehension as it supports a reader's ability to generate inferences from knowledge of the world, words, and structure, and content information found within texts. Young children first begin to develop pragmatics through communicative exchanges (i.e., conversational narratives or discourse) with adults and peers as they engage in play, daily routines, and shared readings (Crais, 1990). As children in the primary grades learn how to read, they begin to extend their functional and social use of language to their transactions with text. The varied and complex text forms introduced in the intermediate and upper grades requires young adolescents to rely heavily on their pragmatic abilities, specifically their expectations and knowledge of the rules and conventions of language, to construct meaning from text. Readers must use their knowledge of the world, along with pragmatics and other components of language to independently generate inferences in relation to such factors as the detection of an authors' purpose or taking a character's point of view (Bishop & Adams, 1992).

In review, each of the five domains of language including phonology, semantics, morphology, syntax, and pragmatics plays a unique role in the overall process of silent reading comprehension. A strong foundation in oral language is an essential part of what students require if they are to become independent and successful readers of texts. As students transition from learning how to read to reading to learn some domains of oral language such as phonological awareness become less predictive of students silent reading comprehension whereas others such as morphology and pragmatics gain prominence. Because young adolescents, with and without language, reading, and other literary-related disabilities, face tremendous literacy challenges that directly rely on oral language competence, it is important to understand which areas specifically relate to students' struggles with silent reading comprehension and how they influence it.

Evidence of the General Oral Language-Reading Connection

Young adolescents with reading comprehension difficulties have shown deficits in several of the general oral language forms including semantics (Catts, Adlof, & Weismer, 2006; Catts, Hogan, & Fey, 2003; Nation, Adams, Bowyer-Crane, & Snowling, 1999; Nation, Clarke, Marshall, & Durand, 2004; Nation & Snowling, 2004; Share & Leikin, 2004; Scarborough, 2005), syntax (Catts, Adlof, & Weismer, 2006; Nippold, Mansfield, Billow, and Tomblin, 2008; Synder & Downey, 1991), and morphology (Nation & Snowling, 2000; Stothard & Hulme, 1992). In a recent concurrent and retrospective investigation, Catts, Adlof, and Weismer (2006) examined the relationship between reading achievement and component skills among young adolescents with and without reading difficulties. One hundred and eighty-two, eighth-grade students were recruited for participation from an ongoing epidemiological study of language impairments. Student participants were assigned

to one of three reading groups based on performance scores achieved on an eighth-grade assessment of reading: poor decoders, poor comprehenders, or typical readers. All students were administered measures of reading comprehension, word identification, nonverbal cognitive ability, and oral language (i.e, phonological processing, receptive vocabulary, syntax, listening comprehension, and inferencing). Results suggest that eighth grade reading achievement was significantly related to varying component skills, depending on reading group membership. Students with poor comprehension performed below the other two ability groups on measures of receptive vocabulary, syntax, and inferencing. Students with poor decoding ability performed at similar achievement levels to typical readers on measures of receptive vocabulary and inferencing, but not syntax. While all students, regardless of ability level, struggled to generate distant inferences (e.g., when supporting context does not immediately follow), students with poor comprehension performed significantly below the other two groups; a finding consistent with other investigations (Cain, Oakhill, & Lemmon, 2004). The authors proposed that deficits in working memory (e.g. inner speech in the WTP model) may be the reason why poor comprehenders struggle to generate inferences, a view held by other investigators (e.g., Cain, Oakhill, & Byrant, 2004) and worthy of future investigation.

Cutting and Scarborough (2006) conducted a cross-sectional investigation of the relative contribution of word recognition/decoding, oral language, and cognitive components in the prediction of reading comprehension ability. Study participants included 97 children and adolescents, with and without attention deficit hyperactivity disorder (ADHD) and ranging in age from 7 to 15 years old. Multiple measures of reading including three separate assessments of reading comprehension, along with IQ, skills related to executive functioning,

oral language, fluency, and word recognition/decoding were individually administered to student participants. Cutting and Scarborough (2006) found that word recognition/decoding and oral language (i.e., semantics and syntax) each made a unique contribution to the prediction of reading comprehension ability. The amount of variance in the prediction of reading comprehension ability however, differed across measures of reading comprehension. Differences in the amount of variability, suggested Cutting and Scarborough (2006), were due to differences in how comprehension was measured across all three tests. Beyond word recognition and oral language, the only other variable to make a significant contribution to the prediction of reading comprehension was reading speed, a component of fluency. None of the other components including working memory, rapid auditory naming, IQ, or attention made significant contributions to the prediction of reading comprehension.

In a retrospective study, Stothard, Snowling, Bishop, Chipchase, and Kaplan (1998) assessed a group of adolescents who were identified with general cognitive delays and speech-language impairments (SLI) at the age of four. A battery of measures was used to assess the general comprehension, nonverbal intelligence, receptive and expressive language, and literacy skills in four different groups of students between fifteen and sixteen years old: 52 typically developing students, 26 students with resolved SLI, 30 students with persistent SLI, and 15 students with generalized cognitive delay. Results demonstrate marked differences between the groups on a variety of measures. Specifically, many of the students with resolved SLI achieved similar scores to typical controls on measures of nonverbal ability and language with the exception of tasks tapping listening comprehension and phonological processing. In addition, approximately 52% of the students with resolved SLI performed well below a 12-year-old reading level and below the control group in reading

accuracy, comprehension, and spelling. Students with persistent SLI demonstrated weaknesses across all language and literacy measures, mirroring performance patterns of students with generalized cognitive delay. The findings from Stothard et al. (1998) suggest that adolescents who experienced early difficulties with establishing a strong foundation in oral language skills are at an increased risk for persistent struggles with language and literacy achievement throughout schooling.

Students with and without Reading Disabilities/Language Disorders

A number of studies have examined the concurrent relationship between general oral language abilities and reading comprehension in adolescents with and without reading disabilities (Nation & Snowling, 2000; Nippold, Mansfield, Billow, & Tomblin, 2008; Synder & Downey, 1991). Synder and Downey (1991) examined the relationship between component skills and silent reading comprehension ability in a group of students with and without identified reading disabilities. One hundred and eight-six students were divided into two groups according to identification and age. Ninety-three children identified with reading disabilities were assigned to either a younger (i.e., ages 8-11) or older (11-14) group. The other 93 students identified as normally achieving were assigned to an age group in the same manner as students with reading disabilities. All students were individually administered measures of phonological awareness, rapid automatic naming, sentence-completion, narrative discourse, nonverbal intelligence, and reading comprehension. Results revealed several significant differences between ability and age-level groups. For example, normally achieving students performed significantly better on measures of rapid automatic naming, phonological awareness, sentence-completion, and narrative discourse than students identified with reading disabilities. Effects for age-level were found with the older students

within each of the ability groups performing higher on measures of rapid automatic naming, phonological awareness, sentence-completion, and narrative discourse. Within the normally achieving group, the variance in younger children's performance on a measure of silent reading comprehension was best accounted for by performance on multiple tasks including sentence completion, rapid automatic naming time, and narrative discourse-story retelling. Narrative discourse or story retelling best explained the variance in silent reading comprehension for the older, normally achieving students. Sentence completion and rapid automatic naming time and accuracy best accounted for the variance in reading comprehension for younger students with reading disabilities. Narrative discourse, specifically making inferences, was the one component of oral language that best accounted for variance in students' performance in silent reading comprehension. Based on the results of their investigation, Synder and Downey (1991) speculated that different combinations of oral language skills account for variability in the relationship to silent reading comprehension at different ages.

Investigations of young adolescents with reading disabilities (Carlisle & Katz, 2006) and language disorders (Windsor & Hwang, 1999) have revealed significant weaknesses in students' comprehension and use of derivational morphology to identify and determine the meaning of words. Unlike inflectional morphology where the base word does not change in meaning as a result of the addition or deletion of a suffix, derivational morphology has less predictable rules, and often changes the meaning of the word when one or more suffix is added such as in the example *hope*, *hope-**less***. Students who struggle with derivational morphology often mispronounce prefixes or suffixes, omit syllables, overlook portions of words, and fail to apply word analysis strategies (Archer, Gleason, & Vachon, 2003).

Difficulties with decoding or deconstructing multisyllabic words may lead to an inability to acquire the breadth of vocabulary equal to that of peers who read without difficulty. In addition, students with poor morphological analysis skills can demonstrate limited comprehension due to ineffective strategy use such as skipping over novel or difficult words or failing to derive meaning from context clues (Archer, Gleason, & Vachon, 2003).

Developmental investigations of morphology have revealed that typically developing students may also demonstrate differences in their ability to understand and manipulate longer, more morphologically complex word forms. For example, a study conducted by Carlisle (2000) examined the morphological problem solving and reading comprehension abilities in a group of third and fifth grade students. The results of this study demonstrated marked developmental changes in morphological problem solving ability as the fifth grade students outperformed the third grade students. In addition, Carlisle (2000) identified significant relationships between morphological structure and word definition in third grade students and morphological structure, word definition, and reading comprehension in fifth grade students.

Collectively, therefore, there is strong evidence to suggest that deficits within certain domains of oral language significantly affect young adolescents' ability to read silently with successful comprehension. Young adolescents with past or current histories of oral language impairments are at a higher risk for poor reading achievement than their typically developing peers although typically developing adolescents have also been shown to struggle with some forms of oral language when reading. Further, research supports the view that areas of oral language that contribute to silent reading comprehension can change over time. This view is of particular relevance given that word identification processes have historically been

emphasized as the primary predictor of later literacy development. However, the assumption that deficits in word identification are the main source of young adolescents' struggles with silent reading comprehension is incorrect. Collective consideration of potential underlying components of oral language is required if we are to gain a comprehensive view of young adolescents' difficulties with silent reading comprehension.

Components of Advanced Oral Language

In addition to general forms of oral language, there are more complex, advanced forms that contribute significantly to young adolescents' ability to independently construct meaning from connected text. Advanced oral language refers to the numerous forms of language that develop during young adolescence through adulthood that are required for successful listening, speaking, reading, and writing in middle and high school (Paul, 2007). It is well established that many forms of advanced language continue to develop and refine through adolescence (Nippold, 1991; Nippold, Cuyler, & Braunbeck-Price, 1988; Nippold, Moran, & Schwartz, 2001; Palmer & Brooks, 2004; Reed, 2005). Two forms of advanced language that are of particular importance to this study are lexical ambiguity and inferencing. Both lexical ambiguity and inferencing draw upon and integrate components from within the five primary domains of language. Lexical ambiguity refers to words, phrases, or sentences that consist of double meanings such as in the statement, "w*atch out for the bat"*! Given the absence of a context, the word "bat" may refer to a wooden club used to hit a ball or a flying mammal. To decipher words with lexical ambiguity, readers must rely on the integration of pragmatic knowledge (e.g., breadth and depth of use of words with multiple meanings), world knowledge, semantic knowledge (e.g., accessing all possible meanings for words), and syntactic knowledge (to support differentiation in word choice given the context).

Competence in deciphering lexical ambiguity is essential to successful, independent construction of deeper-levels of meaning from school-based texts. Young adolescents often encounter lexical ambiguity within and across the content-areas. The words *value* and *retort* for instance are two words that represent different meanings according to the specific discipline. Retort, meaning to sharply reply to, may be used by Language Arts teachers in their transactions with students while debating context. The word retort, however, may also be used in Science to refer to an object that is used for "distilling or decomposing substances by heat" (p. 457, The Princeton Review, 2002). Young adolescents with limited abilities to decipher lexical ambiguities are at significant risk of failing to independently construct meaning within and across content areas for words such as this.

Inference generation is an additional higher-level or advanced language process that is necessary to achieve whole-text or global coherence and has been shown to uniquely contribute to reading comprehension ability (Botting & Adams, 2005; Cain, Oakhill, & Bryant, 2004; Cain, Oakhill, & Lemmon, 2004). In silent reading comprehension, inferencing refers to the process of using text-level or background knowledge to generate information that is not explicitly provided within the text. Generating missing information within texts is essential to constructing a coherent representation of meaning derived across sentences, also known as whole-text or global coherence (Kintsch, 2004). Further, inference generation is necessary to support students' advancement from concrete, surface level reasoning to more sophisticated, deeper levels of comprehension. The ability to generate inferences is particularly important for young adolescents as they are introduced to a variety of complex text and discourse forms requiring independent attainment of deeper levels of comprehension (CCAAL, 2010). It is interesting to note that the importance of inferencing

ability to successful reading comprehension was cited well over 20 years ago in the National Commission on Excellence in Education's (NCEE, 1983) report, *A Nation at Risk* as among the prominent indicators of a nation at risk to compete in a growing, global economy:

"Many 17-year-olds do not possess the "higher order" intellectual skills we should expect of them. Nearly 40 percent cannot draw inferences from written material; only one-fifth can write a persuasive essay; and only one-third can solve a mathematics problem requiring several steps." (pg. 11)

In review, advanced language forms have been cited as part of the underlying components related to struggles with reading comprehension in students with poor comprehension (Cain & Towse, 2008; Zipke, 2007), oral language deficits (Kerbel & Grunwell, 1997; Nippold, 1991; Nippold, Moran, & Schwarz, 2001) or whose first language is not English (Tompkins, 2001). Typically developing students may also experience difficulty with comprehending advanced language forms (Nippold, Moran, & Schwarz, 2001). Because students with and without identified language difficulties can struggle with ambiguous or figurative language forms as they engage in literacy-based transactions (Nippold, 1991), it is important to understand how these advanced language forms and processes relate to young adolescents' ability to read with comprehension.

Evidence of the Advanced Oral Language-Reading Connection

Lexical ambiguity, the words, phrases, or sentences that consist of double meanings, requires the integration of semantic knowledge to know the possible meanings of words and syntactic knowledge to understand which meaning of the word to draw upon. In an investigation of lexical ambiguity (i.e., multiple meanings) forty students ages 9, 12, 15, and 18 years were asked to decipher the meanings of ambiguous advertisements using authentic

texts including magazines, newspapers, and brochures (Nippold, Cuyler, & Braunbeck-Price, 1988). Students were presented with 18 items, 14 consisted of two different meanings and 4 contained a single interpretation. Multiple meanings fell into two categories: physical or psychological. Physical meanings reference concrete objects or actions while psychological meanings relate to mental states, opinions, and emotions. The results of the investigation revealed significant differences in comprehension of lexical ambiguity between the ages of nine and twelve (Nippold, Cuyler, & Braunbeck-Price, 1988). Nine-year-old children were able to accurately explain only one-third of the advertisement meanings compared to 12-year-olds who could explain two-thirds of the meanings. In addition, 12-year-old students' abilities to accurately decipher both meanings (physical and psychological) far exceeded that of the 9-year-old students. Results of this study suggest that the ability to understand multiple meanings, specifically lexical ambiguities, steadily increases with age. The authors noted that 18-year-old students never reached a ceiling or performed with 100% accuracy, suggesting ongoing development in the ability to decipher multiple meaning words throughout adolescence.

Inferencing

The ability to make inferences relies on the integration of explicit text-level knowledge including knowledge of words, word parts, and structure with prior knowledge in order to construct appropriate inferences for missing information to form a global understanding of the text (Kintsch, 1988). Numerous investigations have sought to determine the relationship between inferencing and silent reading comprehension ability. For instance, Cain, Oakhill, and Bryant (2004) examined the working memory, oral language, and component abilities of a group of typically developing students. The student participants

were assessed annually over a period of three years, from age 7 to 11 years, as part of a longitudinal study. The total number of student participants decreased from 100 at year one to 80 at year three. Students were individually administered assessments of word identification, oral language, working memory, verbal IQ, inferencing, text integration, comprehension monitoring, and reading comprehension. Results indicated that at each of the three time points, there were consistent correlations between students' working memory (i.e., sentence-span only), oral language (i.e. syntax), comprehension monitoring, inferencing and reading comprehension ability. Further, Cain et al. (2004) found that after controlling for working memory, both inferencing ability and comprehension monitoring each made a unique contribution to reading comprehension supporting the view that these components skills are not entirely mediated by working memory skills. Cain, Oakhill, and Bryant (2004) concluded that components of working memory best account for the variance in reading comprehension ability.

In a related study, Cain, Oakhill, and Lemmon (2004) conducted an initial investigation of verbal inferencing abilities between groups of good and poor comprehenders. Twenty-four students, ages 9-10 years old, were assigned to one of two groups depending on reading comprehension ability. Students were administered measures of vocabulary inferencing and working memory. In the vocabulary inferencing task, students were assessed on their ability to determine the meaning of an unknown word from context in one of two conditions: the novel word was introduced and then directly followed with supporting context (i.e., near condition) or filler sentences were placed between the novel word and supporting context (i.e., far condition). Poor comprehenders performed lower on tasks of both verbal inferencing and working memory than students with good comprehension.

Significant differences were also found between the near and far conditions for poor comprehenders as this group struggled to construct inferences for unknown words that were in the far condition. In a second follow-up investigation, Cain, Oakhill, and Lemmon (2004) examined the ability to learn new word meanings among three separate groups of students: students with good comprehension, students with poor comprehension, and students with poor vocabulary and comprehension skills. In all, 36 students, ages 9-10 years, were assessed on tasks of vocabulary learning, vocabulary inferencing, short-term memory, and working memory. Results of the second investigation revealed significant effects for ability group wherein students identified with good comprehension performed higher on vocabulary instruction, vocabulary inferencing, and working memory. In contrast, students identified with poor comprehension and poor vocabulary and comprehension both performed lower on vocabulary inferencing and working memory. There were no significant performance differences between the two "poor' ability groups except in the vocabulary task where students with poor comprehension performed similarly to students in the good comprehension group. Students with both poor vocabulary and comprehension requested more repetitions for vocabulary learning than did students with good and poor comprehension, suggesting that students with both poor vocabulary and comprehension may present with deficits in working memory. Conversely, in an investigation of working memory and oral language in students with and without poor reading comprehension, Nation, Adams, Bowyer-Crane, and Snowling (1999) found that differences in reading comprehension ability were best associated with deficits in oral language (i.e., semantics) rather than working memory. Thus, the existence of deficits in working memory in students

with poor reading comprehension has been linked with impairments in components of language, particularly semantics.

Botting and Adams (2005) examined the semantic and inferencing abilities in groups of students with and without communication disorders. One hundred and fifty-nine students were assigned to one of three ability groups. There were 25, 11-year-old students identified as specific-language impaired (SLI), 22, 11-year-old students with pragmatic difficulties in the presence of no other language impairments, and 112, 7 to 11-year-old students identified as typically developing (TD). Students within the TD were separated into three different groups according to age (i.e., 7 year olds, N=37, 9 year olds, N=40, and 11 year olds, N=35) and used as comparison groups for age (11 year olds only) and similar levels of language ability. All students were individually administered assessments of semantics, inferencing (i.e., logical, bridging, elaborative), syntax, receptive vocabulary, and cognition. Significant group differences were found. For example, students with SLI performed lower on measures of semantics and inferencing compared to age-matched peers. Students with pragmatic difficulties also performed lower on measures of semantics and inferencing, but no significant differences between this and the SLI group were found. Group differences were also found between cognition and measures of semantics and inferencing. Specifically, the SLI group demonstrated cognitive ability that was significantly correlated to measures of receptive vocabulary, syntax, and inferencing whereas for the pragmatic difficulties group, variance in cognitive ability was best accounted for by measures of semantics and inferencing. Unfortunately, the authors did not report any findings regarding group differences on ability to construct each of three different forms of inferences. From their results, Botting and Adams (2005) concluded that students with specific forms of

communication disorders perform lower on measures of semantics and inferencing than same age peers and in the case of semantics lower than younger children (i.e., age 9) thus supporting the existence of an overall weakness in general oral language. Knowledge of an overall weakness in semantics and inferencing competence within special populations can aid in the appropriate design and implementation of reading instruction. Significant differences between students with SLI and pragmatic difficulties, however, were not found and Botting and Adams suggest that further examination of these two populations is necessary in order to determine the exact sources of their struggles with pragmatics.

In sum, evidence from investigations on inferencing ability among different subgroups of young adolescents supports the role of inferencing in successful, silent reading comprehension. Whether inferencing ability is mediated by other components such as oral language (Nation, Adams, Bowery-Crane, & Snowling, 1999) or has a unique relationship to silent reading comprehension (Cain, Oakhill, & Bryant, 2004) continues to be open to question. What research consistently supports, however, is that the quality and level of comprehension that is constructed during silent reading comprehension not only depends on meaning that is derived through text-level processing of explicit information (i.e., using knowledge of semantics, morphology, and syntax), but also through the integration of prior knowledge and inferencing to form a complete, coherent representation of the text (Kintsch, 1988). Inferencing ability must be included as part of an overall multi-component assessment of skills underlying silent reading comprehension ability in young adolescents.

Cognitive and Affective Factors that Influence Silent Reading Comprehension

The consideration of cognitive and affective factors influencing reading achievement among adolescents has been examined by various disciplines. Two factors of particular

relevance to this investigation are problem solving and attitudes toward reading. Problem solving in text comprehension involves the recognition of an obstacle to comprehension and the subsequent application of strategies such as planning, reviewing, and adjusting to reach the goal of comprehension. Attitudes toward reading or reading attitudes refers to an individual's expression of a system of feelings, represented along a continuum from positive to negative, towards reading and associated activities. Given that silent reading comprehension for young adolescents requires high-levels of independent problem solving ability and motivation to apply their knowledge and skills, the inclusion of these two factors should be considered in a multi-component assessment of underlying causes for poor reading achievement among young adolescents.

Problem Solving as a Contributor to Silent Reading Comprehension

The goal of reading, to construct meaning from connected text, requires problem solving processes when obstacles impede a reader's ability to read silently with comprehension. The ability to critically and successfully comprehend a variety of text forms requires multiple problem solving processes such as purposeful planning, sustained and selective attention, active and flexible thinking, efficient strategy application, and self-monitoring (Westby, 2005). Collectively, these problem solving processes are commonly associated with executive functions. Executive functions have long been a topic of interest to researchers concerned with the brain-based location of thinking, cognitive development, and use of differentiated thinking to learn (Lyon & Krasnegor, 1996). Traditionally, executive function has been theorized as a single, overarching or central cognitive processor responsible for the initiation and mediation of brain processes required for learning (Anderson, 2002; Shallice, 1990). More recent brain imaging investigations, however, have

revealed a complex interchange of brain activity between the frontal lobes and other, diverse locations in the brain (Carpenter & Just, 1999; Carpenter, Just, & Reichle, 2000). Information gained from brain imaging studies have significantly contributed to current views of executive functions, which are now generally held as a collection of interrelated brain processes that, for the purpose of achieving a goal, are initiated and mediated through involvement of frontal lobes and associated connections (Elliott, 2003). In other words, executive functions are the result of the active processing of information between diverse, but selective coordinated brain connections for the purposes of learning and developing new knowledge. Although there is some variability in the assignment of specific behaviors or component skills believed to reflect executive functions, the following skills are consistently referenced in the literature: (a) initiation and sustaining; (b) organizing; (c) set shifting; (d) planning and selecting; (e) response inhibition; and (f) self-regulation through ongoing monitoring and evaluation (Elliott, 2003; Gioia, Isquith, Kenworthy, & Barton, 2002; Lyon & Krasnegor, 1996). Each of the component skills associated with executive functions is believed to contribute to reading comprehension in a unique way, but requires many of the skills to be used in concert, along with other domain skills such as oral language, for efficient processing (Westby, 2005).

Goal setting or orientation is a primary domain area within some theoretical models of executive functions (e.g., Anderson, 2002). Goal setting behaviors, including problem solving, support students' ability to strategically engage in constructing meaning from connected texts through organization and planning. Problem solving processes or behaviors that have been cited as being important to the process of successful silent reading include the ability to plan, organize sequences of steps or information, identify key elements within text

structures, interpret and summarize main concepts, and monitor comprehension (Block & Pressley, 2003; Ehren, 2006; Jetton & Dole, 2004; Moore, Moore, Cunningham, & Cunningham, 2003; Nation, 2005; NRP, 2000). While some processes associated with problem solving, such as working memory, have been significantly associated with reading comprehension ability (Baddeley, 1992, 1994; Cain, Oakhill, & Bryant, 2004), less is known about other processes such as the relationship between planning skills and reading comprehension (Cutting, Materek, Cole, Levine, and Mahone, 2009; Semsa, Mahone, Levine, Eason, & Cutting, 2009). Since planning ability, a subcomponent of problem solving has been an essential underlying tenet of widely used forms of comprehension instruction, (Baumann, Seifert-Kessell, & Jones, 1992, Ogle, 1992; Palincsar & Brown, 1984) investigation of planning ability might yield some important information not necessarily identified or isolated in other measures.

Emerging evidence suggests that students' planning abilities makes a unique contribution to reading comprehension (Cutting, et al., 2009; Semsa et al., 2009) and that efficiency in planning and reading comprehension ability appear to share a positive relationship (Semsa et al., 2009). Effective planning can support strategic and organized problem solving, assist in appropriate goal setting, and encourage online monitoring of silent reading comprehension. For example, planning ahead before reading a text by establishing a purpose for reading, previewing or skimming the text for structure, and predicting story content are all examples of how planning contributes to students' ability to read with comprehension. As with advanced language processes, a variety of problem solving processes influence reading comprehension; however, their strength in predicting reading comprehension individually and collectively has yet to be extensively explored.

Semsa, Mahone, Levine, Eason, and Cutting (2009) investigated the contribution of a constellation of EF related skills, along with other component areas, in relation to their relative contribution to single word reading and reading comprehension. Specifically, measures of attention, working memory, planning, decoding, receptive vocabulary (i.e. single-word), fluency, and reading comprehension were administered to 60 students with and without reading disabilities. Within the single population of students, 29 were identified with various deficits related to word reading accuracy, reading comprehension, or attention. The other 31 students were identified as typically developing. Student participants ranged in age from 9 to 15 years old. Semsa et al., (2009) found that a model comprised of measures tapping decoding, fluency, and receptive vocabulary accounted for 69% of the variance in students' single-word reading. Working memory and planning did not make any significant contribution to students' single-word reading ability. Alternatively, a model consisting of measures of fluency, receptive vocabulary, working memory, and planning ability accounted for 63% of the variance in students' reading comprehension ability. In addition, working memory and planning, skills subsumed under executive functioning, each uniquely contributed to reading comprehension ability in their student sample. Semsa et al., (2009) concluded that the working memory and planning skills are likely to be an essential part of what is required to independently construct meaning of written text.

In a notable investigation, Cutting, Materek, Cole, Levine, and Mahone (2009) used measurement procedures similar to those used in the current study to examine how components of word fluency, oral language, and executive function affect reading comprehension ability. The authors were particularly interested in how these underlying components affected reading comprehension ability in students identified with specific-

reading comprehension deficits or what has previously been referenced as poor comprehenders. Fifty-six students, ranging from 9 to 14 years old, were recruited for this study. Students were assigned to one of three groups based on their performance scores on measures of word reading and reading comprehension. Specifically, 21 students were placed in the typically developing group, 18 students fit into the category of general reading disability, and 17 students were assigned to the specific-reading comprehension deficits group. All student participants were individually administered measures of word fluency, oral language, and executive function. Word fluency, the speed of word identification, was measured in isolation (i.e., single words) and in context. Measures of general oral language included one-word receptive vocabulary and syntax. Advanced oral language forms were also assessed including lexical ambiguity and making inferences. Finally, measures of executive function included tasks of planning and verbal working memory.

Cutting et al. (2009) found several interesting relationships between some of the component areas and reading comprehension among the three groups. First, students in the typically developing group performed well on both measures of word fluency: words identified in isolation and in context. The students identified with specific-reading comprehension deficits also performed well on reading words in isolation, but performed significantly below the typically developing group on contextual word reading. Students within the general reading deficits group performed below the other two groups on both word fluency tasks. In terms of general and advanced oral language, students within the typically developing group presented with significantly stronger performance across all measures than students within both the specific-reading comprehension deficits and general reading deficits groups. Students within both the specific-reading comprehension deficits and general

reading deficits groups demonstrated significant weakness in syntax and inferencing ability. Furthermore, the specific-reading comprehension deficits group did not present with difficulties in receptive vocabulary, as in the general reading deficit group. From their results, Cutting et al. (2009) concluded that subcomponents of executive function, including planning, uniquely contribute to silent reading comprehension in students with specific-reading comprehension deficits. Further, for students with reading disabilities, different aspects of general and advanced oral language (i.e., syntax, semantics, and inferencing) were strongly associated with reading comprehension.

Attitudes Toward Reading as a Contributor to Silent Reading Comprehension

Success with silent reading comprehension not only requires the contribution of skill-based components such as oral language and problem solving, but also bidirectional, affective influences such as students' attitudes towards reading or reading attitudes (McKenna, 2001). Students' attitudes toward reading, a subcomponent of motivation (Guthrie & Wigfield, 2000), have been associated with grade level, gender, reading ability, and willingness or aptitude to participate in reading activities (McKenna, Kear, & Ellsworth, 1995). While the literature on students' reading attitudes references various definitions, the current investigation defines reading attitudes as an individual's expression, along a continuum of likes and dislikes, towards reading related activities (McKenna, 2001; McKenna, Kear, & Ellsworth, 1995).

Since the mid-1990s, several large-scale studies of students' reading attitudes have produced a substantial body of evidence supporting the relationship between positive reading attitudes and successful reading achievement in children and young adolescents (Lazarus & Callahan, 2000; Mathewson, 1994; MacMillian, et al., 1992; McKenna, Kear, & Ellsworth,

1995). Yet, it is the seminal work in the measurement of attitudes (Allport & Hartman, 1925; Thurstone, 1928) that led to the initial and consistent research interest in examining the relationship between reading attitudes and achievement since the 1970's (Estes, 1971). For instance, Thurstone (1928) designed a method whereby attitudes were represented along a graduated scale ranging from strongly against to strongly in favor. The representation of reading attitudes along a graduate scale or linear continuum rather than rank order, moved research forward in this area by providing a means for examining changes in reading attitudes over time relative to discrete measurement. Estes (1971) was among the first to apply a graduated scale to the measurement of attitudes toward reading. Estes (1971) developed a way in which reading teachers could quantitatively measure change in students' attitudes toward reading, differentiate among students with positive and negative attitudes toward reading, and inform instructional decisions. Despite the advancement in measurement design, early research on reading attitudes tended to report a single, composite score, which limited the ability of researchers to identify or understand subcomponents of reading attitudes. Thus, researchers began to design and use measurements that reported multiple scores based on the growing perception that reading attitudes are a whole-part or multidimensional construct (Engin, Wallbrown, & Brown, 1976; Mathewson, 1994; McKenna, 1994; Wallbrown, Vance, & Prichard, 1979).

Attitudes toward Reading: A National Survey

The measurement of reading attitudes was not the only limitation of early research. The recruitment of small and homogenous samples of students was another significant limitation to the generalizability of results. In response to this limitation, McKenna, Kear, and Ellsworth (1995) conducted the first national investigation of reading attitudes and

recruited a demographically diverse sample of 18,185 students in grades one through six. Specifically, these researchers sought to examine: (a) developmental trends in recreational and academic reading across grade, and (b) differences between reading attitudes and reading ability, gender, and ethnicity. Using the Elementary Reading Attitude Survey (ERAS; McKenna & Kear, 1990), as a measure of recreational and academic reading attitudes, participating teachers administered the ERAS in group settings. Teachers categorized students' reading ability as *above average*, *average*, or *below average*. McKenna, Kear, and Ellsworth (1995) found significant developmental trends in reading attitudes indicating that despite initial positive attitudes toward recreational and academic reading, as grade levels rose, students reading attitudes steadily declined. Significant differences were also observed between reading attitudes and ability. Students with low average reading ability reported more negative attitudes towards recreational reading than students with above or average reading ability. Further, as the grade levels rose, the gap between attitudes toward recreational reading and ability significantly widened. As reported in previous studies on reading attitudes, McKenna et al. (1995) also observed significant gender differences as girls in grades one through six reported more positive reading attitudes for both recreational and academic reading than boys. In reference to differences in reading attitudes by ethnicity, McKenna et al. (2000) found that African American students across all grades generally reported positive attitudes towards reading compared with those reported by Hispanic and White students. Although a decline in positive reading attitudes was observed across all ethnic groups, this decline leveled out around fourth and fifth grades for African American students whereas a negative trend towards reading continued for all other ethnic groups through sixth grade.

There was no significant gender by ability difference found. While there were no significant findings between recreational reading attitudes and ethnicity, African American students across all grades reported more positive reading attitudes than Hispanic or White students. In addition, the decline in reading attitudes by African American students leveled out around fourth and fifth grades whereas the downward trend in reading attitudes continued for all other ethnic groups beyond that grade level.

McKenna, Kear, and Ellsworth's (1995) national survey of reading attitudes among students in grades one through six contributed to the field's ability to generalize the results to the greater population, supported findings from earlier research (i.e., decline in positive reading attitudes as grade levels rose, gender differences, reading ability differences), and established the ERAS as a reliable measure of students' reading attitudes in grades one through six (McKenna, 1994). Another significant finding reported by McKenna, Kear, and Ellsworth (1995) was that as grade levels rose, the gap between students' attitudes toward recreational reading and ability levels widened. Specifically, students with low reading abilities reported more negative attitudes toward recreational reading than did students with average or above average reading abilities. This finding provided substantial support to the widely held view that students who have more experience with reading become better readers whereas students with limited reading experiences become less able to read at or above reading levels of same age peers (Stanovich, 1986). Further, the findings of a significant relationship between negative reading attitudes and low reading abilities served to support both previous research findings (e.g. Wallbrown, Vance, & Prichard, 1979) and future investigations (Lazarus & Callahan, 2000) of the reading attitudes among special populations with low reading abilities.

Attitudes toward Reading in Special Populations

While most of the early research in reading attitudes recruited typically developing populations, there were a few researchers interested in the assessment of reading attitudes among special populations (MacMillan, Widaman, Balow, Helmsley, & Little, 1992; Wallbrown, Vance, & Prichard, 1979). Wallbrown, Vance, and Prichard (1979) examined the reading attitudes and interests of two groups of intermediate grade students to determine which, if any, dimensions of reading attitude could discriminate between the students with and without identified reading disabilities. Two hundred intermediate grade students identified as either typically developing (N=84) or reading disabled (N=116) were recruited from a single school system located in the rural south. An identification of a reading disability was determined by teacher or parent referral of a reading problem and with reading performance at least one year below expected grade-level. The *Survey of Reading Attitudes* (Brown, Engin, & Wallbrown, 1979) was group administered to the students. The *Survey of Reading Attitudes* consisted of 88 items and five response categories arranged along a continuum from strongly disagree to strongly agree. Individual student responses to the survey items were summed for each of the eight dimensions. The authors found that differences between the two ability groups could be accounted for by three independent dimensions of reading attitudes: (a) Expressed Reading Difficulty (i.e., student perceptions of self as having difficulty with reading and willingness to acknowledge their own reading difficulties); (b) Reading Group (i.e., student attitudes towards their reading group and instructional materials they are required to use); and (c) Reading as Enjoyment (i.e., student perceptions of the intrinsic value of reading as a source gaining information, learning and emotional satisfaction independent of outside influences). Overall, students identified with

reading disabilities perceived themselves as having more difficulty reading than their typically developing peers. Further, students identified with reading disabilities viewed their group placement and materials in a more negative manner than their peers. The typically developing students rated reading for intrinsic value more positively than their counterparts.

MacMillan et al. (1992) examined the relationship between students' attitudes towards school, including reading attitudes, and their academic level, ethnicity, and gender. Students were assigned to one of three academic levels (i.e., learning handicapped, educationally marginal, or regular class), as determined by their special education identification or previous year's performance scores on academic achievement tests. Students were also assigned to one of three ethnic groups (e.g., European-American, African American, Mexican-American) and gender (i.e., male, female). Through stratified random sampling, 1,140 eighth grade students were recruited for participation in this study. All students were given the *Survey of School Attitudes* (SSA; Hogan, 1975) to examine their attitudes towards four content areas including mathematics, social studies, science, and reading/language. In response to each of the 60 items, students were instructed to choose one of the following three expressions of attitude: like, not sure/don't care, or dislike. Each student's performance on the SSA was compared to the previous year's scores on reading and mathematics achievement tests. MacMillan, et al., (1992) found statistically significant group differences between students' attitudes towards reading and academic level, ethnicity, and gender. In general, students in the regular class group reported more positive attitudes towards reading than the other two ability groups. There were no statistically significant differences in reading attitudes between students identified as educationally marginal or learning handicapped. Similar to the previous findings black or African American students,

regardless of ability level, reported higher or more positive reading attitudes than students within the other ethnic groups. Consistent with previous findings, females reported more positive attitudes toward reading than males. While it is uncertain whether the SSA was able to account for reading related activities embedded within the other three content areas, the findings of MacMillan et al. (1992) provided evidence of differences in reading attitudes among special populations.

Lazarus and Callahan (2000) sampled 522 elementary grades students and young adolescents (i.e., grades 1-5) identified with learning disabilities to examine reading attitudes, specifically towards recreational and academic reading. Further, these researchers sought to determine differences in reading attitudes across grades and between students identified with learning disabilities and a normative, non-disabled population. Students were randomly selected from 42 elementary schools across four, demographically different states (i.e., Ohio, Kansas, Georgia, and Michigan). The Elementary Reading Attitude Survey (ERAS, McKenna & Kear, 1990) was administered to small groups by the teacher of students with learning disabilities at each school. Consistent with the normative, non-disabled population (McKenna, Kear, & Ellsworth, 1995), Lazarus and Callahan (2000) found significant grade differences as students generally reported positive reading attitudes in first-grade followed by a steady decline in grades two through five. Consistent with their typically developing peers, students with learning disabilities favored recreational reading over academic reading. Lazarus and Callahan (2000) also found significant differences between students identified with learning disabilities and the norms for non-disabled students determined by McKenna, Kear, and Ellsworth (1995). In contrast to the their low and average non-disabled peers, students with learning disabilities, who received extra support in reading instruction, reported

positive attitudes toward reading for both categories of reading. Of particular interest was that the ratings provided by students identified with learning disabilities closely tracked those by average, non-disabled peers in grades three through five.

Students' negative attitudes towards reading are not necessarily limited to populations who struggle with silent reading comprehension. Investigations examining the relationship between reading attitudes and reading achievement among academically talented or gifted students have shown variability in positive reading attitudes. Martin (1984) investigated the reading attitudes and behaviors among groups of students with below average, average, and above average reading ability. One hundred and twenty-four students in grades six through eight were recruited from a single school district. Each of the students was assigned to one of three ability groups (below average, average, and above average) based on standardized performance scores, academic achievement, and teacher evaluations. All students completed a measure of reading attitudes and a questionnaire related to leisure time activities. As expected, a substantial portion of the students who had below average reading ability, reported negative attitudes towards reading due to difficulties with word identification or comprehension. Martin (1984) found, however, that 19% of the students in the above average group also reported negative reading attitudes. In particular, the above average students perceived reading as a waste of time or a competing constraint on their academic/leisure time. Further, both groups of students in the above average and average reading ability groups cited uninteresting reading materials as one of the primary reasons for a negative reading attitude. Results of this study suggest that some groups of academically gifted students, although possessing the necessary skills to read with successful comprehension, did not have positive attitudes toward reading.

Anderson, Tollefson, and Gilbert (1985) examined the reading attitudes and behaviors among a sample of 276 students, in first through twelfth grades, identified as academically gifted. The students were assigned to one of four grade-level groups: primary (grades 1-4), intermediate (grades 5-6), junior high school (grades 7-9), and high school (grades 10-12). All students were administered a researcher-developed questionnaire designed to measure students' attitudes towards reading assignments, reading work load, and reading as a leisure activity. The authors also investigated the number of books read by the students as well as their reasons for choosing them. Students responded to each of the 11 questions using a five-point Likert scale. The academically gifted students reported positive attitudes towards reading, viewed reading as fun, cited personal choice as a reason for reading, and noted leisure reading as a favored activity. While most academically gifted students did not find reading or reading assignments difficult, some reported that the assignments were too long and tedious. Further, the authors found as grade-level increased, academically gifted students' positive attitudes towards reading and interest in reading as a favorite leisure activity declined. Anderson, Tollefson, and Gilbert (1985) suggested that such downward trends in positive attitude among academically gifted students may be due educational demands or competing influences on leisure time such as watching television. The authors concluded that the reading attitudes and behaviors among academically gifted students should also be considered when planning reading instruction or developing programs intended to increase reading achievement among adolescents.

In a recent investigation, Worrell, Roth, and Babelko (2007) examined the reading attitudes in a sample of students identified as academically talented. Five hundred and seventy-five rising first through seventh graders completed the ERAS. Performance scores

by the academically talented group were compared to the ERAS's normative sample (McKenna & Kear, 1990). Results indicated that as a group, academically talented students demonstrated above average attitudes towards reading and consistent with previous investigations, significant gender differences were found. Females reported more positive attitudes towards recreational reading (4^{th} and 6^{th} grade) and academic reading (6^{th} grade) than males. Worrell, Roth, and Babelko (2007) did not find any statistically significant grade-level differences or downward trends in reading achievement as found in other investigations (Anderson, Tollefson, & Gilbert, 1985; Martin, 1984).

Investigations of reading attitudes among special populations are critical to our understanding of the underlying components related to reading achievement among young adolescents. As referenced, there are some discrepancies among the reported findings on reading attitudes among special populations (Anderson, Tollefson, & Gilbert, 1985; Martin, 1984; Lazarus & Callahan, 2000; MacMillan, et al., 1992; Wallbrown, Vance, & Prichard, 1979; Worrell, Roth, & Gabelko, 2007). While it is logical to assume that reading attitudes among special populations tend to coincide with their reading ability, there is research to suggest that this assumption is not always true (Martin, 1984; Lazarus & Callahan, 2000). Consequently, such research should warn us not to make automatic assumptions regarding students attitudes toward reading based solely on perceptions in terms of ability level or special identification.

Longitudinal studies of attitudes toward reading

In an effort to better understand the developmental relationship between reading attitudes and reading achievement, several studies have examined changes in reading attitudes over time. In an early longitudinal investigation, Ley, Schaer, and Dismukes (1994)

examined the reading-related attitudes, behaviors, and activities among a group of young adolescents. Each year for three years, 164 students were administered measures of reading attitudes, behaviors, and activities. Significant relationships between students' general attitudes toward reading and reading behaviors were found. Specifically, the results indicated that students' attitudes towards reading and reading activity declined over the three years. In addition, students placed a much lower value on reading for enjoyment than reading for utilitarian purposes. In contrast to findings of other researchers, Ley, Schaer, and Dismukes (1980) did not find a statistically significant difference between reading attitudes and gender and suggested that limitations in their sample may have contributed to a non-significant finding.

Sainsbury and Schagen (2004) examined fourth and sixth grade students' reading attitudes at two time points (i.e., year one and year five) to assess whether positive attitudes and reading ability in students changed over time. Consistent with McKenna, Kear, and Ellsworth (1995), they found that girls' reading attitudes were significantly higher than boys' and positive reading attitudes and reading ability were significantly related for students during year one. At year five, however, despite the substantial decline in students' reading attitudes as they got older, students perceived reading tasks less challenging, a perception supported by increased reading achievement. Thus in this case, reading attitudes and reading achievement were not significantly related in year five. The authors hypothesized that this difference may have been attributable to students' experiences with the National Literacy Strategy program implemented in England or technological changes that may distract students from reading for enjoyment (Sainsbury & Schagen, 2004).

Kush, Watkins, and Brookhart (2005) used longitudinal covariance structural modeling to determine if reading attitude, behavior, and achievement at grades two and three would predict reading achievement in grade seven. At grades two and three, measures of reading behavior were collected through documented amount of time spent on extracurricular reading via reading logs. Reading attitude was measured at the beginning of grade three using the ERAS (McKenna & Kear, 1990). Measures of reading achievement were collected at grades two, three, and seven by examining performance results on the Iowa Tests of Basic Skills (ITBS; Hieronymous, Hoover, & Lindquist, 1990). Results of the study indicated that early reading achievement strongly predicted later reading achievement. In addition to the predictive relationship between early and later reading achievement, the authors also found that reading attitude at third grade had a significant predictive relationship with reading achievement at seventh grade. Interestingly, there was no significant relationship between reading attitudes and reading achievement at grades two and three indicating the possibility of developmental influences over time as explained by Kush, Watkins, and Brookhart's (2005) temporal-interaction model. Though reading achievement and reading attitudes in the elementary grades were not significantly related, both demonstrated significant, causal paths to future reading achievement. Martinez, Aricak, and Jewell (2008) used the temporal interaction model as Kush and colleagues (2005) to examine the same reading attitude-achievement relationship in a select group of fourth-grade students. In addition to investigating the reading attitude-achievement relationship, Martinez and colleagues also sought to determine whether gender and ability differences contributed significantly to attitude towards reading. Martinez and colleagues found that reading ability and reading attitudes significantly predicted near-future reading achievement (i.e., four months), girls

reported more positive attitudes towards reading than boys, and reading attitudes reported by good and poor readers were not significantly different between groups.

Collectively, the body of research on reading attitudes supports the existence of a significant relationship between attitude towards reading and reading achievement in children, young adolescents, and special populations. Despite the well-documented evidence of a significant relationship between reading attitudes and achievement, most summative assessment protocols fail to include such a measure. Given the consistent findings of a decline in positive reading attitudes throughout adolescence coupled with gender discrepancies, a measure of attitude towards reading is warranted if we want to obtain a comprehensive view of the underlying components related to reading achievement among young adolescents.

Multi-component Assessments of Silent Reading Comprehension

In an effort to go beyond general test scores to determine the underlying causes of poor performance on assessments of reading, Buly and Valencia (2002) examined component skills in a group of 4th grade students. One hundred and eight students who scored below a proficient level (i.e., a 1 or 2 on a scale of 104) on the Washington Assessment of Student Learning (WASL; Washington Superintendent of Public Instruction, 2009) were selected to participate in the study. Interestingly, none of the students had a prior or current history of being identified as needing or receiving remedial reading instruction. Students were individually assessed on measures of phonemic awareness, word attack, fluency, and comprehension. Student participants performed below grade level across all measures. Performance scores on all measures, with the exception of phonemic awareness, correlated to students' scores on the WASL. Buly and Valencia (2002) speculated that students' spelling

abilities aided in the students' ability to decode thereby confounding the results. Measures of phonemic awareness therefore, were excluded from further analysis.

Three factors in particular accounted for 78% of the variance in WASL scores: word identification, fluency, and comprehension. In order to determine if there were differences in performance patterns among students, Buly and Valencia (2002) conducted a cluster analysis revealing 10 different profiles. Students whose scores fell in clusters 1 and 2, aptly named "automatic word callers" (Buly & Valencia, 2002, pg. 229) or what is commonly referred to as poor comprehenders accounted for 18% of the sample. Students who fell within these two clusters presented with age-appropriate or above abilities in word identification and fluency, but struggled with comprehension. Performance patterns identified in cluster three were similar to those students in clusters 1 and 2 with the exception of mild difficulties in word identification. These students identified as "struggling word callers" (Buly & Valencia, 2002, pg. 230), accounted for 15% of the sample population. Finally, recall the sample of students selected for participation, the authors selected students from a pool within their district that had no prior or current history of needing or receiving remedial reading instruction. Nonetheless, approximately 9% of the students sampled fell into clusters 9 and 10 whose performance scores were so low across all three factors that they would certainly be candidates for specialized instructional support in reading (Buly & Valencia, 2002). Although clusters 9 and 10 are relatively small in comparison to the rest of the clusters, the findings of Buly and Valencia (2000) support the need to "probe beneath test scores" (Buly & Valencia, 2002, pg. 233) for a comprehensive review of students who are at risk for or who have performed poorly on high-stakes assessments of reading.

Results of the study conducted by Buly and Valencia (2002) clearly reveal the complex nature of reading and the combination of underlying skills that are related to some students' poor reading achievement. Performance scores obtained from general assessments of reading do provide information as to where students' overall ability to read with comprehension, falls on a continuum. What performance scores obtained on general reading assessments fail to provide are the kinds of specific information necessary to guide appropriate, research-based decisions regarding reading instruction and intervention pathways. Without a firm understanding of the underlying component abilities associated with reading achievement, there is little guidance to support the construction and delivery of the kinds of differentiated reading instruction necessary to ameliorate poor reading comprehension among young adolescents.

Conclusion

The literature pertaining to the underlying components related to silent reading comprehension demonstrates past and current efforts to understand the persistence of poor reading achievement among young adolescents. It is only recently however, that the topic of adolescent literacy has received the wide spread attention and resource allocation required to consolidate research efforts and forward a comprehensive understanding of poor reading achievement among adolescents. The complex nature of silent reading comprehension with its' dynamic, whole-parts necessitates a multi-component investigation. Current research directions are moving towards a cross-disciplinary examination of multiple components underlying silent reading comprehension (Hannon & Daneman, 2001). This form of investigation is of particular relevance given that a substantial portion of reading comprehension difficulties among young adolescents resides across and within component

areas in contrast to younger readers who predominately struggle with word identification skills. In an effort to forward current understandings of the persistence of poor reading achievement among young adolescents, this study used a multi-component approach to determine the unique and combined contribution of oral language, problem solving, and reading attitudes to silent reading comprehension in a group of young adolescents with varying skill in silent reading comprehension.

CHAPTER 3

Methods

Given that a substantial portion of reading comprehension difficulties among young adolescents resides across and within component areas other than word identification, the purpose of this investigation was to increase understandings of these component areas and their relative contributions to silent reading comprehension.

Research Hypotheses

This study employed a multivariate, single group design to determine the combined and unique contribution of oral language, problem solving, and reading attitude to silent reading comprehension. From a pool of 102 potential student participants, 60 participants were selected for participation using stratified random sampling with 20 students selected from each of the three grades. The specific hypotheses tested were:

Hypothesis One. There will be a significant correlation between general and advanced receptive language and reading comprehension ability.

Hypothesis Two. There will be a significant correlation between problem solving and reading comprehension ability.

Hypothesis Three. There will be a significant correlation between reading attitudes and reading comprehension ability.

Hypothesis Four. The correlation between reading comprehension ability and a linear combination of oral language, problem solving, and reading attitudes will be stronger than the correlation between reading comprehension and any of the individual components.

Participants and Setting

The current study was conducted in a public middle school located in the central Piedmont area of North Carolina. One of three middle schools located within a single district, 38% of the rural site's student population were eligible to participate in the free or reduced-price lunch program, compared to 35% at the district level (North Carolina Department of Public Instruction [NCDPI], 2009). During the period of this study, the school served 494 students in grades six through eight between the ages of 10 and 14 years with a diversity composition that closely approximated district and state levels thereby providing equal access to participation among minorities (NCDPI, 2009). Refer to Table 3.1 for a breakdown of students by ethnicity representation.

Table 3.1
Ethnic Representation for Sample as Compared to Research Site, County, and U.S. State

Ethnicity	Sample	Site	County	State
American Indian	-	.2%	.3%	1.4%
Asian	-	.6%	.9%	2.5%
Hispanic	1.7%	6.1%	10.9%	10.7%
Black	35.0%	24.5%	20.7%	31.2%
White	58.3%	65.0%	67.1%	54.3%
Multi-Racial	5.0%	3.6%	-	-

Note. Percentages of multi-racial students were not reported by county or state.

Student Participants

Sixty students between the ages of 10 and 14 participated in the current study. From the available participant pool of 102 students, twenty students from each of grades 6, 7, and 8 were randomly selected. The total number of students at each grade level from which the 20

were selected was 37, 35, and 30. All student participants were individually assessed in a self-contained, quiet room on the school campus. Refer to Tables 3.2 and 3.3 for demographic data of student participants including age, gender, grade, and identification.

Table 3.2
Descriptive Statistics for Chronological Age of Sample Population (N=60)

Sample Characteristics	Mean	SD	Minimum	Maximum
Overall Sample	12.57	1.03	10.92	14.83
Grade 6	11.45	0.37	10.92	12.08
Grade 7	12.54	0.42	11.75	13.58
Grade 8	13.70	0.55	12.92	14.83

Table 3.3
Descriptive Statistics for Gender and Educational Placement of Sample Population (N=60)

Sample Characteristics	Number	Percent
Female	39	65.0%
Male	21	35.0%
Students in the Exceptional Children's Program	10	16.7%
Students in the Academically Gifted Program	9	15.0%

Appropriateness of Sample Size

G* Power (Faul, Erdfelder, Lang, & Buchner, 2007) power analysis software was used to compute the appropriate sample size for the planned analysis. For each of the

planned correlations, the relationship between a single predictor variable and reading comprehension required a sample of 23 participants given a large effect (r=.50), an alpha of .05, and power of.80. For the planned multiple regression there were a total of 8 predictor variables. The multiple regression required a minimum of 52 participants given a large effect (f^2=.35), an alpha of .05. and power of .80. To meet these projections, a total of 60 students were recruited through stratified random sampling.

Procedures

All students in attendance at the research site were invited to participate in this study. A parent letter that provided a description of the study, methods and type of data collection, inclusion/exclusion criteria, potential benefits and risks, and an invitation to participate was sent home with each of the 494 students. All parents or legal guardians were required to provide consent and due to the ages of the students, written assent from each student participant was also obtained. Student assent forms were read aloud to all potential student participants to ensure their comprehension of the study. Any student's decline of assent superseded a parent's consent, as was the case for two students who refused assent. In addition, both parents and students were informed of their right to withdraw from participation at any point during the course of the study without consequence.

Screening

All potential student participants completed the Test of Word Reading Efficiency (TOWRE; Torgesen, Wanger, & Rashotte, 1999) as an initial screening measure to ensure adequate word identification skills. A minimum word reading level of 2nd grade was selected as a requirement for participation in this study. This minimum was selected to maximize the lower-limits of reading skills required for participation while also guaranteeing that potential

participants had adequate word reading skills to suggest that they should be able to read connected text. The Test of Word Reading Efficiency was selected because it is a reliable, standardized tool used to quickly assess children's decoding and cipher abilities. The Test of Word Reading Efficiency is comprised of two subtests: *sight word efficiency* (SWE) and *phonemic decoding efficiency* (PDE). The SWE was used to assess each student's sight-word recognition. Sight words are words that are automatically recognized and produced "without conscious decision or attention to the decoding process" (Cunningham, 1993, p. 34). Each student was given 60 seconds to read aloud as many words as they could from a list of 104 words. The PDE was used as a measure of each student's ability to quickly and accurately decode a list of nonsense words. Decoding is the process of breaking down a word based on its letter-sound relationship and then blending those sounds together to produce a phonological representation of the printed item. The Test of Word Reading Efficiency took approximately 3-5 minutes to administer and was an appropriate measure of both sight word recognition and decoding ability. Grade equivalent scores were calculated for each subtest based on the guidelines provided in the Test of Word Reading Efficiency. Any student who scored below a second-grade level on either subtest was excluded from participation in the second phase of this study.

During screening, students also completed the Elementary Reading Attitude Survey (ERAS; McKenna & Kear, 1990) which is a norm-referenced measure of students' attitudes toward recreational and academic forms of reading. While a particular performance on the Elementary Reading Attitude Survey was not part of the criteria for inclusion as a participant in the study, the Elementary Reading Attitude Survey was completed during the screening to take advantage of the time students spent with the examiner during the first meeting. Two

versions of the Elementary Reading Attitude Survey were used in this study. The original version contained four different black and white drawings of a well-known cartoon character, *Garfield.* The four picture choices were represented in a Likert-type scale starting from the far left denoting "very happy" and moving to the right depicting "very upset." There are a total of 20 reading-related questions. Following each question, students were shown four different emotion-state Garfield pictures and were asked to circle the picture that matches how they felt in response to a reading-related question. A second, modified version of the Elementary Reading Attitude Survey was made available to students in seventh and eighth grades. The modified Elementary Reading Attitude Survey contained the same 20 reading-related questions as the original, but asked each participant to circle text-only choices again arranged in the same Likert-type scale. Refer to Appendix A for a copy of the modified Elementary Reading Attitude Survey. The student participants in seventh grade were given the choice as to which test version to use. In all, 25 students (20 sixth graders and 5 seventh graders) used the original, picture version of the Elementary Reading Attitude Survey and 35 students used the modified, text-based version. The Elementary Reading Attitude Survey has two scales that can be used to describe students' reading attitudes on two dimensions: (a) students' attitudes towards recreational reading and (b) students' attitudes towards academic reading. As normative data was not available for students beyond sixth grade, raw scores across both scales were computed and used in the current study as a measure of reading attitudes. After the Elementary Reading Attitude Survey was completed, all participating students were read the following exiting script to clarify the end of their role in the first part of the study:

> Thank you, student's name, for helping us out with our study today. The word activity and reading attitudes survey you completed will help us to better understand how the skills and reading attitudes of students like you relate to reading comprehension. You have now finished your part in the screening. At some point in the future, I may ask you to participate again. Whether I ask you to help out again or not, I want you to know how thankful I am for your help and time.

The results of the Test of Word Reading Efficiency and Elementary Reading Attitude Survey were not disclosed to student participants at any time before, during, or after the current study to prevent the possibility of stigmatization. The initial assessment session lasted approximately 25-to-30 minutes. The results of the Test of Word Reading Efficiency were used to determine which students would be included in the next phase of the investigation. In order to participate in the second phase of the study, all students had to: (a) be enrolled in the North Carolina Standard Course of Study; (b) demonstrate fluency in English; (c) present with no known hearing deficits within the last three years; and (d) achieve a grade equivalent score of 2nd grade or higher on the Test of Word Reading Efficiency. Initial screening for inclusion and exclusion criteria eliminated 11 students, thus leaving 102 potential student participants. Stratified random sampling was used to select 20 students from each grade for further participation for a total of N=60.

Research Assistant Training for Screening

One research assistant helped with participant screening. The research assistant had completed the required training in human research ethics, was enrolled as a graduate student in the University of North Carolina at Chapel Hill Masters of Science in Speech and Hearing Sciences program, and had prior experience working with school-age students. The research

assistant completed three hours of training before being allowed to independently screen student participants. One introductory session and two, one-hour training sessions were held to allow time for the research assistant to complete assignments necessary to successfully complete the training. During the one-hour introductory session, the primary investigator explained the purpose and procedures of the research study and reviewed the code of student conduct as outlined by the American Speech-Language-Hearing Association Standards for Speech Language Pathologists.

The first one-hour training session involved an overview of the screening protocol used in the research study. During this training session, the investigator introduced the Test of Word Reading Efficiency (Torgesen, Wanger, & Rashotte, 1999) and the Elementary Reading Attitude Survey (McKenna & Kear, 1990) and previewed the procedures for test administration and scoring (including how to calculate chronological age and how to convert raw scores to grade equivalent scores and standard scores when applicable). The research assistant was asked to become familiar with the screening measures and practice test administration and scoring with a peer during the break between training sessions one and two.

For the second and final training session, the primary investigator observed the research assistant as she administered and scored the screening battery independently. In order to move on to independently administer the screening, the research assistant had to administer each assessment using the appropriate procedures and obtain an inter-rater agreement of 90% or higher for the scores obtained on each of the two assessments. The research assistant met the criteria during the first observation and was subsequently allowed to independently administer the screening battery to student participants.

Data Collection Methods and Study Assessment Measures

Over a period of several one-on-one sessions, students with adequate scores on the Test of Word Reading Efficiency completed a battery of standardized assessments that included measures of: (a) reading comprehension; (b) general and advanced oral language skills that included semantics, syntax, multiple meanings, and inferencing; and (c) non-verbal and verbal problem solving abilities that included planning and deductive reasoning, predicting, inhibition, and cognitive flexibility. The assessment protocol was carefully selected based on the extant literature and the most salient skills necessary for text-level comprehension. The administration of the study assessment measures was counterbalanced in order to reduce the potential of order effects. The entire assessment process took approximately 3 ½ hours of direct student participation. Some students required more time than others to complete the non-timed assessments. To protect against stigmatization, at no time prior, during, or after the current study were student's performance on assessments revealed to them. Once each student had completed all of the assessments, their participation in the study was complete.

Assessment Measures

The assessment measures described in the current study were used to examine students' current level of ability across several components of oral language, problem solving, students' attitudes toward reading, and silent reading comprehension. The study assessment protocol was carefully constructed using subtests from commercially available assessments. The initial study assessment protocol was comprised of nine subtests (i.e., predictor variables) measuring components of syntax, semantics, lexical ambiguity, inferencing, problem solving, and students' attitudes toward recreational and academic

reading. One measure of silent reading comprehension was included as the outcome variable. A detailed description of each of the measures contained in the study assessment protocol follows.

Measure of Silent Reading Comprehension

The Woodcock Reading Mastery Test-Revised-Normative Update (WRMT-R/NU; Woodcock, 1998) was used to examine students' silent reading comprehension ability. Specifically, the *Passage Comprehension* subtest of the Woodcock Reading Mastery Test-Revised-Normative Update was used to assess a student's ability to read 68 short passages and identify key missing information by responding with a correct, one-word response. All students were presented with a sample item to introduce them to this cloze activity. The sample item included both a picture cue (i.e., picture of a cat playing with a ball) along with the accompanying sentence, "*The cat is playing with a* _____" wherein a correct response would be *ball*. Given the age range of the students, all participants began with the same suggested starting point, item twenty-nine. Presented with text-only items, students silently read four passages per page that gradually increased in sentence length and linguistic complexity. A ceiling was reached when a student made six or more consecutive errors that ended with the last item on a page. The raw score for each student was the total number of correct responses and was used in the data analyses as a measure of silent reading comprehension ability. The Woodcock Reading Mastery Test-Revised-Normative Update includes norms for students of all ages included in the study and has a split-half reliability for the Reading Comprehension cluster of .95.

Measures of General and Advanced Oral Language

The Clinical Evaluation of Language Fundamentals®-Fourth Edition (CELF®-4; Semel, Wiig, & Secord, 2003) is a standardized instrument used to assess children's core language skills including expressive language, receptive language, language content, and language memory. Three subtests from the Clinical Evaluation of Language Fundamentals®-Fourth Edition were administered: (a) *Concepts and Directions*; (b) *Recalling Sentences*; and (c) *Sentence Assembly.* These three subtests were selected from 11 possible subtests due to their linguistic relation to auditory processing, semantics, and syntax, which are essential general receptive language elements for text-level comprehension and academic achievement. Raw scores derived from each subtest were recorded and used in the analyses.

The *Concepts and Directions* (C&D) subtest is a measurement of syntax, metalinguistics, and memory. In this task, students are presented with a series of black and white pictures of common shapes and objects (i.e., circle, house). Students are required to point to each of the objects in response to oral directions; similar to the common child's game *Simon Says*. For example, the examiner may say, "point to the small shoe, the white house, and the big black fish. Go." The student is expected to point to each of the objects in the exact order as stated by the examiner. Raw scores (total number of correct responses) were calculated for each student.

Recalling Sentences (RS) requires students to imitate sentences of increasing length and complexity thereby assessing their memory, syntax, and metalinguistic ability. Each student was presented with a sentence read aloud by the examiner and asked to repeat, verbatim as much of each sentence as they could remember. Raw scores were calculated

based on the number of errors made during each item repetition ranging from three to zero. For instance, a sentence repeated without any error was awarded three points while a repetition that contained two-to-three errors was awarded one point. If a student participant scored two or more standard deviations below the mean on this assessment, procedures were implemented to rule out the possibility of a hearing deficit. Among the student participants, only two scored two or more standard deviations below the mean. A review of both students' records indicated a bilateral, passing score on a hearing screening conducted by the school-based, speech-language pathologist within three months of the time each students' assessment.

The *Sentence Assembly* (SA) subtest was chosen as a measure of semantics wherein students were orally and visually presented with series of non-ordered target words and required to produce two different, grammatically correct sentences. For example, students were read and shown the words, kitten, chair, is, and on the. The student was then expected to produce two different sentences such as "the kitten is on the chair" and "is the kitten on the chair" (Semel, Wiig, & Secord, 2003). Raw scores for each student were calculated based on the total number of correct responses.

The Test of Language Competence-Expanded Edition-Level 2 (TLC-E-2; Wiig & Secord, 1989) is a standardized assessment with moderate to strong reliability for subtests ranging from .59-.78. The Test of Language Competence-Expanded Edition-Level 2 is a measure of an individual's ability to understand and use advanced language forms (i.e., metalingustic competence) such as multiple meanings, inferences, complex sentence structures, and metaphors all of which are important to reading comprehension achievement. The Test of Language Competence-Expanded Edition-Level 2 is designed for older

elementary school children through young adulthood (9:0-18:11). Two core subtests of the Test of Language Competence-Expanded Edition-Level 2 were administered: *Ambiguous Sentences* (AS) and *Listening Comprehension: Making Inferences* (LC:MI). The *Ambiguous Sentences* subtest is devised to assess a student's ability to derive two different meanings from a linguistically vague statement such as "*Jane had a bad day when she broke her heel*." In this instance, the word *heel* holds two possible meanings: heel of a shoe or heel of a foot bone. Each sentence was read aloud by the examiner as well as provided in black and white text form. Students were required to provide two, different possible alternate meanings for each sentence. A raw score was calculated based on the number of errors per item. Students able to provide two different meanings were awarded three points, one meaning one point, and no or incorrect responses were assigned zero points.

The *Listening Comprehension: Making Inferences* subtest is a measure of a student's ability to draw inferences based upon limited, but key information. Each student was required to listen to a short passage read aloud by the examiner. After each passage was read aloud, the easel was turned to provide each student with the passage in text form along with four possible scenarios. Students were asked to select the two scenarios that provided the best explanation of what could have happened in each story. For example, each student was read aloud the following trial passage, "Mother was happy to have the turkey and all of the trimming in the house. The family was disappointed when they had to eat at a restaurant on Thanksgiving Day" (Wiig & Secord, 1989). In this instance, the two best choices were, "the mother got sick with the flu" and "mother burned the turkey by cooking it too long" whereas "most people think Thanksgiving dinner is always better at a restaurant" and "mother forgot to buy the turkey" were incorrect. A raw score was calculated based on the number of errors

per item. Two correct responses were awarded three points, a single correct response was given one point, and no or two incorrect responses were awarded zero points. Raw scores from each of these two subtests were used in the planned analyses.

Measures of Problem Solving

The Delis-Kaplan Executive Function System (D-KEFS™) is a relatively new standardized measurement of problem-solving appropriate for individuals between 8 and 89 years old (Delis, Kaplan, & Kramer, 2001). Through a variety of verbal and spatial tasks, the Delis-Kaplan Executive Function System measures problem-solving, inhibition, and cognitive flexibility. The Delis-Kaplan Executive Function System was standardized on a nationally representative sample of 1750 children, adolescents, and adults (Delis, Kaplan, & Kramer, 2001). Overall, the Delis-Kaplan Executive Function System demonstrates strong construct validity based on using subtests that are based on over 50 years of neuropsychological research (Delis, Kaplan, & Kramer, 2001). Reliability for most of the measures on the Delis-Kaplan Executive Function System are in the medium to high range with a few of the subtests falling within the low to medium range (Delis, Kaplan, & Kramer, 2001; Henry & Bettenay, 2010).

The Delis-Kaplan Executive Function System was selected due to its comprehensive inclusion of conventional problem solving measures (Anderson, 1998; Lyon & Krasnegor, 1996; Zelazo & Mueller, 2002) and flexibility of test administration (i.e. nonverbal and verbal measures). Student participants completed two subtests, the *Tower* and *Twenty Questions*. The *Tower* and *Twenty Questions* subtests were selected because they assess both non-verbal and verbal problem-solving ability and problem-solving skill both independent of language as well as mediated through language. Students completing the Delis-Kaplan

Executive Function System may be provided with visual cues (i.e., pictures, word and sentence level text), auditory cues (i.e., sentences read aloud), and in some instances tactile cues during the two subtests. For instance, the *Tower Test* requires students to produce a pre-determined block tower pattern with one spatial cue (the initial placement of blocks is done by the examiner), one visual cue (the end position is pictured) and two verbal rules: (a) only one block can be moved at a time and (b) a larger block cannot be placed on top of a smaller block. The students are asked to move their tower from the initial position to the pictured end position in as few moves as possible and without violating the rules. Materials for this task include a wooden board with three vertically positioned, equally spaced pegs and five wooden oval-shaped blocks with holes in the center to allow for placement on the pegs. The blocks are sized in a hierarchical manner (similar to a child's stacking toy). Tasks range from low-to-high levels of complexity such as using only two blocks in relation to using all five (Delis, Kaplan, & Kramer, 2001).

The *Twenty Questions* subtest was used as a measure of language-loaded problem solving. Unlike the Tower subtest, this subtest required students to use their overt language skills in addition to problem solving to guess which object the examiner picked from a selection of 30, two-dimensional colored drawings of objects. For each of the four trials, students were asked to make thoughtful, guesses as to which object was chosen by the examiner. Students were given the opportunity to ask up to 20 questions per trial and the examiner was allowed to answer each question with only a *yes* or *no* response. For example, if a student asked the question "is it the elephant" the examiner could respond with a yes or no, but if the student asked "is it the elephant or the monkey" the examiner could not respond and would have to remind the student to ask a question that could be answered with either a

yes or no. A total raw score for this subtest was calculated by adding up the four weighted achievement scores for each trial. Raw performance scores on both the *TOWER* and the *Twenty Questions* subtests were used in the analyses.

Measure of Students' Attitudes toward Reading

The Elementary Reading Attitude Survey (McKenna & Kear, 1990) was administered during the first session of the study as a reliable assessment of students' attitudes towards recreational and academic reading. The battery of assessments used in the second session of the study resulted in nine predictor variables (see Table 3.4). Student's scores on the Woodcock Reading Mastery Test-Revised-Normative Update *Passage Comprehension* subtest served as the dependent or outcome variable for all analyses. Scores on select subtests of lower and higher level receptive language (five), problem solving measures (two), and motivation (two) represent the predictor or independent variables (see Table 3.4).

Table 3.4
Research Assessment Protocol

Component Area	Assessment	Subtests
Silent Reading Comprehension	WRMT-R/NU	Passage Comprehension
General Oral Language	CELF®-4	Concepts and Directions Recalling Sentences Sentence Assembly
Advanced Oral Language	TLC-E-Level 2	Ambiguous Sentences Listening Comprehension: Making Inferences
Problem Solving	D-KEFS™	Twenty Questions Tower
Students' Reading Attitudes	ERAS	Recreational Reading Attitudes Academic Reading Attitudes

Planned Data Analyses

Several separate analyses were conducted to address each of the four hypotheses driving this research. A first-order analyses were conducted to ensure that assumptions were met for the planned application of simple correlational analyses including screening the data (i.e., missing data, outliers) and evaluating the assumptions of parametric data including normality of the sampling distributions, homogeneity of variance-covariance matrices, and mutlicollinearity (Field, 2005). In addition, a Pearson correlation matrix was created to evaluate the strengths of the relationships between each pair of the predictor or independent variables (i.e., scores on oral language, problem solving, and reading attitude measure). Observation of a high correlation coefficient ($r \geq .8$) (Salkind, 2004) between two predictor variables indicated measurement of a common construct and warranted removal of one of the independent variables from the original data set or reduction of the data by combining two or more predictor variables into a single variable. The resulting data was analyzed using correlation analyses in order to determine the relationship between reading comprehension and the three component areas. Each student's raw score on the WRMT-R/NU *Passage Comprehension* subtest was used as the outcome variable across all planned correlation analyses. Raw scores on the subtests of general and advanced oral language (five), problem solving measures (two), and reading attitudes (two) represent the nine predictor variables. Correlation analyses was conducted for each predictor variable to determine if a relationship exists with reading comprehension ability.

Correlation

To test the first hypothesis that there would be a significant correlation between

general and advanced receptive language and reading comprehension ability, raw scores on the *Recalling Sentences, Concepts and Directions,* and *Sentence Assembly* subtests from the Clinical Evaluation of Language Fundamentals-Fourth Edition and *Ambiguous Sentences and Making Inferences* from the Test of Language Competence-Level 2 were used. Correlation analyses were conducted for each of the five oral language measures to determine if there was a significant relationship with reading comprehension ability.

To test the hypothesis that there would be a significant correlation between problem solving and reading comprehension ability, the *Tower* and *Twenty Questions* subtests from the Delis-Kaplan Executive Function System were used. Correlation analyses were conducted for each of the two problem solving measures to determine if there was a significant relationship with reading comprehension ability.

To test the hypothesis that there would be a significant correlation between reading attitudes and reading comprehension ability, raw scores obtained by combining scores from students' attitudes toward recreational and academic reading on the Elementary Reading Attitude Survey were used. A correlation analysis was conducted for the single measure of reading attitude to determine if there was a significant relationship with reading comprehension ability.

Multiple Linear Regression

Multiple regression analyses were used to test hypothesis four which stated that the correlation between reading comprehension ability and a linear combination of oral language, problem solving, and reading attitudes will be stronger than the correlation between reading comprehension and any of the individual components. The dependent or outcome variable was each student's score on the Woodcock Reading Mastery Test-Revised-Normative

Update *Passage Comprehension* subtest and the independent variables were scores from select measures of component skills (general and advanced oral language, problem solving, and reading attitudes). To ensure that assumptions were met for the use of multiple regression analyses, the data was evaluated for all assumptions including the existence of a linear relationship, normality of the sampling distributions, homogeneity of variance-covariance matrices, and mutlicollinearity (Field, 2005). The subset of predictor variables indicated by the analysis to validate independency was used in the multiple regression analyses. Multiple linear regression provided computation of the multiple correlation (R) which indicated how well the combined independent variables predicted reading comprehension ability. The relative strength of each predictor was analyzed using the standardized coefficients reported by IBM® SPSS 18.0.

Inter-Rater Reliability

A third-year doctoral student volunteered to assist with secondary scoring. The volunteer was also a licensed speech-language pathologist with over 5 years of professional experience working with students with language deficits and disorders in Title I elementary schools. Prior to a check of inter-rater reliability, a meeting was held between the primary investigator and the volunteer to discuss assessments, scoring protocols, and documentation procedures. After all assessments had been completed, inter-rater reliability was determined using point-to-point between two raters on a random selection of 10% of all assessments. The volunteer rater randomly selected six participant files, two from each grade, for review. Reliability was calculated by dividing the number of agreements between raters by the total number of agreements and disagreements, then multiplying by 100. The point-to-point agreement was 96.7%. Discrepancies were resolved by discussion and consensus.

Summary

The current study used a multivariate, single group design to examine the existence and strength of relationships between individual components of oral language, problem solving, and attitudes toward reading and silent reading comprehension ability in a group of young adolescents. Further, this study sought to determine the relationship between reading comprehension and a linear combination of the component skills to assess their combined effect in predicting reading comprehension ability. In order to accomplish these goals, a carefully devised battery of assessments was constructed to examine students' abilities in the following components in relation to silent reading comprehension: semantics, syntax, lexical ambiguity, inferencing, planning, and students' attitudes toward reading. In all, the student participants completed an assessment battery comprised of nine components (i.e., predictor variables) and one measure of silent reading comprehension (i.e., outcome variable). Using a series of correlation and multiple regression analyses, four central hypotheses were tested.

CHAPTER 4

Results

The purpose of this investigation was to determine the unique and combined contribution of oral language, problem solving, and reading attitudes to silent reading comprehension ability in a group of young adolescents. A cross-sectional design was used to assess sixty students, between the ages of 10 and 14 years, on measures of oral language, problem solving, reading attitudes, and reading comprehension. Multiple data analyses were conducted using IBM® SPSS 18.0 for Windows to test the four central hypotheses of this investigation. The results are described in the following sections with reference to each hypothesis. All analyses were conducted with an alpha level of .05.

Students' raw scores on all measures were used in the planned correlation and regression analyses. The decision to use raw scores instead of standard scores was based on the following rationale: (a) forty students were above the chronological age range for the Clinical Evaluation of Language Fundamentals-Fourth Edition *Concepts and Following Directions* subtest thus "raw scores couldn't be translated to age-appropriate standard scores or percentile ranks" (Semel, Wigg, & Secord, 2003, pg. 13) and (b) the Elementary Reading Attitudes Survey does not provide normative data (i.e., percentile ranks) for students beyond sixth grade (McKenna & Kear, 1990; McKenna, Kear, & Ellsworth, 1995). Output is provided in those instances where raw scores could be translated to standardized or normative scores for purposes of comparison to the larger population.

Descriptive Statistics

A global screening of the data was initially performed by examining the univariate descriptive statistics output shown in Table 4.1. The purpose for this initial screening was to observe for reasonable means, standard deviations, maximums, and minimums. None of the data appeared to be significantly different or skewed.

Table 4.1
Descriptive Statistics for General and Advanced Oral Language, Problem Solving, and Reading Attitudes for Student Participants in Grades 6-8

Measure	Mean and *SD*	Minimum	Maximum
CELF-4-Concepts & Following Directions	49.38(3.92)	34	54
CELF-4-Recalling Sentences	71.88(11.38)	44	90
CELF-4-Sentence Assembly	12.37(3.96)	2	19
TLC-E-Ambiguous Sentences	23.97(8.38)	7	39
TLC-E-Listening Comprehension: Making Inferences	28.50(4.16)	15	36
D-KEFS-Twenty Questions	14.13(2.29)	8	19
D-KEFS-Tower	16.45(3.31)	9	29
ERAS-Recreational Reading	28.22(5.87)	16	40
ERAS-Academic Reading	28.08(5.79)	11	40
WRMT-R/NU-Passage Comprehension	45.00(8.24)	29	65

Note. Standard deviations are in parentheses.

Next, histograms and box plots for the variables were reviewed to assess for shape of distributions and any noteworthy breaks in the continuity of the data (see Appendix A). In general, the review of the histograms for all measures showed distributions that were approximately normal or bell-shaped. The histogram for the CELF-4 *Concepts and*

Following Directions however, was noted to be negatively skewed, which is most likely due to the number of data points at the upper end or maximum value of sixty-five. In other words, a large number of the students performed well on this measure and scored towards the upper end or limit; a finding not surprising given that most students were above the target age range for this subtest.

A small number of outliers were identified in a review of the boxplots. Individual inspection of each of the outliers revealed that they were not due to incorrect data entry, missing data, or data collected from outside of the sample population. Instead, the outliers (i.e., individual students' performance on specific measures) appeared to be related to student characteristics. For example, analyses of all outliers revealed that outliers with an extreme high value were obtained by individual students identified as academically gifted while outliers with an extreme low value were achieved by students identified with special needs including ADHD and Language-Learning Disability. Given that the intent of this investigation was to capture a range of student abilities similar to those found in the greater population, the outliers were retained in subsequent data analyses.

Prior to conducting all planned analyses, a check for multicollinearity using bivariate correlations and tolerance values was conducted to assess for the presence of a strong correlation or relationship between two or more predictor variables. A strong relationship between predictor variables could suggest that measures used in the study are too similar or redundant (e.g., measurement of the same construct) thus warranting removal of one or more predictor variables from the data set. As a general rule, an r value of .90 or above is an indicator of multicollinearity (Field, 2005). As shown in Table 4.2, the regression matrix confirmed that none of the r values between the predictor variables exceeded a value of .676.

Table 4.2
Correlations Among Measures of General and Advanced Oral Language, Problem Solving, and Reading Attitudes

	CELF-CD	CELF-RS	CELF-SA	TLC-E-AS	TLC-E-LC:MI	D-KEFS-20	D-KEFS-Tower	ERAS-REC	ERAS-AC
CELF-CD	__	.511	.487	.483	.517	.261	.286	.173	.219
CELF-RS		__	.480	.518	.515	.088	.233	.229	.235
CELF-SA			__	.427	.600	.292	.271	.306	.277
TLC-E-AS				__	.601	.253	.309	.439	.220
TLC-E-LC:MI					__	.197	.214	.230	.166
D-KEFS-20						__	.254	.176	.099
D-KEFS-Tower							__	.110	-.041
ERAS-REC								__	.676
ERAS-AC									__

Note. CELF-4-CD, Clinical Evaluation of Language Fundamentals-Fourth Edition, *Concepts & Directions*; CELF-4-RS, Clinical Evaluation of Language Fundamentals-Fourth Edition, *Recalling Sentences*; CELF-4-SA, Clinical Evaluation of Language Fundamentals-Fourth Edition, *Sentence Assembly*; TLC-E-L2-AS, Test of Language Competence: Expanded Level Two, *Ambiguous Sentences*; TLC-E-2-LC:MI, Test of Language Competence: Expanded, Level Two, *Listening Comprehension: Making Inferences*; D-KEFS-20, Delis-Kaplan Executive Function System, *Twenty Questions*; D-KEFS-Tower, Delis-Kaplan Executive Function System, Tower; ERAS-REC, Elementary Reading Attitude Survey-*Recreational*; ERAS-AC, Elementary Reading Attitude Survey-*Academic*.

While none of the r values violated the strict assumption of non-collinearity, the presence of low-to-moderate levels of correlation between some of the predictor variables is the basis for a reduction in the predictor variable set which will be discussed later in this chapter.

As a final step, standardized sample means on advanced oral language and problem solving measures were examined to provide a comparison with the larger population. As can be seen in Table 4.3, the subtest scaled scores for the sample group is no more than .43 standard deviations from the population mean (Mean=10, SD=3) for each of the subtests. Results indicate that the sample population closely resembles the larger populations.

Table 4.3
Descriptive Statistics for Normalized Subtest Scores on Measures of Advanced Oral Language and Problem Solving for Student Participants in Grades 6-8

Measure	Sample Mean	Sample Standard Deviation	Sample Standard Deviations from Population Mean
TLC-E-Ambiguous Sentences	9.20	4.591	-.174
TLC-E-Listening Comprehension: Making Inferences	8.63	3.199	-.428
D-KEFS-Twenty Questions	10.42	2.331	+.180
D-KEFS-Tower	10.13	2.432	+.053

Note. TLC-E-AS, Test of Language Competence: Expanded, Level Two, *Ambiguous Sentences*; TLC-E-AS, Test of Language Competence: Expanded, Level Two, *Listening Comprehension: Making Inferences*; D-KEFS-20, Delis-Kaplan Executive Function System, *Twenty Questions*; D-KEFS-Tower, Delis-Kaplan Executive Function System, Tower

Correlation Analyses

A primary aim of this investigation was to examine the strength of the relationship between each of the nine predictor variables and silent reading comprehension. To accomplish this aim, Pearson product moment correlations were conducted. All Pearson product moment correlations were based on the combined performance of the sixty students in grades six through eight. Weak-to-strong, positive correlations were found between each

of the nine predictor variables (oral language, problem solving, and reading attitudes) and silent reading comprehension ranging in value from r=.29 to r=.73, p=<.05. Results for each of the planned correlation analyses will follow in relation to the first three research hypotheses.

Research Hypothesis One. The first research hypothesis predicted that there would be a significant correlation between aspects of general and advanced oral language and silent reading comprehension. As shown in Table 4.4, the three measures of general oral language showed moderate-to-strong, significant and positive correlations to silent reading comprehension. Both measures of advanced oral language were strongly correlated with students' silent reading comprehension. The results for both of the advanced oral language measures indicate that students who performed higher on measures assessing their ability to decipher ambiguous lexicon and generate inferences showed stronger silent reading comprehension skills.

Research Hypothesis Two. The second research hypothesis predicted that there would be a significant correlation between aspects of problem solving and silent reading comprehension. The results of the correlation analyses (see Table 4.5) indicated that the D-KEFS Tower was more strongly correlated with silent reading comprehension (r=.379, p=.003) than the D-KEFS-20 Questions (r=.292, p=.024). Although the D-KEFS Tower had a relatively low-to-moderate correlation to silent reading comprehension, its low correlation with other predictor variables suggests that it makes a unique contribution to silent reading comprehension.

Table 4.4
Correlations of General and Advanced Oral Language Measures to Silent Reading Comprehension

Measure	Pearson Correlation Coefficient
CELF-Concepts & Following Directions	.475***
CELF-Recalling Sentences	.618***
CELF-Sentence Assembly	.598***
TLC-E-Ambiguous Sentences	.733***
TLC-E-Listening Comprehension: Making Inferences	.710***

*** p<.001.

Table 4.5
Correlations of Problem Solving Measures to Silent Reading Comprehension

Measure	Pearson Correlation Coefficient
DKEFS-Twenty Questions	.292*
DKEFS-Tower	.379**

* p<.05. ** p<.01.

Research Hypothesis Three. The third research hypothesis predicted that there would be a significant correlation between students' attitudes toward reading and silent reading comprehension. Students' attitudes towards reading both for academic and recreational purposes were both moderately correlated to silent reading comprehension (see Table 4.6). Students' results for recreational reading however, demonstrated a stronger correlation to silent reading comprehension (r=.478, p<.001) than did their results for academic reading (r=.353, p=.006). These results suggest that students' positive view toward reading for

recreational purpose may be a better indicator of their reading comprehension skill than their attitude toward reading in school.

Table 4.6
Correlations of Students' Attitudes Toward Reading to Silent Reading Comprehension

Measure	Pearson Correlation Coefficient
ERAS-Recreational Reading	.478***
ERAS-Academic Reading	.353**

** p<.01. *** p<.001.

Summary of Correlation Analyses

In summary, the results of the correlation analyses indicated that components of advanced oral language, ambiguous lexicon and inferencing have the strongest relationship with silent reading comprehension ability. The strength of the relationships between the remaining component skills and silent reading comprehension ranging from strongest to lowest were general oral language, reading attitudes, and problem solving. While the problem solving measures have the lowest correlation to silent reading comprehension, they are also weakly correlated with the other predictor variables (r<=.309). This finding suggests a unique contribution of problem solving to silent reading comprehension that was later confirmed in the multiple linear regression analyses.

Multiple Regression Analyses

The final research hypothesis predicted that the correlation between reading comprehension ability and a linear combination of oral language, problem solving, and reading attitudes would be stronger than the correlation between reading comprehension and any of the individual components. To address this hypothesis, multiple regression analyses

were used to examine a linear combination of the predictor variables that would best predict silent reading comprehension.

As an initial step in the multiple regression analyses, a full model containing all nine predictor variables was constructed. As shown in Table 4.7, the full model resulted in an equation that strongly predicted silent reading comprehension (R=.87, p<.001). This correlation coefficient exceeded the highest correlation coefficient of reading comprehension to an individual component (i.e., Test of Language Competence-Expanded: Level 2, *Ambiguous Sentences*, r=.733).

Table 4.7
Multiple Regression for Full, Nine-Variable Model

R	R Square	Adjusted R Square	Std. Error of the Estimate
.870(a)	.757	.713	4.414

a Predictors: (Constant), DKEFS_Twr, ERAS_AC, TLC-E-2_LC:MI, DKEFS_20, CELF-4_RS, CELF-4_CnD, CELF-4_SA, TLC-E-2_AS, ERAS_REC

Collectively, the combination of all nine predictor variables accounted for a significant portion of the variance in students' silent reading comprehension, R^2=.757, F=(9, 50) =17.288, p<.001. These results indicate that 76% of the variance in students' silent reading comprehension can be explained by the linear combination of all nine measures of general and advanced oral language, problem solving, and reading attitudes. The t-statistics and p-values in the full model suggests that TLC-E-2-Listening Comprehension: Making Inferences (t=3.144, p<.003), TLC-E-2-Ambiguous Sentences (t=2.865, p<.006), and CELF-4-Recalling Sentences (t=2.227, p<.030) are the strongest contributors to the variance in silent reading comprehension (see Table 4.8).

Table 4.8

Predictor Characteristics for Multiple Linear Regression using the Full, Nine-Variable Model

Measure	Standardized Coefficient (Beta)	t	Sig.
CELF-CD	-.090	-.971	.336
CELF-RS	.205	2.227	.030
CELF-SA	.103	1.065	.292
TLC-E-AS	.299	2.865	.006
TLC-E-LC:MI	.324	3.144	.003
DKEFS-20	.061	.806	.424
DKEFS-Tower	.143	1.845	.071
ERAS-REC	.119	1.113	.271
ERAS-AC	.096	.953	.345

As a next step, the full model was examined to identify and eliminate those predictor variables that showed the weakest contribution to the multiple linear regression in order to maximize the predictive power of the equation while minimizing the number of predictor variables. By process of elimination, predictor variables that had the least effect on the model, as indicated by highest alpha level, were removed for each regression analysis. The elimination process was stopped at the five variable model as the largest significance or alpha level for contributing predictor variables had reached alpha of p=.051. Table 4.9 shows the eliminated predictor variable and corresponding alpha levels for each iteration.

Table 4.9

Results of Elimination Process used for Removing Predictor Variables in the Multiple Linear Regression Analyses

Number of Predictor Variables	Predictor Eliminated	Significance (α) of eliminated predictor	Highest α (Lowest model contribution) of Remaining Predictors	Remaining Predictors
9			.424	CELF-4-CD, CELF-4-RS, CELF-4-SA TLC-E-2, AS; TLC-E-2, LC:MI D-KEFS-Twenty Questions; D-KEFS-Tower ERAS-Recreational; ERAS-Academic
8	D-KEFS-Twenty Questions	.424	.347	CELF-4-CD, CELF-4-RS, CELF-4-SA TLC-E-2, AS; TLC-E-2, LC:MI D-KEFS-Tower ERAS-Recreational; ERAS-Academic
7	ERAS-Academic	.347	.471	CELF-4-CD, CELF-4-RS, CELF-4-SA TLC-E-2, AS; TLC-E-2, LC:MI D-KEFS-Tower ERAS-Recreational
6	CELF-4-CD	.471	.238	CELF-4-RS, CELF-4-SA TLC-E-AS; TLC-E-2, LC:MI D-KEFS-Tower ERAS-Recreational
5	CELF-4-SA	.238	.051	CELF-4-RS TLC-E-AS; TLC-E-2, LC:MI D-KEFS-Tower ERAS-Recreational

In total, five multiple linear regressions were conducted with nine, eight, seven, six, and five predictor variables.

As shown in Table 4.10, the five variable model resulted in an equation that strongly predicted silent reading comprehension (R=.86, p<.001). The results of the fifth and final regression analysis accounted for a significant portion of the variance in silent reading comprehension, R^2=.740, F(5, 54) = 30.729, p<.001 and is presented as an equation for prediction of silent reading comprehension:

WRMT-R-PC = -7.043 + .711*TLC-E-_LC:MI + .365*DKEFS-Tower
+ .300*ERAS-REC + .264*TLC-E-AS + .153*CELF-4-RS

Table 4.10
Summary of Model using Five Predictor Variables

R	R Square	Adjusted R Square	Std. Error of the Estimate
.860(a)	.740	.716	4.392

a Predictors: (Constant), DKEFS_TWR_TLC-E_LC:MI_CELF-4_RS, TLC-E_AS ERAS_REC

A scatter plot showing the relationship between measured values of silent reading comprehension and model predicted values is shown in Figure 1. The data is homoscedastic as there is a uniform dispersion of the data points about the regression line. A computation of descriptive statistics for the difference between students predicted and measured values of silent reading comprehension showed a mean difference of .0151 and a maximum of 10.88 for the sample of 60 students.

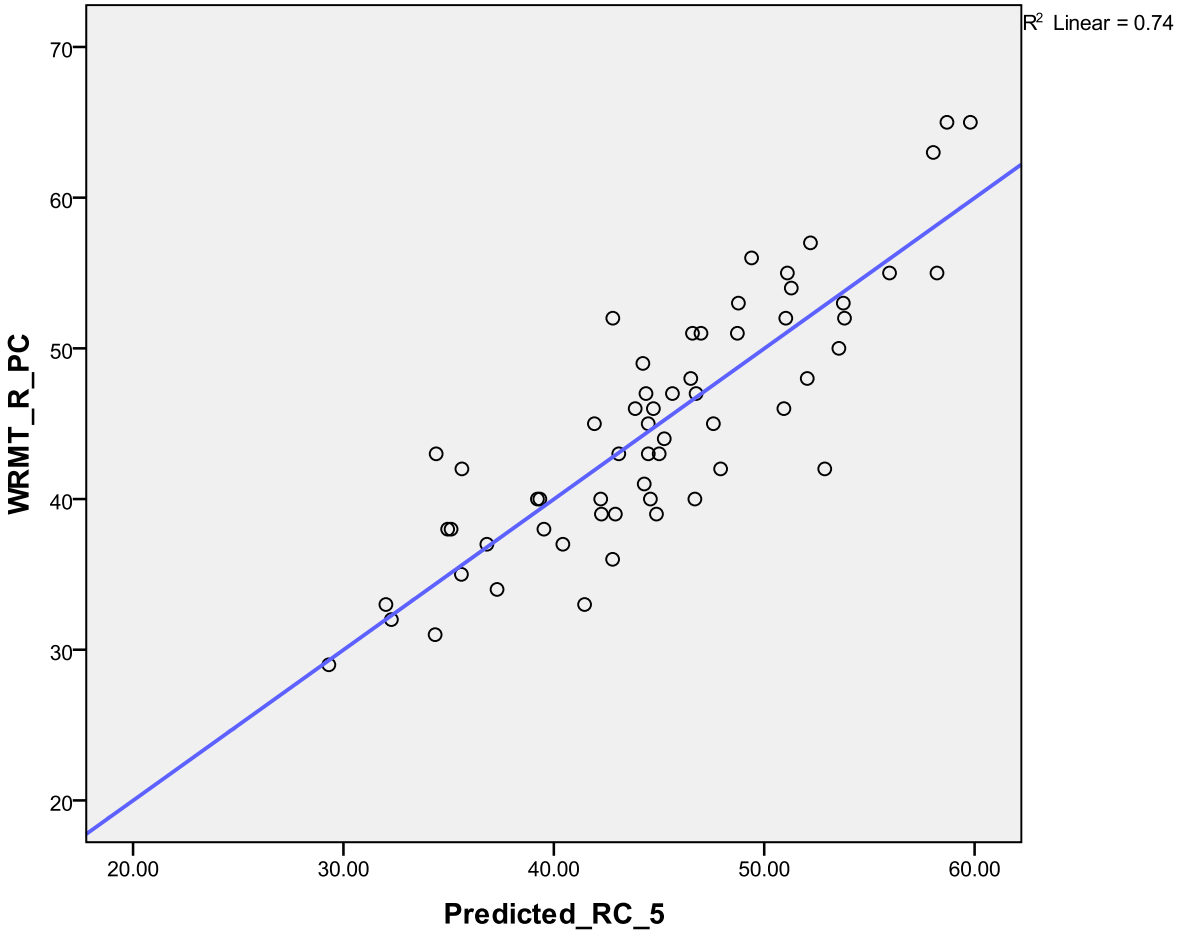


Figure 4.1. Relationship Between Measured Values of Silent Reading Comprehension and Final Model Predicted Values

A one-way multiple analyses of variance (MANOVA) by grade was performed on the five predictors shown in last row of Table 4.9. None of the five predictors showed significant differences by grade for the sample population, hence a linear combination of the five predictors does not demonstrate significance by grade. Results of the MANOVA are shown in Table 4.11.

Table 4.11
Summary of One-Way MANOVA by Grade

Predictor Variable	F	Significance
CELF-4-Recalling Sentences	.132	.877
TLC-E: Ambiguous Sentences	.816	.447
TLC-E: Listening Comprehension: Making Inferences	1.536	.224
D-KEFS-Tower	.138	.872
ERAS-Recreational Reading	.817	.447

Summary of Multiple Regression Analyses

Multiple regression analyses were used to examine which combination of predictor variables best explained the variance in silent reading comprehension. Although the first regression model containing all nine predictor variables accounted for 76% of the variance in students' silent reading comprehension, a model containing five predictor variables accounted for 74% of the variance. The results of the multiple regression analyses suggest that a sufficient and parsimonious model for predicting silent reading comprehension ability among young adolescents includes using the five-variable model with the Clinical Evaluation of Language Fundamentals-Fourth Edition, Recalling Sentences; Test of Language Competence-Expanded: Level 2, Ambiguous Sentences and Making Inferences; Delis-Kaplan Executive Function System, Tower; and Elementary Reading Attitude Survey, Recreational.

Summary

The findings from analyses employed in this study indicate that silent reading comprehension ability shares a significant relationship to several component areas of oral language, problem solving, and students' attitudes towards reading. As an initial step, correlation analyses were conducted to determine the extent and strength of the relationship between each of the component areas and silent reading comprehension. Measures of advanced oral language, specifically ambiguous lexicon and inferencing, shared the strongest relationship with silent reading comprehension. In addition, component areas including syntax, planning, and recreational reading attitudes also shared significant, positive relationships with silent reading comprehension ability.

Additional analyses were conducted to determine the ability of a linear combination of component skills to predict silent reading comprehension. The results of the multiple linear regression analyses indicated that although a nine variable model accounted for the largest amount of variance in silent reading comprehension ability (76%), a five variable model still accounted for 74% of the variance in silent reading comprehension. Thus, the five variable model that includes the specified measures of ambiguous lexicon, inferencing, syntax, planning, and attitudes towards recreational reading was positively correlated and significantly predictive of silent reading comprehension ability.

As a final step, the linear equation for the five variable model was plotted against the measured values for silent reading comprehension equation for prediction of silent reading comprehension. The results of this comparison confirm that the five variable prediction model demonstrates a strong, positive correlation with measured silent reading comprehension scores.

CHAPTER 5

Discussion

The purpose of this study was to determine the unique contribution of components of oral language, problem solving, and reading attitudes to silent reading comprehension ability in a group of young adolescents. The first goal of this study was to determine the extent and strength of individual relationships between each of the nine components of oral language, problem solving, and reading attitudes and reading comprehension ability. In all, nine components or predictor variables were selected as part of the study assessment protocol. As hypothesized, results from a series of correlation analyses revealed significant relationships between each of the components and silent reading comprehension ability. The second goal of this study was to examine the relationship between a linear combination of components and reading comprehension ability in order to determine their combined effect in predicting reading comprehension ability. Multiple linear regression analyses confirmed that a linear combination of five specific components of oral language, problem solving, and reading attitudes strongly predicted silent reading comprehension performance and suggest that successful reading comprehension requires a combination of skills and understandings. A detailed account and interpretation of the findings are discussed in relation to previous research and in the context of the Whole-to-Part model of silent reading (Cunningham, 1993).

Oral Language and Silent Reading Comprehension

Oral language is a collection of expressive and receptive abilities involving the five primary domains of language including phonology, semantics, morphology, syntax, and pragmatics (Catts & Kamhi, 2005). Since many young adolescents have acquired the word identification and phonics skills necessary to successfully read primary grade texts, the focus of this study was to assess the contribution of components of language outside the domain of phonology. Three measures of general oral language were used to determine the contribution of syntax and semantics to silent reading comprehension ability. Within the current sample, syntax held the strongest relationship to silent reading comprehension as evidenced by students' performance on the *Recalling Sentences* subtest from the Clinical Evaluation of Language Fundamentals-Fourth Edition (Semel, Wiig, & Secord, 2003). The *Recalling Sentences* subtest required examinees to repeat, verbatim, sentences of increasing length and syntactic complexity. One purpose of the assessment is to examine students' knowledge of syntax and experience with using this knowledge to accurately reproduce word order and sentence structure and sentence level coherence. Despite being a spoken test of syntax, it may be that the *Recalling Sentences* task replicated, to a varying degree, the forms and levels of syntax that are found in the written texts encountered by young adolescents.. It may also be that the need to retain the sentence for recall in working verbal memory added a component to the *Recalling Sentences* task that links it more directly to silent reading comprehension than other measures of syntax. Evidence supporting each of these possibilities individually or in combination is found in the students' performance on the *Concepts and Directions* subtest (Semel, Wiig, & Secord, 2003), the other measure of syntax included in the assessment protocol. The majority of the students did very well on the

Concepts and Directions subtest regardless of their silent reading comprehension level. This measure of less sophisticated forms of syntax such as temporal and spatial order does not reflect the types of written text structures encountered by adolescents nor does it require the same use of verbal working memory as the *Recalling Sentences* subtest. This may explain why it did not predict silent reading comprehension ability. The current investigation does not allow us to determine which aspects of the *Recalling Sentences* subtest contribute to its relationship to silent reading comprehension, but it is clear that the skills involved in being successful with *Recalling Sentences* are highly related to successful silent reading comprehension.

While the current study does not tell us why the *Recalling Sentences* subtest relates significantly to silent reading comprehension, it does lend support to Cunningham's (1993) assertion in the WTP model that language comprehension, including syntax, has an essential role in successful, silent reading. It may be that for young adolescents, syntax shares an increasingly important relationship to silent reading comprehension because successful, silent reading comprehension is highly dependent on the ability to independently recognize, comprehend, and respond to multiple text forms. Young adolescents are introduced to a multitude of text forms that are laden with discipline-specific, sophisticated forms of text structure that require knowledge of syntax for successful integration of information across content areas. As such, the results obtained from the current study support the need to consider knowledge of sophisticated forms of syntax when considering the underlying components related to successful, silent reading comprehension.

Existing research has also identified significant relationships between advanced components of oral language such as lexical ambiguity (Nippold, Cuyler, & Braunbeck-

Price, 1988) and inferencing (Botting & Adams, 2005; Cain, Oakhill, & Bryan, 2004; Cain, Oakhill, & Lemmon, 2004) and silent reading comprehension among differing populations of adolescents. The ability to decipher double meanings within words, phrases, or sentences and generate plausible inferences for inexplicit or missing information is critical to young adolescents' ability to acquire multiple levels of silent reading comprehension. Therefore, a measure of advanced forms of oral language was included in the study assessment protocol. The importance of its inclusion is supported by the findings. Both lexical ambiguity and inferencing had stronger relationships to silent reading comprehension than any of the other of the predictor variables. One possible explanation for the strong relationship found between advanced oral language and silent reading comprehension is that young adolescents, in contrast to primary grade students, are expected to acquire a large amount of new content within a given discipline (i.e., content-areas) through reading (McKenna & Robinson, 1990). Content-area discourse and written texts introduce young adolescents to a large number of novel, complex, and highly sophisticated forms of oral language (Unsworth, 1999), which require readers to handle lexical ambiguity and make many inferences. As confirmed by the current study, adolescents who are unsuccessful in meeting these demands are not successful in reading with comprehension.

The shared relationship between advanced oral language forms and silent reading comprehension found in the current study provides further support for the WTP model and its inclusion of knowledge of the world and knowledge of text structures as important constructs that contribute to silent reading comprehension ability. The findings from the current study suggest that advanced oral language forms such as lexical ambiguity and inferencing are important for us to consider as important components of successful, silent reading

comprehension for adolescents.

Problem Solving and Silent Reading Comprehension

The ability to read with comprehension depends on the use of problem solving processes, such as purposeful planning, prior to, during, and after reading (Palincsar & Brown, 1984; Pressley et al., 1992). Effective planning can support strategic and organized problem solving, assist in appropriate goal setting, and encourage online monitoring of silent reading comprehension. Planning ability is an essential underlying tenet of widely used forms of comprehension instruction (Baumann, Seifert-Kessell, & Jones, 1992, Ogle, 1992; Palincsar & Brown, 1984; Pressley, et al., 1992), yet there is little evidence of a relationship between planning ability and silent reading comprehension. Two separate measures of planning were used in the current study to determine the contribution of both basic and complex forms of planning ability to silent reading comprehension ability. In the current study, a moderate relationship was found between a measure of planning and silent reading comprehension. Specifically, students' performance on the *Tower* subtest (Delis-Kaplan Executive Function System; Delis, Kaplan, & Kramer, 2001) shared a significant and unique relationship with silent reading comprehension ability; however, no significant relationship was found between the *Twenty Questions* subtest and silent reading comprehension ability. While this finding confirmed the hypothesis that there is a significant relationship between planning and silent reading comprehension ability, it was somewhat unexpected that students' performance on the nonverbal, base measure of planning ability, the *Tower,* held a stronger relationship to silent reading comprehension (r=.379) than *Twenty Questions* which was believed to be the more complex, linguistic measure of planning (r=.292). One possible explanation for this finding is that the *Tower* subtest (Delis, Kaplan, & Kramer, 2001) may

more effectively capture the on-line forms of logical problem solving that are required during silent reading comprehension.

From the perspective of the WTP model of silent reading comprehension (Cunningham, 1993), planning is likely related to both language comprehension and print processing. It is related to language comprehension in that successful planning relative to a text requires the reader to draw upon existing knowledge of the world and knowledge of the structure of the text at hand to effectively set goals, solve problems, and monitor comprehension. It is related to print processing in that inner speech is required to support monitoring during silent reading. Although the *Tower* subtest is recognized as a basic measure of non-verbal problem solving, it is possible that it was more closely related to silent reading comprehension ability because it requires more of these components than the *Twenty Questions* subtest. The results of the current study provide evidence for the inclusion of a measure of planning ability in a multicomponent assessment of young adolescents' silent reading comprehension ability.

Reading Attitudes and Silent Reading Comprehension

The attitudes young adolescents have toward reading have long been of interest to researchers concerned with the contribution of affective influences to successful, silent reading comprehension. Existing research suggests that success with silent reading comprehension not only requires the contribution of skill-based components such as oral language and problem solving, but also bidirectional, affective influences such as students' attitudes towards reading (McKenna, 2001). One alarming trend found within the literature is the decrease in students' positive attitudes toward reading and the continuing decline as grade levels rise (see, e.g., McKenna, Kear, & Ellsworth, 1995). Existing research also

indicates that there are gender and ability differences associated with adolescents' attitudes toward reading (McKenna, Kear, & Ellsworth, 1995, MacMillan et al., 1992).

A prominent reason for interest in young adolescents' attitudes toward reading is the significant relationship that exists between the amount of students' reading experiences and academic achievement (Wigfield & Guthrie, 1997). If successful reading comprehension is one of the prevailing factors driving academic achievement in middle school, and reading attitudes and achievement share a significant relationship, it stands to reason that the assessment of reading attitudes is critical to the understanding of the underlying components associated with reading achievement. Broad assessments of reading comprehension, however, do not typically include measures of reading attitudes nor are they equally accounted for in reading instruction and intervention programs. For these reasons, a measure of reading attitudes was included in the study assessment protocol to determine the relationship between students' attitudes toward academic and recreational forms of reading.

The current study supports the existing research, at least in part, because students' attitudes toward reading, both for recreational and academic purposes, were positively and significantly related to silent reading comprehension. Further, the stronger relationship found between recreational reading and silent reading comprehension ability than academic reading is consistent with existing research (Lazarus and Callahan, 2000; Worrell, Roth, & Babelko, 2007). However, contrary to existing research (McKenna, Kear, & Ellsworth, 1995) no gender or grade level differences were found in the current study. It is possible that no grade level differences were detected because the sample of 20 students in each grade level was inadequate to detect the moderate differences that were found in prior research (McKenna, Kear, & Ellsworth, 1995). A minimum of 33 students at each grade level would

have been required to detect grade level differences in the current study given a large effect (f^2=.35), an alpha of .05, and power of .80.

The size of the sample combined with the unequal distribution of boys (35%) and girls (65%) also may explain why no gender-based differences in reading attitudes were detected in the current study. In order to detect these differences, a sample consisting of at least 26 males would have been required. A larger sample of students in each grade level with an equitable distribution between males and females would be important to determine if there are indeed significant grade level or gender differences within similar populations.

While the findings regarding the relationship between reading attitudes and silent reading comprehension ability are important, the current study only suggests that the relationship exists and does little to shed light on the question of causation. Do better readers have improved attitudes toward reading because they have more success? This question should be addressed in future investigations concerned with determining causal relationships.

Regardless of causation, the significant relationship between young adolescents' attitudes towards recreational reading and silent reading comprehension found in the current study suggests that reading attitudes are an important part of successful, silent reading comprehension. Excluding measures of reading attitudes from assessments of reading comprehension ability will result in an inadequate understanding of the combined, underlying sources of young adolescents' struggles with successful, reading comprehension.

Reading attitudes are also important to include in efforts to understand reading comprehension ability in young adolescents because of the potential influence reading attitudes have on students' self-perceptions as readers (Hall, 2005) and their motivation to participate in future academic and recreational reading experiences (McKenna, Kear, &

Ellsworth, 1995; Wigfield & Guthrie, 1997). The results of the current study do not provide critical information regarding the potential causal relationship between reading attitudes and silent reading ability, but they do provide important confirmation of the relationship between the two.

The results of the current study contribute to a consolidated understanding of the multi-components specifically related to young adolescents' silent reading comprehension ability. Perhaps the most significant and unique finding from the current study is that five specific components of oral language, problem solving, and reading attitudes explained a very large portion of the variance (74%) in silent reading comprehension ability. The final, five-variable component model consisted of lexical ambiguity, inferencing, syntax, planning ability, and students' attitudes toward recreational reading. As previously described, a cross disciplinary review of existing research has found significant relationships between each of the five variables and silent reading comprehension ability individually, but the current study was the first known effort to examine the relationships between this particular combination of components and silent reading comprehension in young adolescents. It is often the case, however, that the particular combination of the five variables is not part of a standard, multicomponent assessment of silent reading comprehension for young adolescents. The power of the combined linear relationship suggests that they should be.

Explanations for Unexpected Findings and Limitations

As a result of the multiple linear regression analyses, four of the nine original components or predictor variables were eliminated from the final, five-variable component model. The four subtests that were eliminated from the final model were *Sentence Assembly* (Semel, Wiig, & Secord, 2003), *Elementary Reading Attitude Survey-Academic Reading*

(McKenna & Kear, 1990), *Concepts and Directions* (Semel, Wiig, & Secord, 2003), and *Twenty Questions* (Delis, Kaplan, & Kramer, 2001). These four were excluded because each iteration of the multiple linear regression analyses resulted in one of the four above variables sharing a relatively weaker relationship to silent reading comprehension than the remaining components. In other words, each of these four variables was related to reading, but they did not explain meaningful variance above and beyond the five components that were included in the final model.

The *Sentence Assembly* subtest (Semel, Wiig, & Secord, 2003) was used as a measure of general semantic ability and was one of the four variables eliminated from the final, five-component model. A possible explanation for its elimination from the final model is that it measured general forms of semantics, which are relatively low-level forms of language given the level of silent reading demanded of the participants. Whatever the explanation, results from the current study lend some support to the view that general semantic skills were not as significant to young adolescents' silent reading comprehension as other more advanced language abilities. Another measure that was eliminated from the final component model was the students' attitudes toward academic reading (Elementary Reading Attitude Survey, McKenna, Kear, & Ellsworth, 1995). The elimination of this measure was not entirely unexpected. Young adolescence is a period of development marked by growing independence. As such, it wouldn't be unusual for students to want more autonomy in their reading experiences. Reading for academic purposes is institutionally driven whereas reading for enjoyment or recreational purposes is self-directed. Existing research supports the general trend among young adolescents in favoring recreational forms of reading over academic (Lazarus & Callahan, 2000; Worrell, Roth, & Babelko, 2007). Although both

components of students' attitudes toward reading each significantly related to silent reading comprehension, it was students' recreational reading attitudes that in the end, was a key contributor to silent reading comprehension ability among the students in the current study.

The *Concepts and Directions* subtest of the Clinical Evaluation of Language Fundamentals-Fourth Edition (Semel, Wiig, & Secord, 2003) was used as a base measure of syntactic ability and a means of identifying students who were functioning below age level in syntactic development. This measure was not one of the key contributors to silent reading comprehension in the final component model. The decision to use the *Concepts and Directions* subtest was based on the previous research findings of groups of older students who demonstrate poor syntax and silent reading comprehension (Catts, Adlof, & Weismer, 2006; Cutting & Scarborough, 2006; Cutting, Materek, Cole, Levine, & Mahone, 2009). It is likely that another measure may have resulted in the inclusion of the syntax measure in the final model, but ceiling effects influenced the current results. Two thirds of the students in this study were above the chronological age range for this subtest. As a result, a majority of this study's participants scored very well because they had developed competence in the early and less sophisticated forms of text structures such as knowledge of temporal and spatial order. Even with this ceiling effect, a moderate correlation was found between the *Concepts and Directions* subtest and silent reading comprehension ($r=.475$, $p<.001$). Not surprisingly, the data was negatively skewed, an indication that most students did very well on the measure. This study confirmed prior research suggesting that syntax and silent reading comprehension ability are related, but the ceiling effects with the *Concepts and Directions* subtest in the current study limited the magnitude of that relationship and therefore led to the

elimination of what may otherwise have been an important variable accounting for an even greater portion of the variance in silent reading comprehension ability.

Planning, a part of problem solving, was assessed through two measures, the *Tower* subtest and the *Twenty Questions* subtest each from the Delis-Kaplan Executive Function System (Delis, Kaplan, & Kramer, 2001). As previously mentioned, the *Tower* subtest was used as a base measure of non-verbal planning ability. As expected, the *Tower* significantly correlated with students' performance on a measure of silent reading comprehension. In contrast, the *Twenty Questions* subtest, a higher-level verbal measure of planning, shared only a weak relationship to silent reading comprehension (.292, <.05). This finding was somewhat unexpected given that the *Twenty Questions* subtest has previously been used successfully as a measure of planning ability (Remine, Care, & Brown, 2008; Siegler, 1977) albeit not in relation to reading comprehension. A possible explanation for the weak correlation of the *Twenty Questions* subtest to silent reading comprehension observed within this study may be that the subtest initially weighs more heavily on the allocation of general semantic knowledge and less on planning skills. In review, the *Twenty Questions* subtest presented students with 30 colored pictures of simple, concrete objects such as a dog, bus, and boat. The pool of 30 objects could be parsed into a total of 18 categories; two high-level categories (i.e, living and nonliving things), four mid-range categories (i.e., plants, animals, kitchen items, transportation), and 12 low-level categories such as birds or fruits. In as few guesses as possible and with a limit of 20 questions, student participants were asked to guess what object the examiner secretly chose. The examiner could only answer the students' questions with a yes or no response. In relation to a measure of planning abilities, students' could use their planning skills to determine the fewest questions needed in order to maximize

the number of eliminated objects from the overall pool. Therefore a question that asked if the target item was a living or non-living thing, would be an indication of high-level planning abilities because it would instantly eliminate half of the potential objects. Students' knowledge of semantic categories, however, most likely played a higher role in their guessing performance acting as sort of a bootstrapping mechanism for weak planning abilities. In other words, students' may have relied more heavily on their knowledge of basic semantic categories, than on their strategic planning. From this viewpoint, the lack of a significant relationship between students' performance on the *Twenty Questions* subtest and silent reading comprehension ability makes sense given that most young adolescents have acquired competence in this area. It is unlikely that the *Twenty Questions* subtest, at least for the students in this study, was an accurate measure of verbal planning, particularly the sophisticated forms of planning that are required during silent reading comprehension.

Limitations

As in any investigation, there are some limitations to the current study that may have influenced the results. One such limitation, the result of a conscious decision to identify student participants in Grades 6-8 as a single group, restricted the ability of this investigation to account for possible grade level or gender differences. Young adolescence is a period of significant development across domains such as physical, cognitive, and social (Caskey & Anfara, 2007) that could affect the allocation of components of oral language, problem solving, and reading attitudes for successful silent reading comprehension. In relation to grade level, the results from this study indicated that no significant grade level differences were found (refer back to Table 4.12). The large portion of variance in silent reading comprehension ability explained by the five-variable model supports the conclusion that, for

the young adolescents in the current study, effects of grade level on the relationship between specified components and silent reading comprehension was minimal. A control for grade level and gender would be important in a future investigation to determine the utility of using the five-variable model to predict silent reading comprehension across grade levels and between genders.

An additional limitation of this study was that the student participants were recruited from a single research site. The decision to recruit students from a single research site was based on accessibility of the research site and the large number of returned consents and assents from which to recruit potential participants. As such, without diverse representation, the ability of this study to generalize its findings to the greater population was limited. Nevertheless, the diversity composition of the sample population closely approximated district and state levels thereby providing equal access to participation among minorities (NCDPI, 2009).

The exclusion of a measure of working memory presents another limitation in the current study. It is possible that working memory had an influence on the results from the *Recalling Sentences* subtest (Semel, Wiig, & Secord, 2003), but it is impossible to know the extent of this influence in the current study. A measure of working memory was not included in the current study due to the length of the study assessment protocol. Because existing research has found a significant relationship between working memory and reading comprehension (Cain, Oakhill, & Byrant, 2004; Cain, Oakhill, & Lemmon, 2004), the inclusion of such a measure in a future investigation would be important to determine its significance as a contributor to silent reading comprehension in young adolescents.

A final limitation of this study was the absence of a measure of morphological awareness. The decision to exclude such a measure was based on the length of the assessment protocol and the lack of an available standardized measurement. Given the increasing evidence of a significant relationship between morphological awareness and silent reading comprehension ability in adolescents (Carlisle, 2000; Larsen & Nippold, 2007; Mahony, 1994), it would be important to include such a measure in an assessment protocol in order to determine its relative contribution to current component model.

Directions for Future Research

Several questions remain as a result of the current study that should be addressed through future investigations before reliable conclusions are made. For example, does the five-variable model maintain the same relationship to silent reading comprehension ability among a larger and more geographically diverse population of adolescents? Do the specified set of components of oral language, problem solving, and reading attitudes change in their level of significance over time or do they remain fairly consistent across the developmental period of young adolescence? First, some of these questions could potentially be answered in a replication of the current study with only a few modifications such as increasing the sample size, including an equal gender distribution, and recruiting from various geographical locations across the state. A modified replication of the current study would contribute to our understanding of the underlying components related to silent reading comprehension among various groups of young adolescents thereby increasing the generalizability of the results.

A potential follow-up or extension of this current investigation would be to administer the study assessment protocol to specific populations of young adolescents (e.g., Language Learning Disabled) to detect within or between group differences. Follow-up

investigations of these types would be important in the identification of component patterns unique to specific populations of young adolescents. The results from comparison investigations could be used to guide differentiated forms of reading instruction/remediation.

In order to determine if the five variable model accounts for the same amount of variance in students' silent reading comprehension over time, another possible future direction is to conduct a longitudinal investigation. Using a longitudinal design, a group of fourth grade students could be followed over the course of five years thereby capturing skill and affective levels at particularly critical periods of academic (Brown, Engin, & Wallbrown, 1979; Chall, 1983; Chall & Jacobs, 1983) and developmental transitions (Blakemore & Choudry, 2006; Giedd, 2004; Giedd, et al., 1999). The results from a longitudinal study could be used to examine the influence of components of oral language, problem solving, and reading attitudes on silent reading comprehension ability and to document changes in influence over time.

The assessment protocol described in the current study also holds promise for future broad clinical applications. Foremost, the results of the current study provide empirical evidence about the specific components underlying young adolescents' success and/or difficulty with silent reading comprehension. Multiple components including syntax, lexical ambiguity, inferencing, planning, and students' attitudes toward reading were shown to significantly contribute to students' silent reading comprehension. Knowledge of the specific components related to young adolescents' silent reading comprehension can inform future assessment and intervention directions. For instance, once word identification and fluency skills have been identified as being within functional limits, the assessment protocol used in the current study could be used as an additional form of assessment for young adolescents'

identified as struggling with language comprehension. Results from the measurement protocol could then be used to provide teachers, literacy coaches, and specialists with the detailed forms of feedback necessary to guide specific interventions. Without the appropriate information to guide reading instruction/interventions, then too many young adolescents will continue to receive reading instruction/intervention that won't support their ability to read with deeper levels of comprehension.

The current measurement protocol may also be of particular importance in the design and implementation of future reading intervention and prevention programs. Young adolescents needing direct support across or within the five components of oral language, problem solving, and reading attitudes could, through a well-designed program, receive the comprehensive forms of intervention essential to successful, silent reading comprehension. Additionally, those students who demonstrated a relative weakness in only one or more areas could receive intervention that targets their specific needs. A final, potential use of the described assessment protocol is that it may one day be used to reliably predict a student's future success or struggles with silent, reading comprehension. Once younger adolescents have been identified as being at risk for future poor reading achievement, such students could be included in prevention programs designed to increase competence and interest levels in the specific, five components.

Conclusion

This current study used a multicomponent approach to determine the unique and combined contribution of components of oral language, problem solving, and reading attitudes to silent reading comprehension in a group of young adolescents. As hypothesized, the findings of correlation analyses revealed significant, positive relationships between each

of the components of oral language, problem solving, and reading attitudes to silent reading comprehension ability. Further analyses revealed a linear combination of five, specific components that explained a significant portion of the variance in students' silent reading comprehension ability.

As the demands on student accountability continue to increase in the wake of federal initiatives such as *Race to the Top* (USDE, 2009) whereby states are receiving monetary rewards for improved/increased student achievement, more than ever before, young adolescents will need both effective and direct forms of instructional and motivational support to ensure improved and sustained success with silent reading comprehension. Knowledge as to the underlying sources for young adolescents' struggles with silent reading comprehension is necessary for the development and implementation of appropriate reading instruction/remediation programs. Results from statewide and national assessments of silent reading comprehension are a useful first-order means of identifying students who struggle with reading comprehension. The knowledge gained from such assessments is limited, however, because they do not provide the specific information necessary to provide young adolescents with the differentiated forms of reading instruction necessary to make substantial improvements to their reading achievement. A multicomponent or whole-part assessment of silent reading comprehension is a necessary second step in discovering the comprehensive parts that are related to young adolescents' struggles with silent reading comprehension.

APPENDIX A

Modified Version of Elementary Reading Attitude Survey

Directions: Please circle the phrase that **best** describes how you feel when you read a book.

1. How do you feel when you read a book on a rainy Saturday?

   Very Happy Somewhat Happy Mildly Upset Very Upset

2. How do you feel when you read a book in school during free time?

   Very Happy Somewhat Happy Mildly Upset Very Upset

3. How do you feel about reading for fun at home?

   Very Happy Somewhat Happy Mildly Upset Very Upset

4. How do you feel about getting a book for a present?

   Very Happy Somewhat Happy Mildly Upset Very Upset

5. How do you feel about spending free time reading a book?

   Very Happy Somewhat Happy Mildly Upset Very Upset

6. How do you feel about starting a new book?

   Very Happy Somewhat Happy Mildly Upset Very Upset

7. How do you feel about reading during summer vacation?

   Very Happy Somewhat Happy Mildly Upset Very Upset

8. How do you feel about reading instead of playing?

Very Happy Somewhat Happy Mildly Upset Very Upset

9. How do you feel about going to a bookstore?

Very Happy Somewhat Happy Mildly Upset Very Upset

10. How do you feel about reading different kinds of books?

Very Happy Somewhat Happy Mildly Upset Very Upset

11. How do you feel when a teacher asks you questions about what you read?

Very Happy Somewhat Happy Mildly Upset Very Upset

12. How do you feel about reading workbook pages and worksheets?

Very Happy Somewhat Happy Mildly Upset Very Upset

13. How do you feel about reading in school?

Very Happy Somewhat Happy Mildly Upset Very Upset

14. How do you feel about reading your school books?

Very Happy Somewhat Happy Mildly Upset Very Upset

15. How do you feel about learning from a book?

Very Happy Somewhat Happy Mildly Upset Very Upset

16. How do you feel when it's time for reading in class?

Very Happy Somewhat Happy Mildly Upset Very Upset

17. How do you feel about stories you read in reading class?

Very Happy Somewhat Happy Mildly Upset Very Upset

18. How do you feel when you read out loud in class?

Very Happy Somewhat Happy Mildly Upset Very Upset

19. How do you feel about using a dictionary?

Very Happy Somewhat Happy Mildly Upset Very Upset

20. How do you feel about taking a reading test?

Very Happy Somewhat Happy Mildly Upset Very Upset

APPENDIX B

Histograms

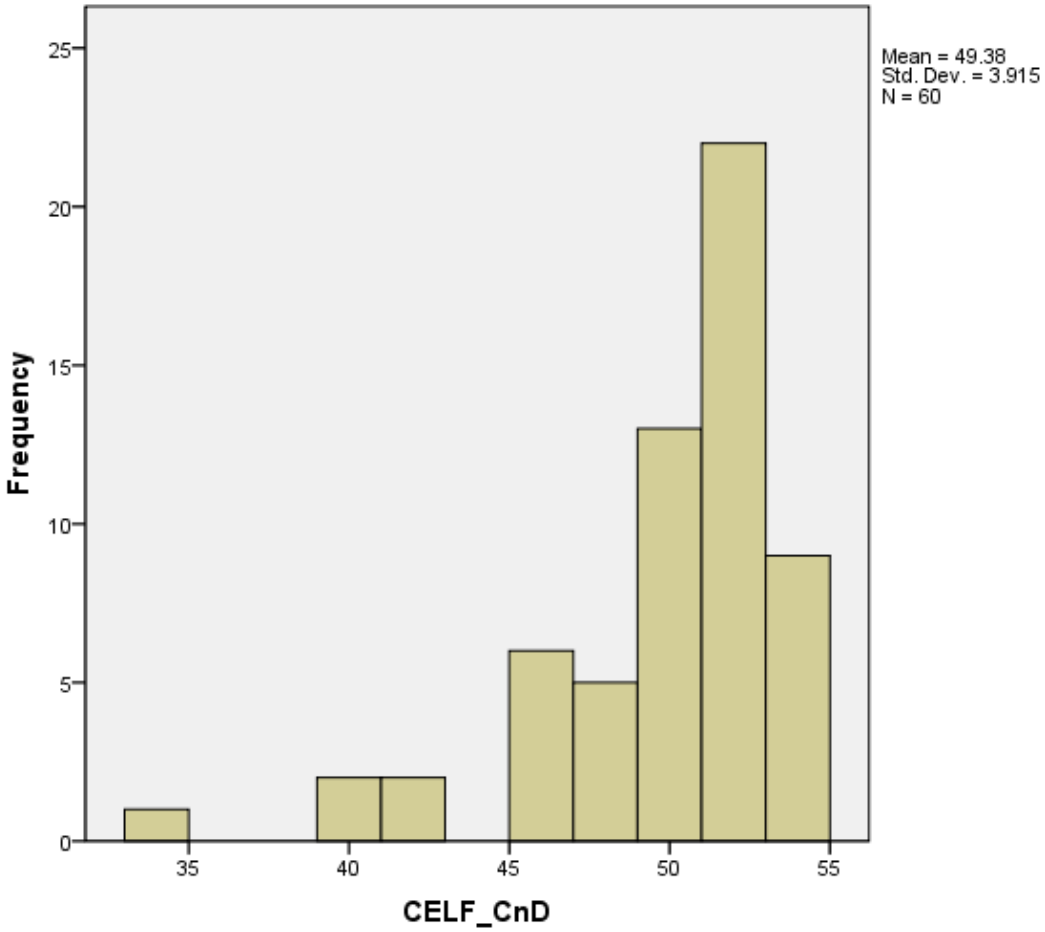


Figure B1. Histogram of *Concepts and Directions* Subtest Raw Score

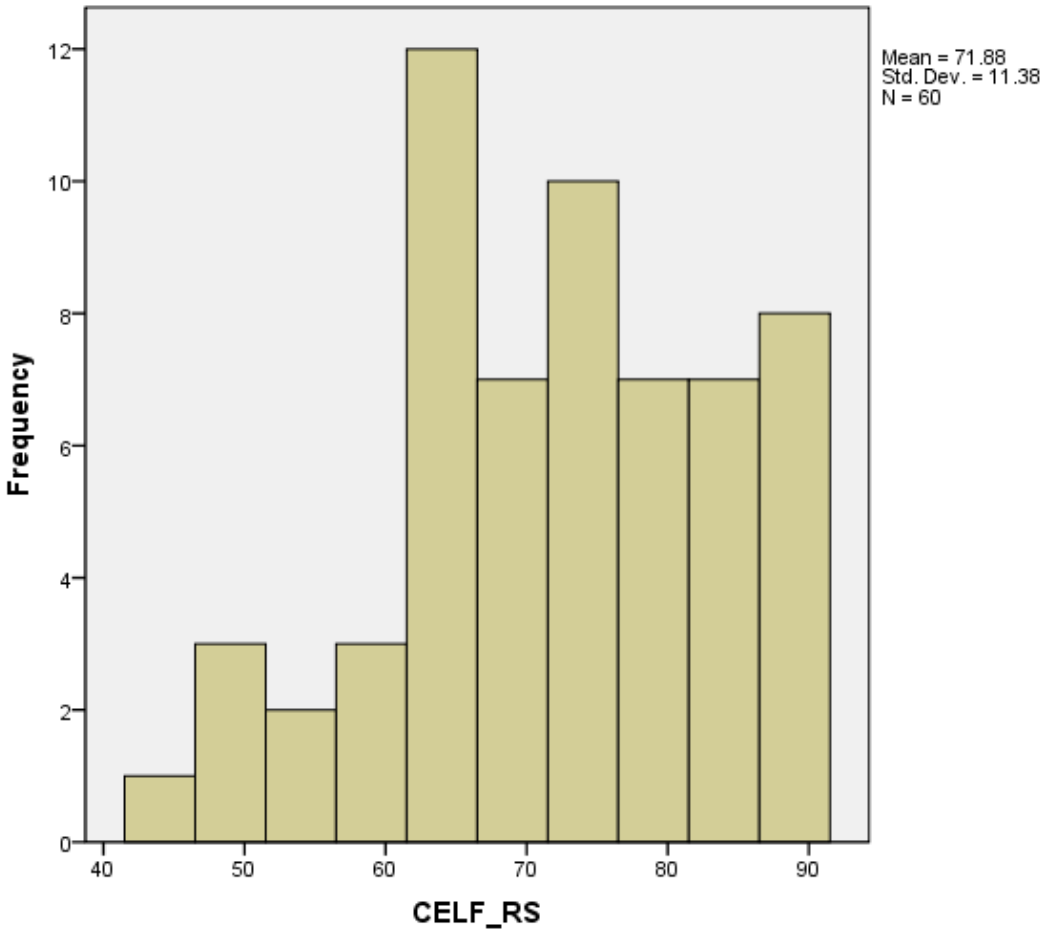


Figure B2. Histogram of *Recalling Sentences* Subtest Raw Scores

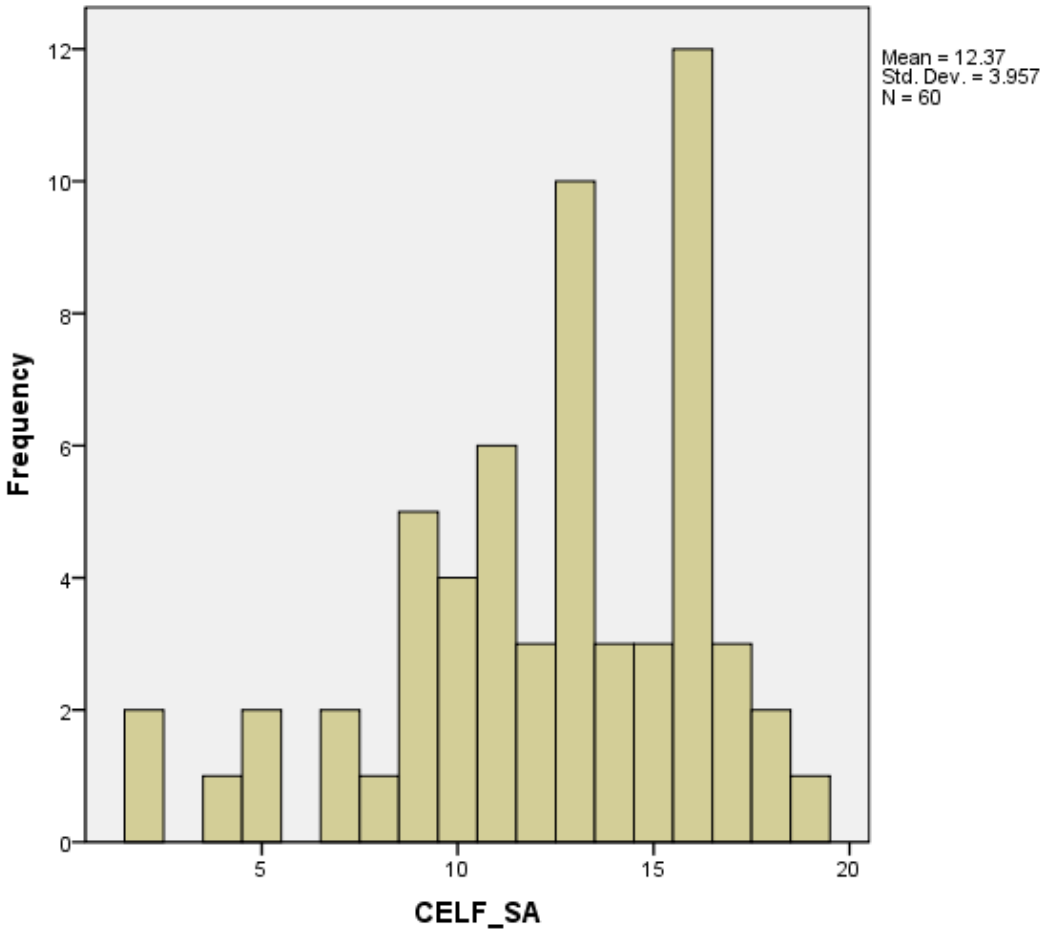


Figure B3. Histogram of *Sentence Assembly* Subtest Raw Scores

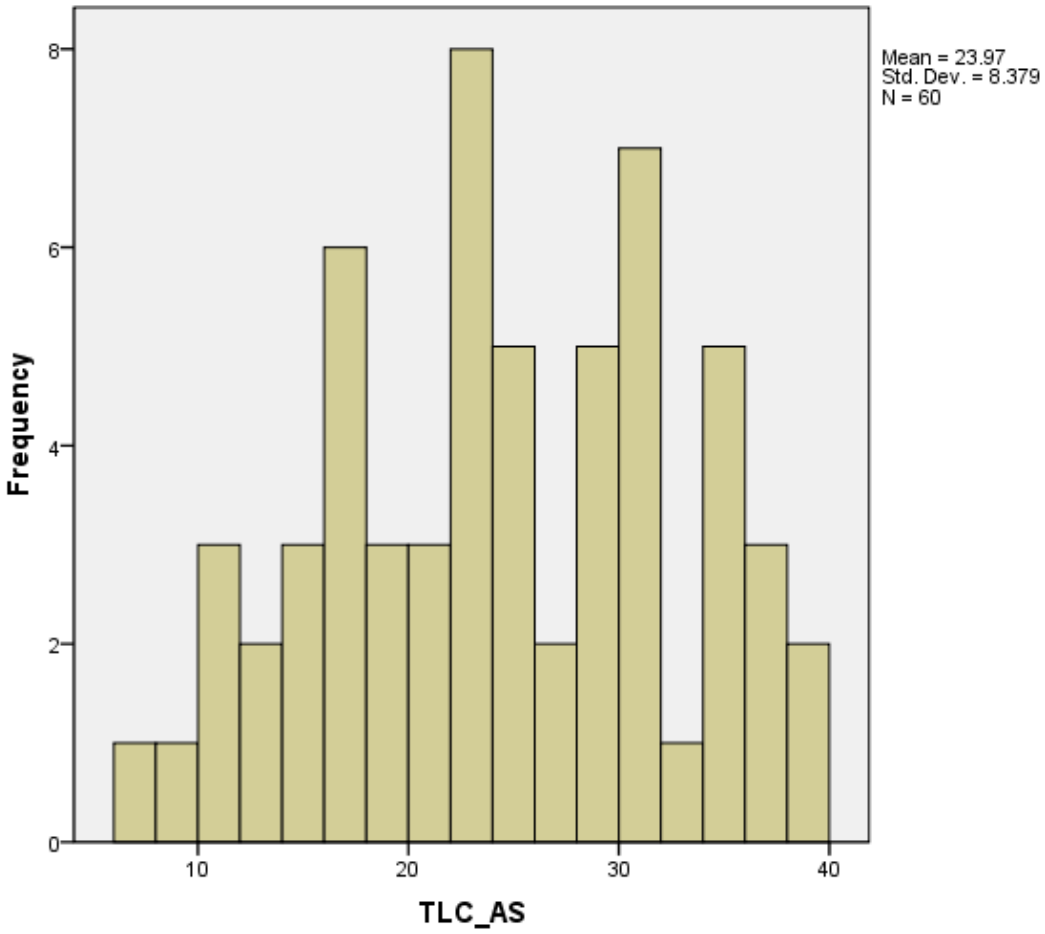


Figure B4. Histogram of *Ambiguous Sentences Assembly* Subtest Raw Scores

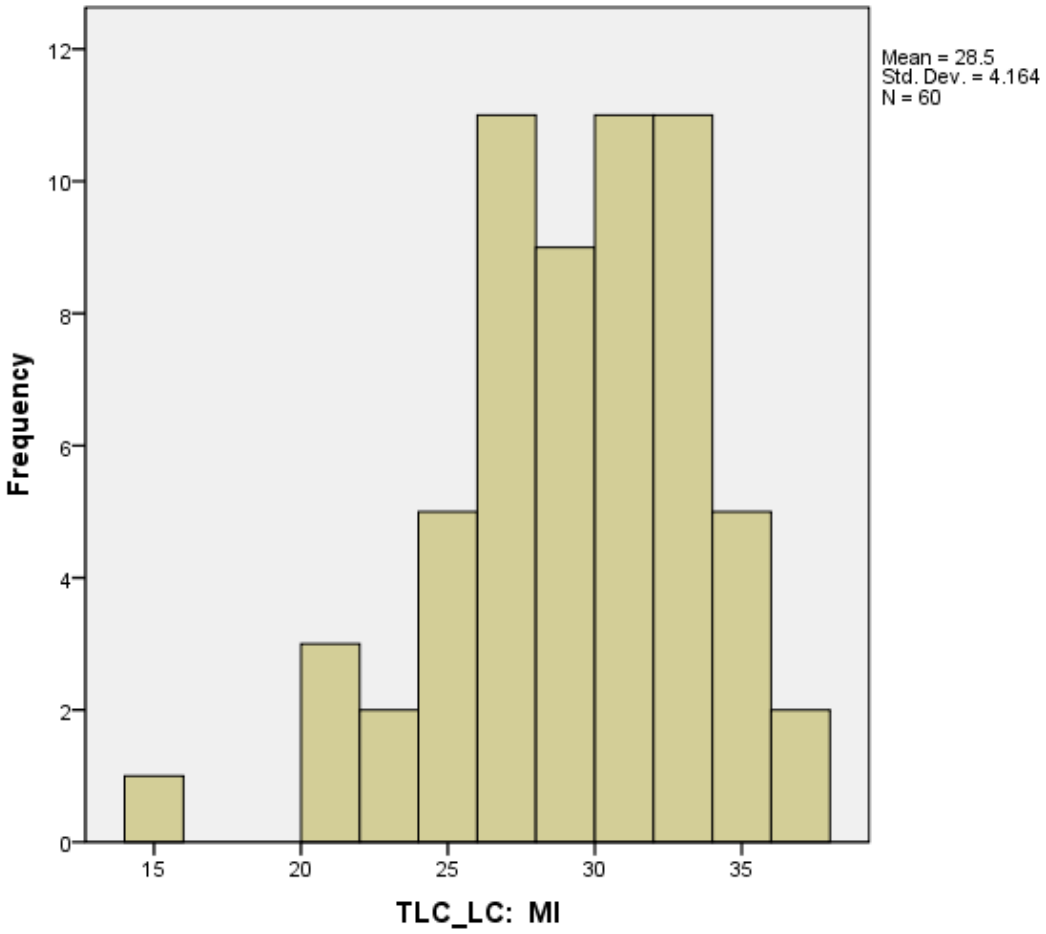


Figure B5. Histogram of *Listening Comprehension: Making Inferences* Subtest Raw Scores

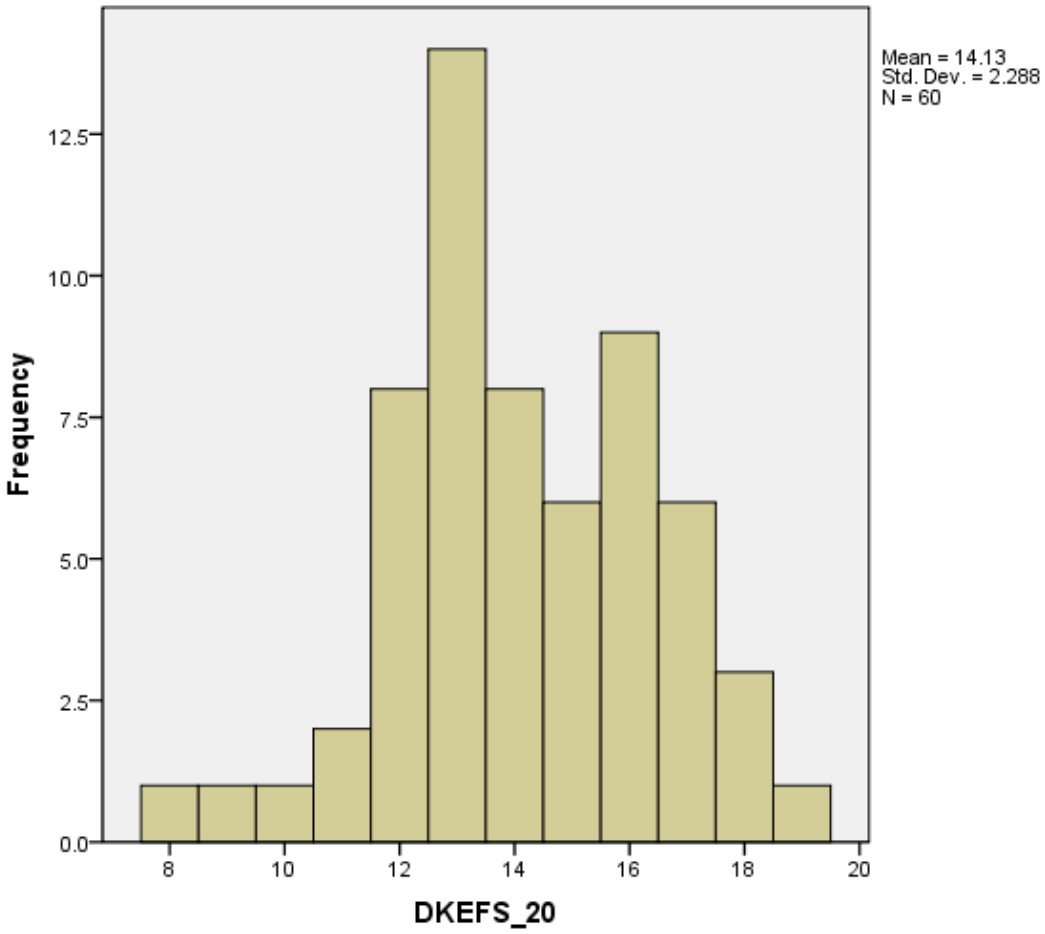


Figure B6. Histogram of *Twenty Questions* Subtest Raw Score

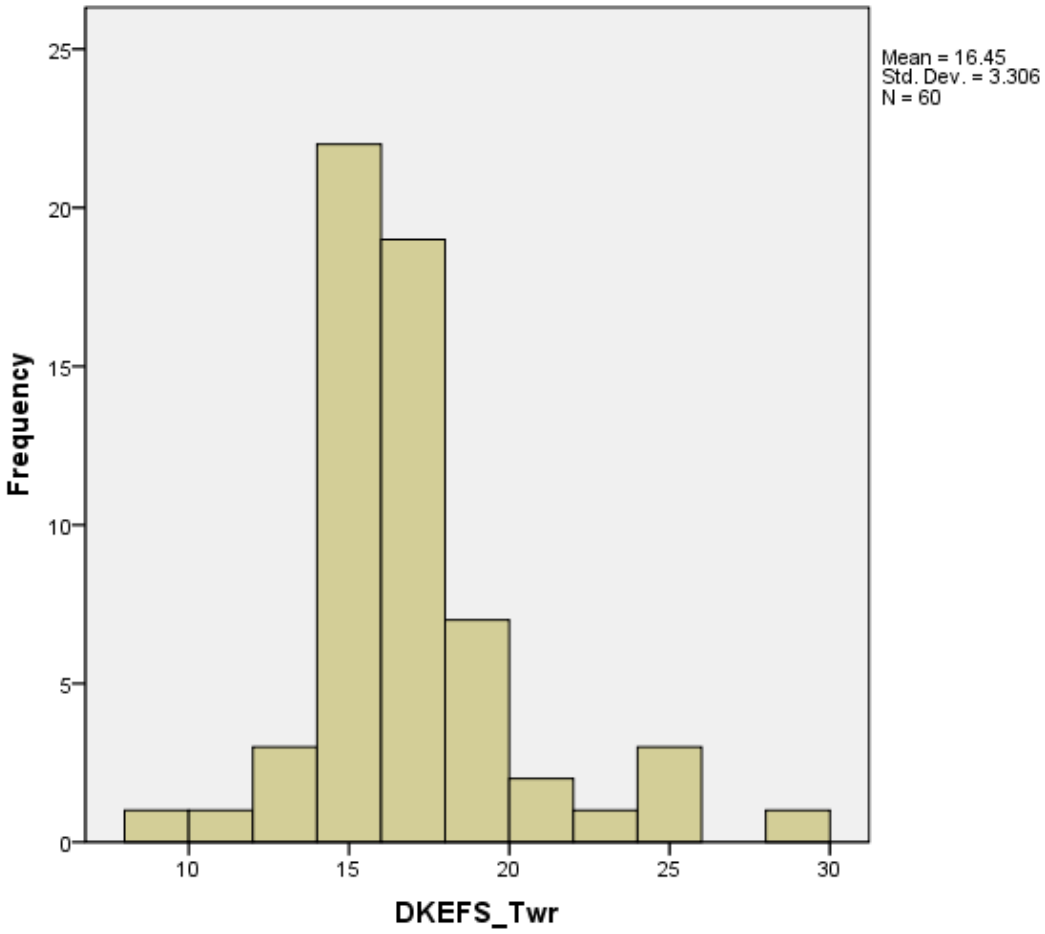


Figure B7. Histogram of *Tower* Subtest Raw Score

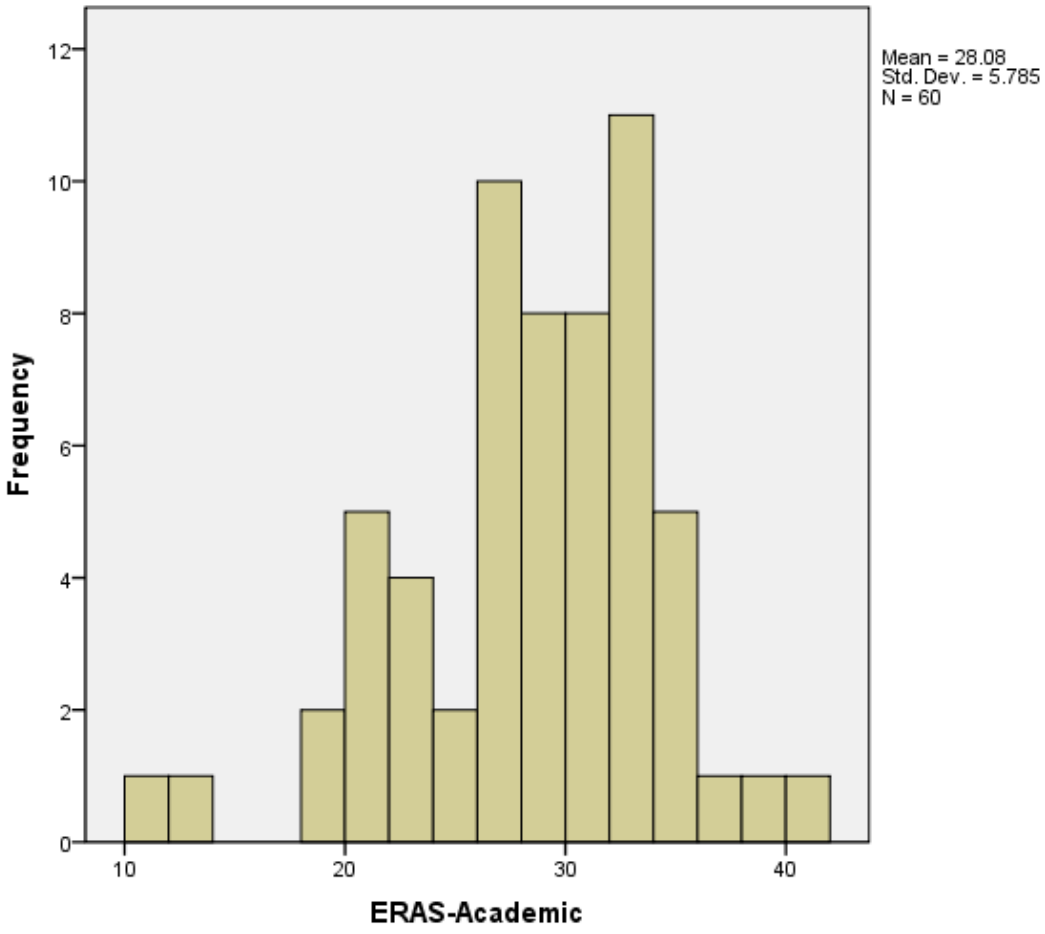


Figure B8. Histogram of *Elementary Reading Attitude Survey-Academic Reading* Subtest Raw Score

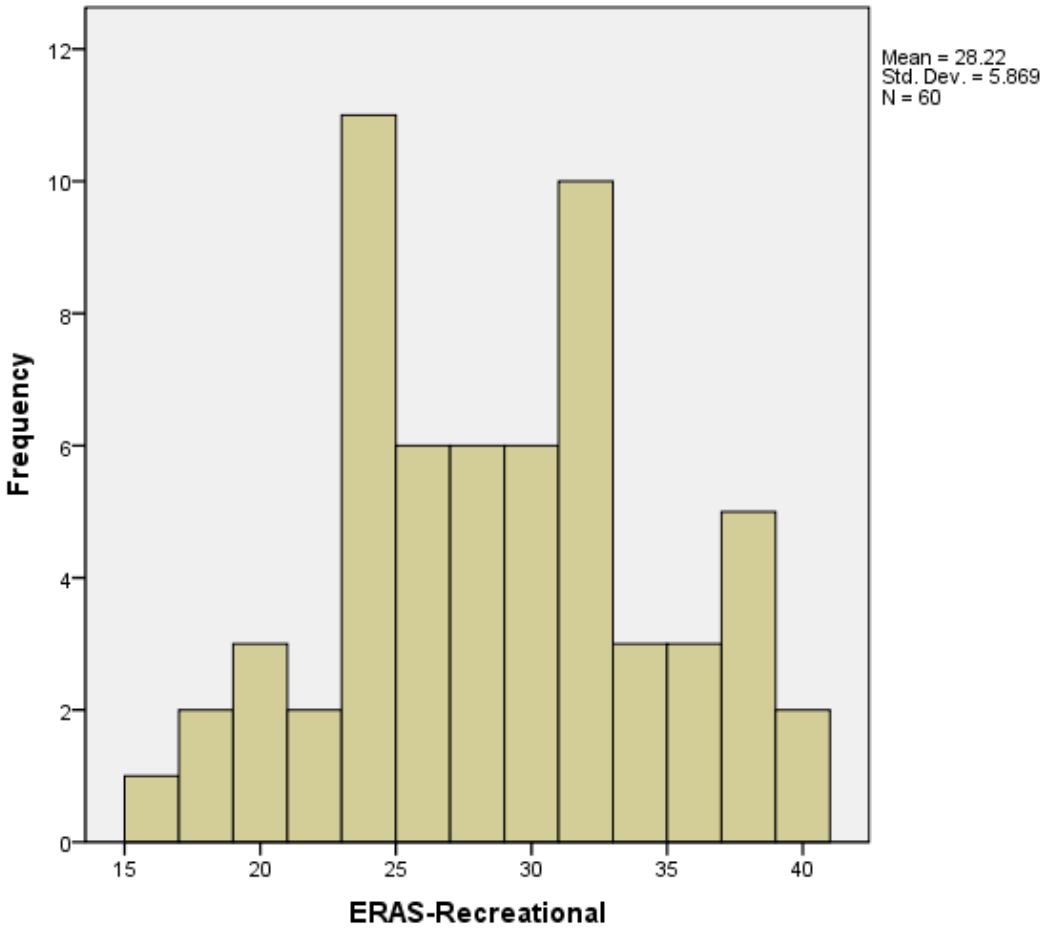


Figure B9. Histogram of *Elementary Reading Attitude Survey-Recreational Reading* Subtest Raw Score

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