

THE CORRELATION BETWEEN THE THREE READING FLUENCY SUBSKILLS
AND READING COMPREHENSION IN AT-RISK ADOLESCENT READERS

by

Craig Courbron

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

Liberty University

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ABSTRACT

The purpose of this study was to determine which of the three reading fluency subskills were most strongly correlated with reading comprehension in adolescent at-risk readers. The participants were 82 adolescent males (ages 13-19) who had been committed to a juvenile detention facility. Archival data from a two-year period was collected from a maximum security juvenile detention facility in a rural section of the Northeastern United States. The Measures of Academic Progress test was used to collect reading comprehension data; the *Qualitative Reading Inventory-4* test was used to collect reading speed and reading accuracy data; the Multidimensional Fluency Scale was used to collect reading prosody data. The data was analyzed using a bivariate correlation analysis in order to measure the strength of the correlations. The research revealed that the relationship between reading speed and reading comprehension had an identical correlation coefficient as the relationship between reading prosody and reading comprehension; both correlations were significant and strong. The research also revealed that reading accuracy and reading comprehension were only weakly correlated.

Keywords: reading, reading fluency, reading prosody, reading speed, reading accuracy, reading comprehension, at-risk readers, adolescent readers, struggling readers, incarcerated adolescents.

Dedication

Colleen Courbron, my beautiful wife, has endured over four years of living with me through this very frustrating process. She has supported me unconditionally. Never once did she say, “put down the computer and spend time with me” or “is this really worth all of this frustration and trouble?” She has selflessly sacrificed time together for the sole purpose of seeing me succeed in this endeavor. For that, and for her, I am eternally grateful.

Russell, Ryan, and Reagan, my three sons, have watched me stare at a computer screen or the inside of a book for four years when I know they have wanted to have fun, participate in father/son activities, and have my undivided attention. I will never be able to make up for the time that was lost during these crucial developmental years, but I fully intend to make it up to them for the remainder of my life. I love them all more than I can say and more than I could, or ever have, shown. Part of the reason that I have pursued a doctoral degree has been so that I could provide a better life for them than I had as a kid. I have wanted to pave their way to success. My hope is that I have been a model of persistence, hard work, finishing strong, and a commitment to excellence in all that you do.

Phyllis Hawkes, my mother, is the reason that I am who I am. George Washington said, “All I am I owe to my mother. I attribute all my success in life to the moral, intellectual, and physical education I received from her.” My mother has endured an unimaginably difficult life and has never complained. She gave up her own chance at success; her considerable intelligence and talents were not used for personal gain, but to ensure that her children had a chance to succeed. She held our family together when it

should have fallen apart. She never judged me, always loved me, and taught me the values that I needed to internalize in order to overcome my obstacles. She modeled spiritual richness and personal integrity in her daily life. Through oppressive poverty and family illness, she made sure that we did not become socioeconomic statistics, but functioning and successful members of society.

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Dr. Lucinda Spaulding, my dissertation chairperson, has displayed the patience of a saint in her guidance of my dissertation process. I know that I get easily frustrated and angry, and occasionally have a negative attitude. She was able to look past those things and keep me focused on the task at hand. Her feedback was always speedy, thoughtful, and insightful. Her willingness to take over as my chairperson after the death of Dr. Jones was a Godsend for me. For her guidance, I am very thankful. Without it, I surely would have not finished.

Dr. Jill Jones, my original dissertation chairperson, saw in me what I could not even see in myself. After her death, I heard several stories about how she bragged about me and how she told others about how successful I was going to be. Much of my drive to finish this process came from wanting to meet those expectations. The day that Dr. Watson sent me the email that she had passed away was one of the most horrible days of my life. It's hard for me to love, but I love her for what she did for me in terms of self-confidence and motivation to succeed.

Dr. Melissa Lannom and Dr. Sharon Crawley, my dissertation committee members, have provided excellent feedback regarding the content of my topic through the many changes that have occurred along the way. Their support and encouragement has been greatly appreciated.

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Abbreviations

NCLB: No Child Left Behind

QRI-4: Qualitative Reading Inventory-4

MFS: Multidimensional Fluency Scale

MAP: Measures of Academic Progress

AYP: Adequate Yearly Progress

WCPM: Words Correct Per Minute

NRP: National Reading Panel

NRPR: National Reading Panel Report

RD: Reading Disability

RIT: Rausch Unit

CHAPTER ONE: INTRODUCTION

Overview of the Study

Background to the Study

The importance of fluent reading to overall reading success is unquestioned (Schwanenflugel, Meisinger & Wisenbaker, 2006). Additionally, the detrimental effects of disfluency are also well accepted. Whithear (2011) stated, “Correlational evidence suggests that a lack of fluency contributes to poor comprehension and this has ramifications for a struggling reader in the secondary setting” (p. 1). Yet, the strength of the relationship between the three fluency subskills and the development of reading comprehension is not known. The purpose of this study was to determine the relationship between the three fluency subskills and reading comprehension in at-risk adolescent readers. This determination was made by calculating the correlation coefficients between reading speed and reading comprehension, reading accuracy and reading comprehension, and reading prosody (the pace, smoothness, expression, attention to textual clues, and suprasegmental ability with which one reads) and reading comprehension. This study was a first step towards linking individual subskills of fluency with reading comprehension ability. It was only a first step because a significant degree of correlation is necessary to assume causation, but not sufficient to do so by itself (Ary, Jacobs, Razavieh, & Sorensen, 2006). Now that the correlation coefficients have been determined, further studies can be conducted to analyze the likelihood of actual causation.

The archival data being analyzed was created during the educational testing of at-risk adolescents (ages 13-19) who are current and former residents of a maximum security juvenile prison in a rural area of the Northeastern United States. Not all of the participants had identified reading disabilities or were classified as special education, but all were classified as at-risk. The target participants were identified as “at-risk” by enrollment in the prison’s education program, which by definition serves only at-risk adolescent readers. Full sets of archival data were available for 82 residents; this is an adequate number of participants to conduct a thorough and statistically significant correlation study (Ary et al., 2006; Tabchnick & Fidell, 2001). The sample pool consisted almost entirely (95.1%) of Caucasian, English-speaking males. However, the sample was consistent with the racial composition of the fourteen counties that the target facility serves, which was 94.9%, according to United States Census Bureau (2010) estimates. Even with these demographical limitations, the research was able to provide valuable insights into ways reading teachers can more effectively and efficiently address adolescent reading difficulties. Further research can now be conducted to expand the scope of the participants being studied, examine causation, and either confirm or reject the initial findings of this study.

At-risk adolescent males, the participants in this study, are particularly difficult to remediate for a number of reasons. They have often experienced reading failure consistently over the course of their entire academic experience, they are generally resistant to any type of direct instruction or intervention, and they often do not see the value in learning to improve (or do not have the motivation to improve) their reading skills (Bintz, 1993; Guthrie & Humenick, 2004). In addition to the problems faced by

the average adolescent reader, the participants in this study have typically experienced problems that are endemic to adolescent at-risk students, including reading disabilities, socioeconomic obstacles, and psychiatric disorders.

The overview sets the stage for the research by providing background on the societal and educational framework for the study, expressing the significance of the research, and stating the research questions and hypotheses. Chapter Two examines the literature surrounding the subject of at-risk adolescent reading. The review of literature discusses the study's theoretical framework and investigates many primary and secondary sources in order to build a foundation upon which the current research can rest. Chapter Three describes the study's methodology. It examines the design, instrumentation, and statistical methods that will be utilized during the course of the study. Chapter Four displays the results of the statistical analyses. Chapter Five discusses those results and their implications in light of the relevant literature.

Rationale for Research

With the publication of the *National Reading Panel Report* (NRPR, 2000), reading teachers, reading specialists, and reading researchers switched their focus from failed whole language approaches to the five elements identified in the study as fundamental reading components: phonemic awareness, phonics, fluency, vocabulary, and comprehension. The meta-analysis (comprised of the five reading component subgroups) results found that successful reading instruction and intervention should be systematic, structured, and involve direct instruction at every level (National Institute for Child Health and Human Development [NICHD], National Institute for Literacy, 2000). Over the course of the following decade, the least studied of these five reading

components has been fluency, especially as it relates to adolescent literacy. Because the relationship between fluent reading and adequate comprehension has been found by multiple authors (Fuchs, L., Fuchs, D., Hamlett, Walz, & Germann, 1993; Fuchs, L., Fuchs, D., Hosp, & Jenkins, 2001; Jenkins, Fuchs, Espin, van den Broek, & Deno, 2000; Paige, 2011; Pinnell, Pikulski, Wixson, Campbell, Gough, & Beatty, 1995; Reutzel & Hollingsworth, 1993; Yovanoff, Duesbery, Alonzo, & Tindal, 2005) to be a significant link that distinguishes proficient readers from poor readers, identifying methods of remediating reading fluency difficulties has become an important issue, and one that incites a great deal of debate amongst reading experts. It seems logical to look for answers to remediation by exploring reading speed, reading accuracy, and reading prosody, the three subskills that comprise fluent reading. Just as logical is to investigate which of those fluency subskills have some influence on reading comprehension. This is the approach that was taken in this study in order to ascertain which fluency subskills most strongly correlate with reading comprehension-the ultimate goal of all reading instruction and intervention.

Once the elements of reading fluency most strongly associated with reading comprehension were identified, adolescent reading instruction and remediation could be more focused on those specific factors and skills so teachers do not waste time addressing fluency skills that do not actually influence reading comprehension, or only impact it marginally. Understanding how certain aspects of fluency interact with reading comprehension also gives teachers a better understanding of how variables that seem to be only peripherally related to reading success can actually impact reading more directly.

An interesting aspect of this research was the ability to focus on reading-related, rather than life-related, variables. Past studies have looked at various combinations of life variables (Klauda & Guthrie, 2008; McCollin, O'Shea & McQuiston, 2010; Rupley, Willson, & Nichols, 1998; Wu & Hu, 2007) in order to ascertain their relationship to comprehension. However, after an extensive literature search that included the search terms mentioned in chapter one, no studies were found that have deconstructed fluency to determine which parts of fluency are most correlated with reading comprehension, as this research did. Since reading teachers have the ability to positively influence a student's fluency skills (and all of fluency's subskills) if given the knowledge and tools to do so, this research is potentially more practical than research that has investigated variables over which teachers of reading have no control.

Trends

Reading and literacy contribute to academic success (Burns, Griffin, & Snow, 1999; NRPR, 2000), and strong reading comprehension predicts performance on achievement tests (Allington, 2002). Despite these findings, the efforts of No Child Left Behind (NCLB, 2001), and the implementation of recommendations made by the NRPR (2000), the ability of adolescents to read is still in a precipitous decline. According to Rasinski (2003b), the decline is evident in the standardized reading test score results, the growth of remedial reading classes in colleges, and the anecdotal evidence of teachers and parents across the country. The high school graduation rate in the United States has dropped steadily to a mere 70%, and approximately 5-10% of high school juniors read below the fourth grade level (Wise, 2009). Compounding the problem is the lack of funding for high school reading instruction, instructors, and remediation. Little money is

available for hiring secondary-level literacy specialists or reading teachers because Title I and state funds marked for school improvement go mostly (65%) to elementary schools (United States Department of Education, 2011).

The resultant gap in services between elementary and secondary at-risk readers creates a Matthew Effect (Ary et al., 2006; Stanovich, 1986), whereby students who are behind in reading in the early school years fall further behind as their school careers progress. Such inequities naturally lead to adolescents graduating without necessary reading skills, and subsequently remaining deficient in reading throughout life. This trend can be reversed, but is not being dealt with properly on a number of important levels, such as funding, staffing, programming, and remediation.

These general problems have answers; difficult ones, but answers nonetheless. The general problems in reading acquisition provide a backdrop for the difficulties in the even more specialized field of reading fluency. The subfield of reading fluency presents many unique and complex challenges for the school personnel who deal with adolescent readers and their complicated reading struggles (Hudson, Pullen, Lane, & Torgesen, 2009). The overall reading failures experienced by adolescents are currently shaping research and development in the field of adolescent reading (Fisher, 2008; Fisher & Ivey, 2006; Hock et al., 2009; NRPR, 2000; Rasinski et al., 2005; Schifini, 2002).

Developments

Malmgren and Trezek (2009) said, “Professional literature and discourse . . . has long overlooked the importance of literacy instruction at the secondary level, particularly for adolescents who struggle with reading” (p.1). Those who have a stake in advancing knowledge about adolescent reading (college professors, researchers, governmental

agencies, school districts, administrators, and teachers) have increased research efforts in an attempt to hurdle the obstacles they face in regards to struggling adolescent readers. This increase in research efforts has resulted in many new theories, practices, and programming models that have served as the foundation for contemporary intervention developments and programs that will benefit adolescent readers and teachers of adolescent reading. For example, some secondary-level schools are now employing at least one reading specialist. The employment of reading specialists is a logical development, considering that approximately 25% of high school students in the United States cannot read at a basic level (Phillips, 2005). Until recently, reading specialists and reading coaches served almost exclusively in elementary schools. However, with the increasingly difficult standards faced by adolescent students, it is now imperative that they have access not only to adequate reading instruction in the content areas, but remediation of basic reading skills when it is deemed necessary. Again, funding has been a problem, especially in a time when schools everywhere face draconian budget cutbacks. Despite this inadequate funding, schools are being forced to address the reading issues of struggling adolescent students in substantial ways, including adding reading intervention staff to high school faculties.

Another rather recent development in reading research that holds the potential to fundamentally alter what reading instructors teach, how they teach it, and to whom it is taught, is brain research. Brain research is showing more and more conclusively that even readers with disabilities can be remediated with intensive fluency interventions given at the right time, using appropriate materials, and with the correct amount of intensity (Fisher, 2006; Wexler, Vaughn, Edmonds, & Reutebuch, 2007; Wilson, 2004;

Wilson, 2006). This new knowledge is permeating the concept of Response to Intervention (RTI). RTI (United States Department of Education, 2004) seeks to remediate reading difficulties as soon as they are discovered with research-based and intensive intervention, thus eliminating the need for special education referrals, which inevitably result when remediation is not early enough or intense enough (Mokhtari, Porter, & Edwards, 2010). No longer can administrators or teachers disregard the needs of the student who appears unable to learn to read. They are now forced to deal with reading-deficient students because brain research shows that reading improvement is a definite possibility for the at-risk population. Even the dyslexic adolescent struggling reader can be taught to learn to read more effectively if the correct parts of the brain are being stimulated (Shaywitz, 2003). Brain research holds especially exciting promise for reading fluency.

Problems

The paucity of funding for literacy materials and literacy specialists in secondary schools is not the only barrier to increasing the reading ability of adolescent struggling readers. The reluctance of secondary-level content area teachers to deal with reading issues is an enormous problem for secondary administrators who desire to implement reading improvement programs in their schools. Secondary teachers often openly rebel against the implementation of reading improvement programs because they feel their students should arrive at the secondary level as proficient readers; even if they do not rebel, they do not feel qualified or responsible to meet reading needs (Ness, 2009). The fallacy of this type of thinking is summarized by Phillips (2005) in the following statement:

If students two to three grade levels behind their peers do not receive intensive literacy instruction, the results can be devastating because the struggling reader will not experience success within the content areas.

Therefore, it becomes even more critical that secondary content area teachers better understand and teach specific literacy strategies to help students read and extract meaning from the written material used to teach the course content. (p. 2)

Often, teachers' job performance evaluations, and in some districts even salary, are tied to how well their students perform on the standardized tests in the content area that they teach. The uninformed content area teacher must begin to realize that if a student cannot read the textbook with appropriate fluency and comprehension, the chance of passing a timed standardized test on that content area's material is significantly diminished.

The tension between content area teachers and administrators in regards to addressing reading in the content area is often a function of a separate problem-lack of teacher training. Karlin (1969) contended that secondary content area teachers often feel that they are not responsible for teaching reading because of the lack of qualified reading teachers and directors of reading at that level. Many high school teachers do not even realize that secondary students can benefit from instruction in reading, therefore they obviously do not see themselves as reading teachers (Jackson, 1979). High school teachers rarely take classes or participate in trainings on how to teach reading in the content area or how to recognize specific reading problems that need to be referred for intervention. The National Council on Teacher Quality (2006) found that "only 14

percent of education schools require courses that teach the basic components of good reading instruction” (p. 31). Thus, the graduates of those programs feel unqualified to address reading in the secondary classroom setting, even when they recognize a potential problem (Ness, 2009). Preparation of content area teachers for reading instruction and intervention is an issue that must be dealt with by college departments of education and state teacher certification boards. Those two entities must demand that teacher candidates be qualified to recognize and remediate reading deficiencies, whether they are reading teachers or not.

Another problem is that students who cannot read fast enough (or with enough accuracy and prosody) to follow along with the increasingly rapid pace of secondary classroom reading quickly become frustrated and disinterested. Subsequently, their grades suffer because they have not had the same access to, or understanding of, the material (stories/expository text) that the other students have had. They are effectively excluded from classroom instruction because of their reading fluency deficiencies. Conversely, students who can keep up with the speed of the classroom reading can make connections to the text and relate the text to prior background experiences as they read. When combined with the problem of secondary teachers who do not, or cannot, teach reading, the results of inadequate reading fluency are devastating to secondary struggling readers. That is why the three fluency subskills (reading speed, reading accuracy, and reading prosody) are the focus of this study.

The overwhelming response to the pervasiveness of adolescent struggling readers has not been a call for an increase in reading intervention or reading classes, but rather a decrease in the difficulty of texts so that the students can access the material. This

demand began as early as 1940 and continues in the present day (Chall, 2006). Scaling back content is currently considered an acceptable alternative to teaching adequate reading skills. According to Chall, textbooks designed for 12th grade students are most often written at a 9th grade reading level. Unfortunately, the natural consequence of reducing the semantic difficulty and syntactic complexity of texts is the inability to perform proficiently on standardized tests, which are written at grade level. Another consequence is the perpetuation of reading difficulties in later grades or in college because the root problems did not receive appropriate attention and effective remediation. Reading standards are once again on the rise due to the influence of NCLB (2001) and the Common Core Standards (National Governor's Association, 2011), but the rebound is slow because of the aforementioned obstacles.

Societal Developments

Accountability is a buzzword that has permeated American society, influencing everything from politics, to business, to education. In the education world, accountability is the accepted euphemism for making sure local schools and entire school districts pass the adequate yearly progress (AYP) guidelines set by NCLB (2001). The focus on accountability especially influences reading because the ability to read proficiently has a direct impact on how well a student can perform on tests in all subject areas, not just the reading portions. Reading is the essential skill that allows access to test content in the other academic areas. Therefore, reading instruction, remediation, materials, theories, and research has been scrutinized like never before. Education stakeholders acknowledge that when reading problems begin to decline, scores will increase proportionally (NCLB, 2001).

However, the push for accountability overlooks the reality that many poor readers, especially adolescent at-risk readers, arrive at school each day with oppressive problems ranging from hunger to abuse. These problems are in addition to the normal stress that comes with being an adolescent, a fact that was first recognized in Hall's (1904) foundational work *Adolescence*. No amount of accountability and no number of new laws are going to convince a child in these circumstances to worry about their reading behavior. Maslow (1943) made it clear that unless basic needs are met, learning will not occur. The increasing prevalence of students who arrive at school each day with unmet basic needs is a societal development that makes teaching reading a much more difficult task. That is why the literature review section includes a discussion of how socioeconomic factors (environmental factors) may significantly impact reading comprehension.

Humans develop by learning (Piaget, 1969). American society as a whole now recognizes, and even verbalizes, that development in life, regardless of the endeavor, is largely dependent upon the ability to read fluently and comprehend (Reis & Fogarty, 2006; Swick, 2009). Thus, it is not just NCLB (2001) that forces schools to make reading a priority; it is society as a whole that now points to reading as a key factor in a successful, fulfilling life.

Problem Statement

Struggling readers are most easily identified by their reading disfluency (Hudson, Lane, & Pullen, 2005). Profiles of secondary level struggling readers frequently identify fluency, as opposed to decoding, comprehension, or any other reading component, as their weakest skill (Hock et al., 2009). It is not uncommon for students to enter high

school on grade level and see their reading fluency remain stagnant, or even decrease, over their final four years of school (Lenters, 2006). While the ability to read fluently generally increases exponentially in elementary school, its growth is sluggish in middle school, and stagnates or declines in high school, often resulting in reading apathy and disengagement from the reading process (Strommen & Mates, 2004).

Even students who enter high school reading at grade level often fall away from the standard due to their inability to read fluently enough to keep up in class or comprehend what they read outside of class. Seventh, eighth, and ninth grade struggling readers become slightly frustrated, but by grades ten and eleven, the frustration has often developed into hopelessness. Lack of fluency is the major reason why this occurs. High school students that “require significantly more time to accomplish any reading assignment than do students who read at a normal reading rate . . . will be frustrated, avoid reading, and, ultimately, fail in school” (Rasinski et al., 2005, p. 22).

The knowledge that reading fluency is a progressively worsening problem for adolescent readers is not enough. It is more important for educators to know which of the three fluency subskills (reading speed, reading accuracy, and reading prosody) most influence reading comprehension, because reading comprehension is the ultimate goal of all reading skill instruction. Once it is known which of the three fluency subskills most impact reading comprehension, more informed and focused instruction and intervention can be developed and implemented.

Reading proficiency is much more of a recent topic of discussion than it has been in the past. The average parent now understands the importance of the ability to read well. Adequate reading skill is especially important for students who are identified as at-

risk. Students who are identified as at-risk are often poor readers, and poor readers are disproportionately represented in juvenile detention facilities in this country (Christle & Yell, 2008). Reading success for adolescent at-risk readers is an important topic that every parent, teacher, and political entity must endeavor to fully understand. This study seeks to improve that understanding through examination of how the three fluency subskills relate to reading comprehension.

Purpose Statement

The purpose of this correlational study was to use archival data to examine the relationship between reading speed and reading comprehension, reading accuracy and reading comprehension, and reading prosody (the pace, smoothness, expression, attention to textual clues, and suprasegmental ability with which one reads) and reading comprehension in at-risk adolescents (ages 13-19) at a maximum security juvenile prison in the Northeastern United States. The fluency variables of interest are (a) reading speed, generally defined as how many words are read correctly in one minute, (b) reading accuracy, generally defined as how many words are read correctly as a percentage of the number of total words read, and (c) reading prosody, generally defined as how smoothly one reads. Bivariate correlational analyses were conducted to examine the relationship between each of these fluency subskills and reading comprehension, generally defined as how well one understands what is being read. Understanding the relationship between these variables enables reading specialists to make reading intervention for at-risk adolescents more focused, efficient, and effective. This more focused, efficient, and effective approach to reading intervention will be possible because the results of the

quantitative analyses have indicated which of the three fluency subskills most highly correlates with reading comprehension.

Significance of the Study

The significance of the study is twofold: First, classroom teachers, who have limited time for intervention, will be able to direct that time toward the fluency variable that had the largest impact on comprehension. Thus, it decreases wasted class time, which is imperative when trying to prepare students for yearly exams. For example, if a reading intervention specialist discerns that a student is struggling with comprehension because of inadequate reading speed, he or she will know how to intervene in the most effective and efficient manner, given the amount of time and resources available. Secondly, it also added another piece of information to the growing, but still inadequate, body of knowledge on adolescent reading instruction and intervention. Reading is a very complex and multifaceted operation that has tentacles reaching back into early childhood, and covers every dimension of the student's life from that point onward.

Research Questions and Hypotheses

This study examined the following research questions:

1. Is there a statistically significant relationship between reading prosody (as measured by the Multidimensional Fluency Scale [MFS]) and reading comprehension (as measured by the Measures of Academic Progress [MAP]) in at-risk adolescent readers?
2. Is there a statistically significant relationship between reading speed (as measured by the *Qualitative Reading Inventory-4* [QRI-4]) and reading comprehension (as measured by the MAP) in at-risk adolescent readers?

3. Is there a statistically significant relationship between reading accuracy (as measured by the *QRI-4*) and reading comprehension (as measured by the MAP) in at-risk adolescent readers?
4. Which of the three fluency variables (as measured by the MFS and *QRI-4*) is most strongly related to reading comprehension (as measured by the MAP) in at-risk adolescent readers?

The associated research hypotheses are as follows:

1. There is a statistically significant relationship between reading prosody (as measured by the MFS) and reading comprehension (as measured by the *Measures of Academic Progress* [MAP]) in at-risk adolescent readers.
2. There is a statistically significant relationship between reading speed (as measured by the *Qualitative Reading Inventory-4* [*QRI-4*]) and reading comprehension (as measured by the MAP) in at-risk adolescent readers.
3. There is a statistically significant relationship between reading accuracy (as measured by the *QRI-4*) and reading comprehension (as measured by the MAP) in at-risk adolescent readers.
4. The fluency variable that is most strongly related to reading comprehension in at-risk adolescent readers (as measured by the MAP) is reading prosody (as measured by the MFS).

Research Hypotheses in Null Form

The associated null hypotheses are as follows:

1. There will not be a statistically significant relationship between reading speed (as measured by the *QRI-4*) and reading comprehension (as measure by MAP) in at-risk adolescent readers.
2. There will not be a statistically significant relationship between reading accuracy (as measured by the *QRI-4*) and reading comprehension (as measure by MAP) in at-risk adolescent readers.
3. There will not be a statistically significant relationship between reading prosody (as measured by the *MFS*) and reading comprehension (as measure by MAP) in at-risk adolescent readers.
4. There will not be a statistically significant difference between how strongly reading prosody (as measured by the *MFS*) is related to reading comprehension (as measured by MAP) and how strongly reading speed and reading accuracy (as measured by the *QRI-4*) are related to reading comprehension (as measured by MAP) in at-risk adolescent readers.

Explanation of Research Hypotheses

The research hypothesis that reading prosody correlates more highly with reading comprehension than any of the other variables of interest is based on the belief that prosody, while still a subpart of fluency, provides a bridge that connects fluent reading to comprehension of text (Kulich, 2009). Research suggests that students who read with appropriate pace, expression, intonation, and attention to textual features have a much better chance of understanding what the text means (Dorit & Mashraki, 2007). It is possible to read with speed and not comprehend, and it is possible to read with accuracy and not comprehend because speed and accuracy can be achieved with strong decoding

skills, even if those decoding skills are not accompanied by any understanding of the text. However, it is unlikely that students whose reading does not exhibit attention to prosody truly comprehend what they are reading (Petscher & Kim, 2011). Therefore, it is hypothesized that students who read with appropriate prosody will test higher on comprehension assessments than students who only read with the appropriate speed and/or accuracy.

Prosodic input, or how well one picks up on the cues within spoken language, can differ greatly from prosodic output, or how well one can look at print and recognize the speech cues that are necessary and transfer those cues to spoken language. This difference is due to the prosodic cues that can be readily heard in speech, but not in print (a concept the researcher refers to as prosodic deficit). This study was only concerned with prosodic output; can an adolescent struggling reader look at the printed word and overlay the proper prosody onto the text and then relate the meaning accurately? Other reading fluency factors may prepare adolescents for becoming efficient comprehenders of what they read (or prevent them from becoming efficient comprehenders of what they read), but problems in that realm can be overcome far more easily than problems with prosodic output when it comes to learning to comprehend literature.

Identification of Variables

There were four variables of interest in this study. Each is operationally defined below:

1. *Reading speed*: Reading speed was operationally defined as the results on the *QRI-4* reading assessment. The number of words read correctly per minute provided that number. There are no published guidelines for how

quickly a high school student should read, so defining appropriate speed is impossible.

2. *Reading accuracy*: Reading accuracy was operationally defined as the results on the *QRI-4* reading assessment. A percentage of words read correctly, as a function of the total number of words read, provided that number. Scores could have ranged from 0-100%. Participants who scored above 95% were considered to be accurate readers.
3. *Reading prosody*: Reading prosody was operationally defined as the results on the MFS prosody assessment. Scores ranged from 4-16. Generally, scores below eight indicated that fluency may be a concern. Scores of eight or above indicated that the student was making adequate progress in fluency (Zutell & Rasinski, 1991).
4. *Reading comprehension*: Reading comprehension is operationally defined as the results on the MAP Reading Comprehension subtest. The RIT (Rausch unit) score on the reading comprehension subtest provided that number. Scores could have ranged from 170-270. The score for adequate comprehension depended on the participant's grade level at the time of the test.

Definition of Terms

In order to ensure that the communication in this study is received as intended, following is a list of words that are likely unknown or have ambiguous meanings, and their corresponding definitions:

1. *disfluency*: Disfluent reading is characterized by lack of speed, accuracy, and prosody.
2. *suprasegmental*: The smooth transition from letter to letter, word part to word part, word to word, or sentence to sentence shows suprasegmental ability.
3. *validity*: Validity is the extent to which a test measures what it is supposed to measure.
4. *reliability*: Reliability is the extent to which a test is repeatable and yields consistent scores.
5. *automaticity*: The ability to recognize a word in print without having to decode its constituent parts is called automaticity.
6. *at-risk*: For the purposes of this study, at-risk status will be determined by enrollment in the target facility's education program. At-risk students are students whose life circumstances, behavior, and/or intellectual ability make them likely candidates for school (and, therefore, reading) failure.
7. *prosody*: Intonation, pitch, tone, phrasing, smoothness, expression, and use of print cues characterizes prosodic reading.
8. *metacognition*: Metacognition is awareness of how one is thinking and processing the text as he/she reads.

CHAPTER TWO: REVIEW OF LITERATURE

Introduction

This review of the literature provides an overview of the reading process, discusses the uniqueness of adolescent reading difficulties, focuses on the place of fluency in that discussion, and explains fluency and its three subskills. The literature review continues by examining comprehension and how readers understand what they read, analyzing how fluency and comprehension are related, hypothesizing and answering the question of which fluency subskills most impact reading comprehension, and mentioning other potential factors that will not be included in the study as variables, but may have an impact on reading comprehension. While all these factors are being scrutinized, it is the three fluency subskills that are of the most interest in this literature review because they are the ones involved in the statistical correlation analyses.

The scholarly books and articles that are discussed in this literature review are varied. The majority of them are quantitative studies that give some transferable information to consumers of the research. Some of the articles and books are from respected names in the field of reading research. These authors are respected because their ideas have been shown to be consistently valuable over the course of many years, despite the constant examination and criticism of their findings. Because the subject of at-risk adolescent readers is currently such a sparsely researched topic, many articles are included that may not seem to be exactly on issue, but provide insight from the broader field of reading research, and are applicable to this research in some relevant way.

This research also recognizes that while fluency and comprehension are not part of a completely linear process, fluency is a precursor, as opposed to a by-product, of reading comprehension (LaBerge & Samuels, 1974; Pikulski & Chard, 2005). Some reading theorists surmise that true fluency is an indication that active comprehension has already occurred (Fuchs, L., Fuchs, D., Hosp, & Jenkins, 2008). However, logically speaking, the goal (i.e., reading comprehension) cannot precede the steps to reach that goal. The prevailing view of the vast majority of past and present adolescent reading fluency experts (see Allington, 2002; LaBerge & Samuels, 1974; Rasinski, 2003b; Shanahan, 2003; Torgesen, 1975) is that fluency must precede comprehension in reading acquisition.

Theoretical Framework

This research on adolescent reading struggles has a few major underlying principles. First, every student has the potential to learn to read if their primary needs are met and they are given the correct social conditions (Maslow, 1943). Second, the problems that have prevented adolescents from acquiring reading comprehension proficiency are preventable if attacked in the correct manner and at the correct developmental stages (Chall, 1983; Erikson, 1950; Piaget, 1969). Third, reading fluency is a highly technical skill with numerous interactions between print, the eyes, speech organs, and the brain (Biemiller, 1978; Hudson et al., 2009; Kame'enui & Simmons, 2001; LaBerge & Samuels, 1974). Each of these principles is either an original social or educational theory, or can be traced to an existing social or educational theory.

Maslow (1943) theorized that when a child's major needs (e.g., food, shelter, safety) are met, they will be more prepared to attack school-related tasks, such as reading.

When a child's major needs are not met, they will be unable and unwilling to put energy into tasks that are inconsequential given their more pressing physical and emotional needs. Struggling readers very often come from homes that do not provide the student with the foundation needed to be successful readers (Brooks & Vetter, 1997; Brownell, 2000; Slavin & Madden, 1989). This is especially true of the students whose data will be analyzed for this study.

Teachers generally support Erikson's (1950) theory that humans develop in stages, and Piaget's (1969) theory that humans develop cognitively in stages, but generally fail to recognize that these theories are applicable to reading development. Jean Chall (1983) said that children also develop reading ability in predicable stages that mirror the intellectual and emotional development discussed by Erikson (1950) and Piaget (1969). Chall (1983) surmised that if reading instruction is appropriate to the developmental stage of the student, the skills necessary to proceed through that stage will more readily be attained. When the reading instruction is incorrect for the stage or the child has developmental delays due to intellectual, physical, or emotional shortcomings, the necessary skills will not likely be learned. This failure, in turn, adversely influences the ability to perform adequately at the next stage of reading (Chall, 1983). At that point, remediation is the only option to fill in the gaps that have opened up in reading ability. Human development does not occur at a constant rate, and is not dependent on age. Teachers disregard, to the detriment of students, the fact that some high school students do not arrive with the skills to comprehend what they read. Ignoring differences or gaps in development is especially unfortunate because reading fluency and comprehension are

the most accurate indicators of not just future reading achievement, but future achievement in school as a whole (Hasbrouck & Tindal, 1992).

Reading researchers have long understood that reading fluency is a complicated, multifaceted process (Hudson et al., 2009; Kame'enui & Simmons, 2001). For example, LaBerge and Samuels (1974) proposed the theory of automaticity, a specific reading fluency theory that underlies this research. This theory states that readers have a limited amount of mental energy available for reading. If too much of that energy is utilized to decode words, then less mental energy will be available for understanding what is being read. This theory was an early indication of the importance of explicit phonics instruction, demonstrating that decoding needs to be automatic in order for comprehension to occur. Biemiller (1978) expounded upon the LaBerge and Samuels' idea by demonstrating through highly technical testing that the speed of reading has an enormous influence on how much of the text is understood, and how well it is understood.

The three aforementioned theories provide an excellent foundation for this study. When a student's needs are met (Maslow, 1943), they are provided the correct reading instruction at the appropriate developmental stage (Chall, 1983), and the ability to read with fluency is established early in life (LaBerge & Samuels, 1974; Rasinski, 2003b), reading problems are unlikely to exist. This study looks at students who have one or more of those foundational pieces missing. The absence of one piece of the framework is troublesome, but when a student arrives in the adolescent years without any of those pieces in place, reading success is very unlikely. The intent of this research is to find which of the fluency subskills is the most strongly correlated with reading comprehension

so that effective and efficient means of remediating the fluency skills of these students might be developed.

Research Process

For this review of the empirical literature on the topic of study, information was gathered in two different ways. First, a computer search was conducted. No date parameters were set for the search due to the fact that much of what constitutes foundational reading research was published many decades ago; the researcher did not want to exclude important articles that may have been written prior to the 21st century. Using ERIC and PsycINFO, various combinations of the following search terms were used in order to obtain the most possible pertinent articles: reading comprehension, comprehension, reading fluency, fluency, struggling reader, disabled reader, reading disability, adolescent reader, adolescent reading fluency, adolescent reading comprehension, correlation research design, juvenile delinquent students, prison schools, reading speed, reading accuracy, reading prosody, automaticity, special education, dyslexia, reading and socioeconomic status, adolescent brain research, brain chemistry, reading and the brain, speech difficulties, reading and speech difficulties, hearing difficulties, reading and hearing difficulties, factors impacting reading comprehension, incarcerated adolescents, and factors impacting reading.

The second search was done on the International Reading Association (IRA) website of archived editions (membership required) to ensure that no relevant articles were overlooked. This was simply a process of reading the titles of all published articles in IRA journals over the previous ten years and downloading the ones that were relevant to this research. No restrictions were initially put on research type or design so as not to

exclude articles that may have been of some use, even if the research was limited in terms of methodology or design.

After the search, the articles were placed into three categories: meta-analysis articles, research articles, and nonresearch articles. To further divide the articles, the researcher separated them according to whether they were articles of theory or empirical studies. The last step was to code the articles that discussed the same general topic, such as prosody or brain research. Each article was then read, highlighted, annotated, and filed for use when writing the review of literature. The written format of this literature review is conceptual. It begins with a broad view of the research on reading, then narrows the discussion down to the five parts of reading (i.e., phonemic awareness, phonics, fluency, comprehension, and vocabulary; NRPR, 2000), discusses fluency and comprehension at length (due to their place of importance in the research hypotheses), examines the connection between reading fluency skills and overall reading comprehension, and finally discusses a wide array of variables that may have an impact on reading comprehension.

Adolescents and Reading

Over one hundred years ago, Hall (1904) wrote a two volume work on how stormy and stressful the stage of adolescence can be in human development. Adding mandatory education to the storm and stress that Hall described seems to be a nearly impossible pedagogical task at times. This is especially true today when secondary students are typically asked to read more often and understand more deeply, even as the length and difficulty of the reading rapidly increases. Statistics show that whether a student comes into high school reading above grade level, on grade level, or below grade level, his/her reading comprehension is likely to decrease over the course of those four

years (Rasinski et al., 2005). Although statistics regarding illiteracy amongst adolescents are often intentionally distorted or unintentionally unreliable due to funding and political battles, it is believed that functional illiteracy rates for adolescents range from approximately 20% in Maine to nearly 60% in Louisiana (Educational Cyberplayground, 2011). Even more concerning for the students whose archival data was analyzed for this study is the fact that over 80% of juvenile inmates nationwide are functionally illiterate (Educational Cyberplayground).

The major contributing factor to this increase in reading failure is lack of fluency (NRPR, 2000). Poor fluency has been shown to be the biggest contributor to high school reading failure (NICHD, 2007). Reading failure results from poor reading fluency because of the direct connection between reading fluency and reading comprehension (Rasinski, Rikli, & Johnston, 2009). In response, colleges must offer more remedial reading courses to compensate for these academic deficiencies. Approximately 43% of students at two year colleges, and 30% of students at four year colleges are enrolled in remedial courses (Schachter, 2008).

Attention to fluency usually begins with explicit fluency instruction (i.e., decoding) following the early stages of reading development and ends at the onset of the comprehension stage, typically in late elementary school. Therefore, an absence of reading fluency instruction coincides with the decrease in comprehension in middle and high school. The researcher does not believe that this is a coincidence. The skill of learning to recognize words with automaticity should be mastered as soon as possible in the course of reading development so that comprehension can flourish. If, however, it is

not mastered, the results are clear: “The lack of reading fluency appears to be the greatest impairment in reading” (Rasinski et al., 2005, p. 22).

One researcher described the problem that struggling adolescent readers face by writing that “the demands of academically rigorous subject matter combined with greater dependence on informational text make it imperative for [secondary] students to attain age-appropriate reading skills” (Burns, 1998, p. 223). High school students encounter concept dense, difficult texts, and will not have the time or perseverance to get through them if they read too slowly. Writing in the *School Administrator*, Linda Blackford (2002) stated, “Textbooks got thicker and students have to comprehend much more sophisticated information than they ever have” (para. 13).

Secondary texts have become richer, deeper, and contain longer words and sentences. However, that does not mean that students should read that text more slowly, less accurately, or with decreased prosody. One researcher addressed this situation by saying, “The demands of academically rigorous subject matter combined with greater dependence on informational text make it imperative for students to attain age-appropriate reading skills” (Schifini, 2002, p. 1). Difficult texts must be read just as fluently as lower level texts in order to maintain comprehension (LaBerge & Samuels, 1974; Wolf, Bowers, & Biddle, 2000). To achieve this level of fluency, however, secondary readers must exhibit more proficiency in prosodic ability because an increase in prosody leads to an increase in reading rate, which ultimately leads to an increase in comprehension, just as it does for K-8 students (Rasinski, 2003a). Conversely, if the difficult text causes a slowdown in reading rate, a decrease in comprehension will result.

Past reading experiences, and the negative attitudes toward reading, are difficult to alter once the student has arrived in high school. However it is not completely useless to try to affect the reading attitudes and behaviors of at-risk high school readers. If students' attitudes and reading skills can decrease once in high school (which they certainly can according to the International Reading Association Summary of the NRPR [2000]), it stands to reason that the opposite can occur as well. If there are factors (e.g., lack of instruction, negative attitudes, apathy, negative biological factors, harmful brain and body chemistry changes) that can work to the detriment of the reader, the opposite of those same factors (e.g., effective instruction, positive outlooks, caring about reading, positive biological factors, helpful brain and body chemistry changes) could work in favor of the reader as well.

In addition, students' reading self-image is deeply engrained by grade nine (Strommen & Mates, 2004). At-risk readers have either been successful or have failed miserably in regards to learning the reading skills necessary to succeed in school. There is very little middle ground. The importance of prior success in reading cannot be overstated. It is important that adolescents "see themselves as participant readers in a community that pursues reading as a significant and enjoyable . . . activity" (Strommen & Mates, 2004, p. 18). Motivation to read and reading perception are two factors that can heavily impact adolescent reading. The participants in this study have all of the aforementioned problems that are endemic in at-risk adolescents, but have the additional burden of being incarcerated as well.

Incarcerated Adolescents and Reading

Incarcerated adolescents arrive at juvenile detention facilities having just been through a number of traumatic experiences in both their academic and personal lives. Reading improvement is not high on their list of priorities. Compound that with the fact that the majority of them (74% in this study, according to school records) of the students are receiving special education services and the vast majority have identified or unidentified (but very obvious) reading disabilities, and the reason for poor reading performance amongst incarcerated adolescents becomes clear. However, it may not be the case that the students in juvenile facilities perform poorly as readers because they are in prison, it may be that they are in prison because they have performed poorly as readers. Christle and Yell (2008) stated, “The fact that youths who have deficits in reading are disproportionately represented in correctional institutions suggests that the juvenile justice system has become the default system for many youths who have reading problems” (p. 148). In other words, the inability to read is a large part of the cause for the aberrant behavior and disillusionment that leads to incarceration to begin with.

Many of the factors that lead to incarceration are the same factors discussed in this research as having an influence on reading comprehension. Christle and Yell (2008) broke those factors into two groups: external factors and internal factors. These factors account for the reading deficiencies of the incarcerated youth. Maguin and Loeber (1996) conducted a meta-analysis of the studies that had investigated the relationship between academic deficits and youth delinquency and found that low school achievement predicts delinquency. Maguin and Loeber’s research suggested that academic problems often foster behavior problems, which can lead to subsequent delinquency. Poor academic skills, particularly in reading, do not directly cause delinquency and

incarceration; yet youths with poor academic skills are disproportionately found in the criminal justice system. Since incarcerated adolescents usually began getting in trouble at a time when reading teachers focus heavily on reading comprehension (late elementary and early middle school) they are often in need of very intensive reading comprehension intervention upon arrival at a detention facility.

While prevention of incarceration is not the primary goal of this study, it is important to note that identifying and understanding risk and protective factors can lead to the development of more effective intervention and prevention strategies. To be effective, however, programs and strategies must address the dynamic interaction between individuals and their social contexts, specifically the collaboration among families, schools, and community agencies. Because a majority of incarcerated youths experience serious reading problems, schools can play an important role in helping to prevent incarceration through systematic and effective reading remediation programs. Indeed, all of the key social agents in the youth's life must be directly involved in the intervention in order to divert him or her from the path to incarceration (Walker & Sprague, 1999). Thus, an important secondary purpose of this research was to locate the key to prevent adolescent crime through improvement of reading skills, which can only be done through careful examination and mitigation of the factors that lead to the preponderance of juvenile offenders being poor readers.

One positive aspect of conducting reading intervention exercises with incarcerated adolescents was reported by Christle and Yell (2008):

Students with very low reading skills can make significant and meaningful gains in reading skills in a relatively short period of time. This is

important because youth in correctional facilities read, on average, at the fourth grade level (Brunner,1993) and the average length of stay for adjudicated youth is eight to 11 months (Drakeford, 2002), a relatively short time for remedial education (p. 26).

Similarly, Allen-DeBoer, Malmgren, and Glass (2006) found that systematic reading intervention improves academic outcomes for adolescents confined to juvenile correctional facilities who are also struggling readers.

Five Elements of Reading

The previous information clearly demonstrates that there is a need for English and reading teachers to focus on explicit literacy instruction in high school (NICHHD, 2007). According to the NRPR (2000), secondary literacy instruction should include fluency and comprehension skill building and practice, but it should flow naturally from previously-learned phonemic awareness and phonics skills. As part of this literature review, it is worth briefly outlining the five components of reading as described by the NRPR (2000). Those components are: phonemic awareness, phonics, fluency, vocabulary, and comprehension. The three most often dealt with in secondary remedial reading settings are fluency, vocabulary, and comprehension.

Fluency, vocabulary, and comprehension are inextricably intertwined and very difficult to separate, especially at the secondary level (Hudson et al., 2009). However, reading teachers must do just that in order to determine the specific causes of reading disabilities when they manifest themselves in adolescent readers. Then, in circumstances when disfluency is found to be the main obstacle for a struggling adolescent reader, teachers must be able to further investigate the student's skills in regard to the three

elements that comprise fluent reading in order to diagnose and remediate the deficiencies that exist. It is hoped that this research supplies teachers with the information needed to make that investigation more efficient and more accurate.

Fluency: Exploring One Specific Reading Variable

History

Fluency strategies and interventions over the past 200 years have been as varied as the eras from which they came. In the nineteenth century, when textbooks began to be utilized to teach reading, oral reading dominated reading instruction in the United States (Rasinski, 2003b). Both the McGuffey Reader and the Newell Reader focused on oral reading instruction and intervention. The aim was eloquent reading (Smith, 1965). The students would recite or read a short story, fable, or Bible verse, and be graded on how fluently the passage was verbalized.

Near the beginning of the twentieth century, oral reading “was largely and vociferously shunned by most reading scholars, and its popularity began to wane” (Rasinski, 2003b, p. 24). Many of the new texts were beginning to focus on phonics instruction and practice. Thomas Mann complained at this time that reading had become the “action of the organs of speech rather than an exercise of the mind in thinking and feeling” (Rasinski, 2003b, p. 25). The goal at that time was to move all readers towards silent or independent reading that was focused on comprehension and meaning. Instruction in reading now took place within the confines of the study of literature. Interventions focused on getting students to read more by themselves, without interference from teachers. Independent reading was more feasible due to the fact that the availability of text (newspapers, magazines, books, etc.) in the early twentieth century

was increasing exponentially. Horace Mann's Common School movement was influential in focusing the mind of students on silent reading and gleaning thoughts from the printed page. Silent reading became such a focus, in fact, that even the internal sounding out of words was discouraged (Hoffman, 1987).

As reading problems inevitably began to arise due to the "nonoral" methods of reading in schools, the pendulum swung and oral reading became more popular as a way for the teacher to assess and intervene when there were obvious reading deficiencies. However, even today, oral reading intervention techniques are varied and often ineffective. In an attempt to adopt "research-based and up-to-date" (Thomas & Wexler, 2007, p. 22) fluency strategies, secondary-level administrators and teachers have begun to latch on to any new method that arises from research and claim it as the holy grail of fluency intervention.

Unfortunately, little is known about the effectiveness of high school fluency intervention programs because of their newness and the dearth of published articles synthesizing the foundational ideas of current intervention programs (Wexler et al., 2007). One influence the author hopes this research has is to focus the direction of fluency interventions towards improving the fluency subskills that will directly influence reading fluency, and subsequently, reading comprehension.

Definition of Reading Fluency

The definition of reading fluency is not commonly agreed upon. Many reading educators have defined fluency as the number of words read correctly in one minute, but that is not an appropriate definition of reading fluency given what researchers now know about the topic of reading fluency and its component subskills (Valencia, Smith, Reese,

Li, Wixson, & Newman, 2011). To truly understand how fluency subskills impact reading comprehension, it is obviously necessary to understand fluency in depth. Dudley and Mather (2006) stated, “Although it is easy for teachers to recognize a fluent reader when they hear one, considerable debate still surrounds the definition of oral reading fluency (ORF)” (p. 17). Essentially, fluency comes down to “effective word recognition skills that permit a reader to construct the meaning of text. Fluency is manifested in accurate, rapid, expressive oral reading and is applied during, and makes possible, silent reading comprehension” (Harris & Hodges, 1995, p. 85).

Wolf and Katzir-Cohen (2001) stated that “the unsettling conclusion is that reading fluency involves every process and subskill involved in reading” (p. 220). Upon close examination, most of the definitions found in the literature can be synthesized into three components: (a) speed, (b) accuracy, and (c) prosody. While these three work together to comprise fluency, they can also be further deconstructed into their constituent parts. Doing so provides insight into how each of fluency’s three skills work.

Reading speed. Adams (1990) said, “The most salient characteristic of skillful reading is the speed with which text is reproduced into spoken language” (p. 21). The most common measurement of reading speed is number of words read correctly per minute. Samuels (2007) stated that it is appropriate to use reading speed as a means to measure student reading progress, but only if the focus on speed does not interfere with comprehending text. An essential component in establishing fluency goals for high school students is not only analyzing what reading speed is necessary to succeed in the classroom, but analyzing standardized tests to see what speed is necessary for there to be time to read, comprehend, and answer the questions presented to them (Sibley, Biwer, &

Hesch, 2001). Calculating the number of words per minute needed to achieve success (fast enough, but also with adequate comprehension) in standardized testing situations should be an important goal of fluency instruction. A reader who reads with adequate speed for a particular reading task demonstrates a functional working memory, demonstrates a grasp on phonics, has the ability to fixate on chunks of words rather than single words or word parts, and can understand nearly all of the words that are read.

Working memory. Working memory and comprehension have an undeniable correlation (Berniger, Abbott, Swanson, & Lee, 2010; Swanson & O'Connor, 2009). However, reading speed and working memory must also be closely related because without the ability to hold items in working memory, students are not able to quickly recall word parts or whole words that they have already read as they continue through the text. One study (Ashby & Rayner, 2004) of 27 college-age participants demonstrated this phenomenon by showing in two separate eye movement experiments that short term memory is important to preserving letter and syllable information across saccades. The maturation of a student's long term memory is also important to reading speed because it holds the schema that allows them to access information and details regarding previously-learned topics in a timely manner (Recht & Leslie, 1988).

Phonics skills. Phonics ability is important to accuracy, but is just as important to reading speed. If the reader is not able to put together word sounds in a reasonably efficient manner, reading speed will decrease. A recent study by Eldredge (2005) showed a causal relationship between word recognition (the ability to recognize words by their spellings) and reading speed. Many teachers of reading, seeking to improve reading speed, have focused on reading speed drills or automaticity exercises. However, it

appears that reading speed is most influenced by phonics ability, meaning that word recognition exercises should be the focus of instruction when increased reading speed is the goal.

Eye fixations. While reading, the human eye fixates either on every letter, every word part, every word, every sentence, or even bigger chunks of text. The fewer eye fixations that are required while reading, the faster the subject can read (Ashby & Clifton, 2005). The United States Department of Defense, among other organizations interested in improving reading speed, has used the tachioscope to aid subjects in reducing their number of eye fixations. Fewer eye fixations translates to higher reading speed.

Vocabulary skills. The availability of, and ability to, acquire vocabulary words is just as relevant to reading speed as reading accuracy. Having a large vocabulary at their disposal reduces the number of times a student has to stop and struggle to pronounce an unknown word, but it also aids in comprehension. If a student automatically recognizes and effortlessly pronounces the words that are being read, he will read faster and more fluently than if he does not (Biemiller, 1978; LaBerge & Samuels, 1974). Studies show that as the number of unknown words decreases through teaching activities such as preteaching of key words, it not only increases reading speed, but reading comprehension as well (Alessi & Dwyer, 2008; Burns, Dean, & Foley, 2004).

Reading accuracy. The most common measurement of reading accuracy is the percentage of words read correctly during a fluency test. Reading words quickly with the correct pronunciation is a skill that relies heavily on phonics. Edwards (2008) conducted an action research project in a classroom consisting of sixteen ninth grade students and found that a high school level, structured phonics program is the most effective way to

impact the reading fluency of adolescent at-risk readers. Without accuracy, fluency is impossible; without a solid phonetical foundation, accuracy is impossible. The phonics-accuracy-fluency-comprehension relationship is at the heart of the emphasis on phonics in early childhood education. Thus, it should be at the heart of any attempt to remediate reading difficulties in adolescent readers as well. A reader who reads accurately exhibits automaticity, has an excellent grasp of phonics skills for sounding out new words, and does not substitute or omit words while reading.

Automaticity. Schwanenflugel et al. (2006) found that word reading accuracy is highly correlated with automatic reading. Automatic reading is the core of fluency in general (LaBerge & Samuels, 1974), but also the heart of accurate reading because it shows an ability to decode quickly and sound out correctly, which leads to increased comprehension (Schwanenflugel et al.).

According to LaBerge and Samuels (1974), automaticity is a result of word understanding (i.e., phonetical awareness) and the ability to limit mistakes as the reading occurs (i.e., accuracy). The technical aspects that surround the issue of automaticity are beyond the scope of this review, but a plethora of technical fluency research supports the idea that automatic reading is a key component to both reading accuracy and reading speed. The research on automaticity most likely began as early as 1899 with Bryan and Harter. They stated that “automatism is not genius, but it is the hands and feet of genius” (Bryan & Harter, 1899, p. 375).

Phonics skills. Phonics skills are important to reading accuracy because without the ability to break down multisyllabic words using orthographic knowledge, accurate and fluent reading is unlikely (Archer, Gleason, & Vachon, 2003). Even more relevant to

secondary teachers is the premise that “it is not too late for struggling secondary readers to learn to read multisyllabic words and improve their overall reading ability” (Archer et al., 2003, p. 91). If accurate and automatic reading is a function of practice, as Allington (1977) found, then practicing the basic phonics skills that allow automatic reading to occur is mandatory.

Vocabulary skills. Weak vocabulary skills produce contextual reading difficulties for students with reading disabilities (Jenkins, Fuchs, van den Broek, Espin, & Deno, 2003). If students have limited lexical access, they will not be able to read many words accurately, which negatively impacts their ability to accurately comprehend the larger context. Though there are some detractors (Ricketts, Nation, & Bishop, 2007), most reading researchers have found that vocabulary ability influences reading accuracy, and those vocabulary skills are best built through repeated and assisted reading techniques as opposed to conventional vocabulary instruction methods or incidental vocabulary acquisition (Dowhower, 1987; Gorsuch & Tagushi, 2008; NICHD, 2000; ZhaoHong & Cheng-ling, 2010).

Reading prosody. Prosodic skill has been hypothesized to predict word reading accuracy and comprehension (Allington, 1983; Dowhower, 1991). The importance of reading prosody to overall reading is becoming more and more obvious as reading research examines it more closely. Prosody encompasses many oral reading skills, such as expression, intonation, suprasegmental ability, and voice pitch (Miller & Schwanenflugel, 2008).

Prosody is a difficult construct to measure (Hudson et al., 2009). The reasons it is so difficult are (a) there are as many definitions of prosody as there are reading experts to

define it, (b) the subskills of prosody are not agreed upon by reading experts, (c) each subskill has to be measured with a separate rubric (for an example of a fluency rubric, see Appendix A), (d) the rubrics themselves are not universally normed, so any resultant measurement using those rubrics would not be universally considered valid, and (e) what each rater considers to fall within the proficient range of each skill is very subjective.

Rather than define prosody, it is sometimes more helpful to look at its purpose. Whalley and Hansen (2006) stated that “prosodic cues help segment the speech stream into phrases, words and syllables, inform syntactic structure and emphasise salient information to facilitate understanding” (p.289). Schreiber (1991) also discussed how prosodic cues segment speech into word chunks to aid reading comprehension.

Prosodic reading is as easy to identify as it is difficult to define. It is often said that it is easy to hear when a student is reading with adequate prosody, even though the term “adequate prosody” is not consistently defined in reading literature. Schreiber (1991) stated:

There are certain phonological cues that provide relatively consistent indication of certain aspects of phrasal organization, especially the ‘higher order’ units of phrasal structure, such as the subject noun phrase and the predictive verb phrase. These cues are the so-called prosodic features. These features are, of course, overtly present in the speech signal and are hence available as primary and observable cues to structure. (p.159)

Conversely, poor prosody can lead to confusion because phrasal structure is poorly organized or completely misunderstood (Yildirim, Yildiz, Ates, & Ctinkaya,

2009). Dowhower's (1991) foundational work on reading prosody listed his six indicators of prosodic reading:

1. There is a presence or lack of pausal intrusions with valid duration.
2. There is a minimum of seven words per phrase.
3. There is an appropriateness to phrasing (suprasegmental ability).
4. There is a lengthening of final words in phrases.
5. There are terminal intonation contours (pitch changes at punctuation).
6. There is a maximum of one stressed word for every five words read.

Effective prosodic reading can be most simply and accurately defined by breaking down prosodic reading into the specific skills (the major ones) that are needed to produce it, according to reading research. Those skills are absence of pausal intrusions, suprasegmental ability, and appropriate attention to textual features.

Pausal intrusions. How often a student pauses while reading, and the duration of those pauses, was found to be an accurate predictor of adolescent reading comprehension (Miller & Schwanenflugel, 2008). In terms of suprasegmental ability, increased duration of eye fixations causes a slowdown in overall reading speed and adversely influences reading prosody. There is a logical progression beginning with eye fixations, which cause pausal intrusions, which in turn decreases reading speed. There are numerous interesting and research-proven psychological explanations for lengthened duration, and while they have implications for reading, they are beyond the scope of this study.

Suprasegmental ability. Suprasegmental ability can be broken down into numerous subskills, and those subskills are not always agreed upon by reading experts. However, at its core, it is simply the ability to move smoothly across syllables, words,

phrases, and sentences without the unnecessary and disruptive pausal intrusions that can be caused by reading with inappropriate stress, intonation, or expression.

Suprasegmental ability is important because “Once learners have established this level of comfort with print, it becomes far easier for them to construct meaning from a given text than when they are still struggling with word identification” (Kuhn & Stahl, 2000, p. 6). Chall (1996) stated that fluent readers make use of emphasis and intonation. It is when they are using proper stress, inflection, and intonation that they demonstrate understanding of the text. Without an understanding of the text, stress, inflection, and intonation could not be appropriate. The problem with this line of thinking is that while lack of fluency does impact on pitch, stress, and expressiveness (Cowie, Douglas-Cowie, & Wichmann, 2002), it is unclear whether the student is unable to read using those particular suprasegmental abilities, or does not recognize the opportunities to use them as they arise in the text. The former indicates a fluency problem, the latter indicates a comprehension problem.

Some researchers have said that the rhythm of perfectly fluent reading should approximate the expressions of spoken language (Allington, 1983), while others have found fault with this statement (Crystal & Davy, 1969; Johns-Lewis, 1986). While most modern reading researchers agree with Allington, I find his argument faulty in two important ways. First, in order for the rhythm of spoken reading to be the same as the rhythm of spoken language, the receptive and expressive prosody that occurs during reading would have to occur at the same rate as the expressive prosody of speech alone, which is clearly an illogicality. Secondly, it would also assume complete control over the mechanics of speech, (such as breath control), a uniformity in the manner of chosen

expression amongst different ages, races, and sexes, as well as an equality of confidence in reading ability and spoken language.

Attention to textual features. One often overlooked element of reading prosody is how well a student attends to the features of text that indicate when to stop, pause, or use expression. The *ability* to use those skills will not result in properly prosodic reading if the reader does not recognize *when* to use them. This is why punctuation, paragraphing, and capital letters are so important to prosodic reading. Chafe (1987) made this point by stating:

Some readers may object that the signaling of prosody is only one of the functions of punctuation, and perhaps not the primary one. Although that is a common belief, and although there are certainly instances of punctuation that do not serve prosodic ends, I will defend the position here that those instances are departures from its main function, which is to tell us something about a writer's intentions with regard to the prosody of that inner voice. (p. 5)

This inner voice guides the punctuation of text. Authors hear what they will write in their own heads before it gets put down on paper. Thus, it is auditory imagery, not grammatically imposed rules, that tells an author how to punctuate. This is why students must be made to read aloud in order for the teacher to capture their understanding of the text and the textual features therein. It is also interesting to note, from the Chafe (1987) study, that the length of intonation units decrease with age, suggesting that older readers naturally pay more attention to textual features and prosodic boundaries and subsequently adjust their reading to approximate natural speech more closely.

The Fluency Number

Never before have reading specialists attempted to quantify these three separate fluency subskills (i.e., reading speed, reading accuracy, reading prosody) with one number. To have a formula that would produce such a number would be an enormously beneficial tool for teachers of adolescent readers. Currently, teachers in secondary schools (if they measure fluency at all) count words correctly per minute to measure speed, count errors per word read to measure accuracy, and then use a rubric to measure prosody. An example of a typical prosody rubric is provided in Figure 1 below.

Figure 1: Typical Prosody Rubric

| |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4. Reads primarily in larger, meaningful phrase groups. Although some regressions, repetitions, and deviations from the text may be present, these do not appear to detract from the overall structure of the story. Preservation of the author's syntax is consistent. Some or most of the story is read with expressive interpretation. Reads at an appropriate rate. |
| 3. Reads primarily in three- and four-word phrase groups. Some smaller groupings may be present. However, the majority of phrasing seems appropriate and preserves the syntax of the author. Little or no expressive interpretation is present. Reader attempts to read expressively and some of the story is read with expression. Generally reads at an appropriate rate. |
| 2. Reads primarily in two-word phrase groups with some three- and four-word groupings. Some word-by-word reading may be present. Word groupings may seem awkward and unrelated to the larger context of the sentence or passage. A small portion of the text is read with expressive interpretation. Reads significant sections of the text excessively slowly or fast. |

1. Reads primarily word-by-word. Occasional two- or three-word phrases may occur – but these are infrequent and/or they do not preserve meaningful syntax. Lacks expressive interpretation. Reads text excessively slowly. A score of 1 should also be given to a student who reads with excessive speed, ignoring punctuation and other phrase boundaries, and reads with little or no expression.

Pinnell, J., Pikulski, K., Wixson, J., Campbell, P., Gough, A., & Beatty, A. (1995). *Listening to children read aloud: Oral fluency*. Washington, DC: U.S. Department of Education, National Center for Education Statistics.

To pare down the cumbersome process of measuring reading fluency ability by providing one fluency number would certainly make measuring reading fluency more efficient, and make it more likely that time-strapped high school teachers would consider measuring fluency, comparing the results to a norms chart (recognized high school word-per-minute norms do not currently exist for many reasons, one being that the preponderance of reading in high school is done silently), and implementing some type of fluency instruction or intervention in their classes.

More specifically, a fluency number would provide an accurate representation of the fluency skills of struggling adolescent readers by combining the three subskills that comprise fluent reading. In addition, while giving an overview of the student's reading fluency, the three numbers that make up the fluency number could also be examined individually to identify the weaknesses more specifically. The combination of the results of this research, which revealed which of the three fluency skills are most strongly correlated with reading comprehension, and the information that could be gleaned from

the fluency number statistic, would make reading intervention much easier and much more focused on the specific problem that the struggling reader is experiencing. Without the fluency number, there is much wasted time in reading remediation, especially among adolescent at-risk readers who read disfluently. Much of that is due to secondary teachers who are untrained in reading instruction and remediation, but some of it is due to a lack of information that prevents identification of the specific fluency issue. Appropriate programs of reading fluency intervention and prevention are of paramount importance if struggling adolescent readers are to attain a level of fluency that allows them to succeed. Scammacca et al. (2007) found that the fluency interventions examined for older students had a very small effect on students' reading rate and accuracy, and virtually no effect on standardized measures of reading comprehension. The development of a fluency number may play a role in changing the focus and subsequently increasing the effectiveness of fluency interventions.

The fluency number, the theory of prosodic deficit, and reading speed norms for high school students could provide the information needed to develop those programs. However, they are all be subjects for further research and development beyond this study.

Fluency Problems: Intervention and Prevention

One method that has shown promise in the field of fluency intervention is computer-assisted instruction (Mastropieri, Leinart, & Scruggs, 1999). This has been especially effective for resistant readers and seriously deficient readers (more than two years behind grade level). The commonsense, logical approach to fluency intervention is to try to provide the disfluent student with the skills that caused the maldevelopment of fluency to begin with, and then build from there. Often those missing skills are code-

based skills that are lacking due to the school's (and teacher's) insistence on using whole language and other "student-centered" reading strategies that have been repeatedly and quantifiably proven as failures (Hempenstall, 2008; Mac Iver & Kemper, 2002; NRPR, 2000). The author of one article on older readers who struggle with fluency stated, "Reading intervention that is grounded in research imparts to older readers the skills they missed in primary grades and can bring them to grade level in one to two years" (Moats, 2001, p. 37). Computer-assisted instruction is especially effective for the instruction and practice of code-based skills because a teacher of adolescent readers may not have the time to teach those skills individually to the at-risk students in her classroom. Computer-assisted instruction of code-based skills would also allow the student to avoid the embarrassment of practicing out loud (i.e. sounding out words) by teaching them the necessary skills covertly and quietly.

The most logical interventions to adopt are the ones that have been demonstrated to work the best. However, the most popular and the most utilized interventions are not always the ones that have been found to be the most effective. Most intervention programs are backed by research, but not all of these programs have been successful. For example, Reading Recovery was supported by a plethora of research, but was such a failure in practice that the program publishers had to start altering testing numbers and changing/redefining terms in order to make it appear successful. Even then, the program was an obvious failure (Center, Wheldall, Freeman, Outhred, & McNaught, 1995). Perhaps the failure of some reading intervention programs is due to the poor quality of research that undergirds them; perhaps it is due to the lack of proper implementation, or inadequate teacher training before using the intervention program. Virtually every

successful fluency intervention has the following characteristics: The assessment for original placement is multi-faceted (not just based on standardized tests), the length of intervention is determined by the level of need, the interventions are research-based, the teacher is knowledgeable, and progress is monitored as movement within the program is accelerated (Feldman, 2004).

Referrals to the reading specialist for placement in a reading intervention program such as those listed above should be made before the reading fluency problem has become unmanageable for the teacher and student in terms of time spent on classroom level remediation (Tier Two intervention if RTI is in use; Coyne, Kame'enui, & Simmons, 2001; Vaughn et al., 2009). If the school is focused on literacy achievement and the students have had access to a variety of reading materials and reading fluency is still an issue “it is likely that an intervention program or initiative is necessary” (Fisher & Ivey, 2006, p. 181). If a new intervention is implemented and seems to be working, gains in comprehension should accompany the gains in fluency. Current research emphasizes the importance of intervention that is early, intensive, and persistent (Coyne et al., 2001; Harn, Linan-Thomson & Roberts, 2008; Jitendra et al., 2004; NRPR, 2000; Vaughn et al., 2009).

While fluency interventions can be effective, prevention is usually the wisest course of action. Fluency interventions have come and gone, but several fluency preventions have withstood the test of time and become accepted by reading experts as best practice. To prevent the initial occurrence of fluency problems, teaching techniques must be examined and labeled as either ineffective or successful.

Like fluency interventions, prevention techniques for fluency are often adopted based on current trends or shoddy qualitative research results rather than what has actually proven to increase reading speed, accuracy, and prosody. For example, in the 1990s, before the NRPR (2000) was published, most classroom teachers had students in high school read in round robin style. In round robin reading, each student takes a turn and reads aloud until the entire text is completed. It sounds logical; students practice reading, other students follow along until it is their turn. Unfortunately, there is no evidence that the round robin technique does anything to increase fluency or comprehension. In fact, it has been found to be a detriment to both fluency and comprehension (Rasinski, 2003a). This is a clear example of a commonly-utilized reading strategy that does nothing to increase fluency or improve comprehension. All teachers need to be aware of reading research and be up to date on the most recent pedagogical techniques and reading strategies in order to be able to teach their students correctly; instruction makes a huge impact (Assaf, 2006; Blackford, 2002; Fischer & Ivey, 2006). This requires them to be wise consumers of reading research so they can differentiate between research-supported techniques and ones that are based on biased or poorly-conducted research. What is fun, student-centered, or well-loved by students and teachers is not necessarily what will work to increase reading fluency in at-risk secondary struggling readers.

There are definite hallmarks of secondary reading programs that influence reading fluency positively. The common characteristics of these programs are that they take place in schools that have a specific required reading class or elective on a school-wide basis, are implemented using a team approach amongst all of the content area teachers,

have incorporated fluency testing at regular intervals throughout the school year, provide reading instruction at the academic level each student needs (Hempenstall, n.d.), and utilize a research-based intervention program that teachers have been trained to use correctly.

Some examples of classroom reading fluency strategies that have valid research to back up their effectiveness are supported reading, code-based intervention, repeated reading, performance reading, choral reading, and teacher read-alouds (Neumann, Ross, & Slobach, 2008; Samuels, 1997). The NRPR (2000) said that guided oral reading with feedback has a significant positive impact on reading fluency, as does repeated reading exercises. Students clearly benefit from following along with their eyes as a fluent reader (presumably the teacher) reads aloud. By following the guided reading with a repeated reading technique, the teacher can utilize the two most effective fluency improvement strategies with every text that the class encounters (O'Connor, White, & Swanson, 2007). One research study found that "repeated readings . . . produced increased reading fluency levels for three high school students who were identified with disabilities in the area of basic reading skills" (Devault & Joseph, 2004, p. 25).

In his book *The Fluent Reader*, Rasinski (2003b) listed the benefits of repeated readings as:

1. It helps good and poor readers recall facts and improves comprehension, which then extends to other, unpracticed passages.
2. It is a better study strategy than note taking or outlining.
3. It helps students remember important information, such as main ideas and key vocabulary.

4. It results in improved comprehension and more sophisticated insights.
5. It promotes faster reading with greater word recognition.
6. It helps struggling readers break out of word-by-word reading into more meaningful phrasing.

Scaffolding, using a temporary support system until further learning is possible (Vygotsky, 1962), is a teaching technique that is effective on many levels, in many subjects, and with a variety of students. Reading fluency is certainly no exception. A teacher should present a reading fluency technique and give a maximum amount of support to the students until the technique has been learned thoroughly. As students experience success, the teacher can release students to do more and more of the task on their own until they can accomplish it independently (Fountas & Pinnell, 1996). Many of the code-based reading programs, such as Wilson (Wilson, 2004), use this scaffolding technique.

Scaffolding can be done as a series of classroom reading fluency exercises. In fact, it is the method that most reading fluency strategies currently utilize. This method is commonly referred to as supported reading, and is based on Vygotsky's (1962) Zone of Proximal Development theory. Assessing reading fluency at regular intervals with some type of curriculum-based measurement is another important aspect of fluency teaching and intervention (Fuchs, Deno, & Mirkin, 1984; Fuchs, L. & Fuchs, D., 1986; Hasbrouck & Tindal, 1992). Unfortunately, assessment of secondary students' fluency is a somewhat futile task until the assessor of fluency skill has national fluency norms for comparison. Prevention of fluency problems and intervention in fluency problems are

very different matters and require very different pedagogical approaches, as the previous paragraphs demonstrate.

Both Pikulski and Chard (2005) and the NRPR (2000) made it clear that the most effective method for prevention of reading fluency difficulties is reading practice. When a student reads, he naturally develops many of the skills that are necessary to prevent problems with reading fluency, such as strengthening graphophonic foundations, building vocabulary, and learning to recognize word parts and spelling patterns (Pikulski & Chard, 2005). Unfortunately, at-risk readers are much less likely to practice reading, further widening the skill gap between them and their grade-level peers.

How Fluency's Three Subskills Impact Reading Comprehension

The previous section defined fluency, its subparts, and common fluency instructional and prevention techniques. However, the ultimate goal is not fluency itself, but the increased comprehension that results from it. It is now known that “at the very least, it is evident that overly slow and disfluent reading is a detriment to reading . . . comprehension” (Rasinski et al., 2005, p. 79) and “improvements in fluency could account for significant and substantial gains in students’ reading comprehension” (p. 79). This hypothesized connection (Biemiller, 1978; Fuchs et al., 2001; Rasinski et al., 2005) between fluency and reading success should make obvious the need to learn which of the fluency subskills most influence comprehension.

The nature of the influence that each of these subparts of fluency has on reading comprehension has not been thoroughly investigated by reading researchers. More importantly, how much influence each of the fluency subskills has on reading comprehension has not been determined. The “how much” is the correlational question

that drives this research because the answer to that question is directly related to the ability to comprehend during the reading process. Following is a simplified explanation of how each of the three fluency subskills impacts overall reading comprehension.

Speed

Reading speed and reading comprehension have repeatedly been shown to have a strong connection. This is true for both grade-level and struggling readers (Biemiller, 1978; Wolf et al., 2000). When a reader can recognize and pronounce the words being read quickly, he or she has to spend less mental energy on decoding, leaving more mental energy to comprehend (Biemiller, 1978; LaBerge & Samuels, 1974). Often, a lack of comprehension is not due to deficiency in vocabulary or a lack of understanding sentence structure, but rather is the result of having spent all of the available brain power on decoding individual words or word parts. This connection was first found by LaBerge and Samuels (1974), but has been reinforced and expanded upon in more recent studies (Biemiller, 1978; Hudson et al., 2009; Samuels, Miller, & Eisenberg, 1979; Wolf et al., 2000).

Accuracy

The connection between reading accuracy and reading comprehension is more obvious, even to casual observers. When a reader omits words, reads words incorrectly, adds words, or repeats words, the meaning of the passage gets lost. The more words that are read incorrectly, the more meaning is lost (LaBerge & Samuels 1974; Samuels et al. 1979; Wolf et al., 2000). The relationship between reading accuracy and reading comprehension appears to be highly correlative. As more words are read incorrectly,

comprehension decreases because even the ability to figure out meaning in context is reduced when there are so many unknown words, phrases, or ideas.

Prosody

Like fluency, reading prosody is difficult to define. What constitutes reading prosody varies depending upon who is giving the definition. However, the elements that most can agree upon are proper expression/intonation, suprasegmental ability, and attention to textual clues. Prosody is sometimes seen as more of an indicator that comprehension is occurring rather than a precursor to its occurrence, like reading speed and reading accuracy (Jitendra et al., 2004; Kame'enui & Simmons, 2001). This author, however, feels that reading prosody has a very direct impact on reading comprehension. In fact, one of the hypotheses of this study is that reading prosody is the fluency subskill that is most strongly correlated with reading comprehension. This hypothesis was made because of the researcher's belief that reading prosody is the strongest in students who comprehend well, and the weakest in those who struggle with reading comprehension. Dowhower (1991) and Schreiber (1987) found that infants use prosodic features as a primary cue to the syntactic structure of their language. Children's sensitivity to prosody makes it reasonable to assume an equal dependence on prosodic features when determining the meaning of text later in life (Kuhn & Stahl, 2000). Before looking at other factors that may impact reading comprehension, it is necessary first to explain reading comprehension in more depth.

Reading Comprehension:

An Examination of the Act of Understanding What is Read

History

Tracing the history of reading comprehension is not as simple of a task as it is for reading fluency. Reading fluency is a much more technical topic, so along with developments in technology and understanding of the human mind came new innovations and theories. Reading comprehension has had few, if any technical improvements over time. The goal of reading throughout history has always been to understand what is being read. The purposes for wanting to understand written text may have changed, but not the goal. Comprehension has always been the goal of reading (Allen, 2005; Chall, 1983; Goff, Pratt, & Ong, 2005; National Reading Panel, 2000). Whether the teacher was concerned with the students' ability to read and comprehend some holy book, classic piece of literature, technical manual, or story read for pleasure, the concern has always been comprehension of the literature. Strategies for teaching comprehension to students have evolved as new research has taken place, but that is quite different than technological innovation.

A distinction must be made here between testing comprehension and teaching comprehension. It has only been relatively recently that teachers of adolescent readers have begun to differentiate between the two, and teach accordingly. In the past, teachers have read a passage with students or had them read it themselves, assumed comprehension, and then asked questions about the text either verbally or in print. This is testing comprehension. Now informed and educated secondary teachers model comprehension strategies that ensure comprehension of text and then release the students to use those strategies on their own. This is teaching comprehension.

Definition of Reading Comprehension

Simply put, to comprehend what is read is to be able to make meaning from the text. Goff et al. (2005) stated that “reading comprehension involves the extraction of meaning from written language and it would generally be agreed that comprehension is the ultimate goal of teaching children to read independently” (p. 583). The debate between author’s intent and the interaction of the reader with the text is beyond the scope of this study, but it seems to this researcher that it requires more reading proficiency for a reader to be able to look past his or her own experiences and biases and see the literature in the way that it was intended than to simply view a text in light of life experiences.

Overarching Components of Reading Comprehension

There are many component skills that comprise reading comprehension. It is an especially complex process for adolescent struggling readers because it involves many facets of previously-learned reading skills that interact with newly-developing skills. Cain, Oakhill, and Bryant (2004) stated that “text comprehension is a complex task that draws on many different cognitive skills and processes” (p. 31). They also concluded that reading researchers have very little knowledge of how the different component comprehension skills work in unison because most research focuses on only one of those components (Cain et al., 2004). However those individual component skills do give reading experts some insight into how people comprehend. Whether readers use only one of these comprehension component skills at a time or many in unison, as the Landscape Model (van den Broek, Rapp, & Kendeou, 2005) suggests, is currently an unsettled debate amongst reading researchers. Following is a list of the overarching skills that comprise reading comprehension.

Vocabulary. There is a strong and nearly unquestioned positive relationship between knowledge of word meanings and comprehension (Nagy, 1988; Zang, 2008). It has been demonstrated through research that “proficient readers bring a wealth of word knowledge that enables them to construct meaning across a variety of texts” (Keehn, Harmon, & Shoho, 2008, p. 338). Some common vocabulary exercises include learning word parts or word families, using context to figure out meaning, and using outside resources such as dictionaries or thesauri.

Speed of cognitive processing. According to the Rauding theory (Carver, 1997), comprehension does not depend on text difficulty or having a purpose for reading; it depends only on the speed at which the reader can cognitively process the words. While word recognition and other component skills are influential and significant early in life, cognitive power takes over as the dominant component at approximately grade six. Discussing the Rauding theory, Carver (1997) stated, “there is . . . an increase with grade of the influence of cognitive power on reading comprehension” (p. 144). The view that cognitive processing ability is a major component of reading comprehension is not held by all. Much new research has been devoted to how to teach comprehension skills to students whose cognitive abilities are impaired in some way. However, the very fact that teachers need to spend an inordinate amount of time and effort teaching comprehension skills to the cognitively weak only reinforces the Rauding Theory’s tenants. Which approach is more correct pedagogically is irrelevant to the fact that cognitive processing does play an enormous role in reading comprehension.

Word identification. The ability to rapidly identify words is an essential precursor to reading comprehension. McCollin et al. (2010) described the need to identify words this way:

Many struggling secondary readers . . . continue to struggle with word identification (e.g., syllabication, identification of affixes to help break words into parts). Research has found that students who expend great energy on decoding typically do not read extensively and, consequently, they do not acquire the background knowledge essential for comprehending secondary-level content-area subject material (p. 133).

This is an especially prevalent problem amongst students of low socioeconomic status.

Attention to textual structures and features. The most commonly-utilized text features are “illustrations, headings, captions, boldface words, graphs, diagrams, and glossaries” (Fisher, Frey, & Lapp, 2008, p. 554). Text structures are often broken down into the following types: compare/contrast, problem/solution, cause/effect, chronological, or descriptive. Each of these text types require the reader to bring a different set of skills to the text in order to comprehend adequately.

Problems With Reading Comprehension

The complex process of reading and understanding often (and quickly) breaks down with adolescent at-risk readers. The reasons for this can be found by examining the specific subskills that are needed to comprehend, but that are generally lacking in adolescent struggling readers. Those skills are numerous and varied, but according to McDonald, Thornley, Staley, and Moore (2009), they can be combined into five distinct categories:

1. previewing text, then applying knowledge about text forms and the ways to use this knowledge to prepare for reading or writing
2. using the surface and language features of a text to build content knowledge prior to reading
3. enhancing comprehension by using more complex skills such as inference and synthesis while continually cross-checking new understandings with what was learned from the preview
4. solving vocabulary problems as they arise during the reading processes
5. reading for a range of purposes and audiences

Wu and Hu (2007) mentioned the need for these additional comprehension skills:

6. textual schema
7. vocabulary knowledge and ability to guess at unknown vocabulary meanings
8. motivation to succeed in life

Recently, reading comprehension best practice has been for teachers to utilize a set of strategies-based skills designed to be used with any text type of any difficulty. Teaching the strategies-based approach emphasizes previewing the passage, noticing textual features, metacognition, postreading exercises, summarizing while reading, paraphrasing, and attention to new vocabulary (Rogevich & Perin, 2008). This approach has been successful with most adolescent at-risk readers (McKeown, Beck, & Blake, 2009).

Catts, Adlof, and Weismer (2006) disagreed that reading comprehension difficulties are as complex as many modern researchers claim them to be. They asserted that deficits in reading comprehension are simply the direct result of deficits in

comprehension of verbal language. Poor adolescent readers can translate words into language (word identification), but cannot make sense of the linguistic information. This is a view that has ample support in literature (Cain, Oakhill, Barnes, & Bryant, 2001; Gough & Tunmer, 1986; Hoover & Gough, 1990) and cannot be disregarded when discussing problems that lead to comprehension deficiencies.

Reading Comprehension: Prevention and Intervention

While prevention of comprehension difficulties begins very early in elementary school (because some of the skills needed to comprehend begin to develop then), intervention in reading comprehension difficulties rarely occurs until upper elementary or middle school, and then by high school the opportunity to remediate is greatly diminished. This occurs because the material that is read increases in difficulty every year, so the student who appears to have the appropriate level of comprehension skills early on due to the easier reading assignments often have not actually developed the requisite skills needed, and that becomes evident when reading becomes more rigorous in middle and high school. Meanwhile, years of potential remediation opportunities have been lost. This phenomenon is a huge problem in terms of recognizing and addressing comprehension deficiencies.

The other obvious problem years of lost remediation time creates is that most schools do not employ reading teachers beyond elementary or middle school, and most secondary-level content area teachers are not trained to intervene to remediate comprehension deficits. Therefore, the student has lost the chance at remediation and begins a cycle in which he becomes frustrated with difficult text, tries for a little while,

then gives up and remains stagnant for the remainder of his years in school. Thus, it is too late for prevention, and intervention is often either unavailable or ineffective.

Effective intervention most often involves instruction in strategies that, when internalized and consistently utilized, aid in comprehension of difficult text. Comprehension strategies are too numerous and varied to cover them all in this literature review.

However, some are worth mentioning here. A strategy that has been proven to be very successful when properly implemented and frequently practiced is paraphrasing. In a case study of at-risk middle school students ($N = 3$), Hagaman and Reid (2008) found that paraphrasing activities increased overall reading comprehension.

Another strategy, called a “framework for reading comprehension instruction” (Faggella-Luby & Deshler, 2008, p. 71), recommends including (a) knowledge of text structures (both narrative and expository), (b) vocabulary/depth of word meaning, (c) domain/prior knowledge, (d) cognitive strategies, and (e) increased motivation/engagement in all reading comprehension instructional situations.

Among the three strategies (i.e., context-based, strategies-based, and basal-based) most commonly utilized by content area teachers in secondary school settings to teach comprehension skills, the approach based on the explicit teaching of comprehension strategies (such as making inferences, finding detail, summarizing, visualizing, synthesizing, evaluating, connecting, predicting, generating questions) was found to be superior to the context-based approach and the basal-based approach (McKeown et al., 2009). Allen (2005) also found these strategies to be optimal for reading skill development.

Other Factors That Influence Reading Comprehension

The three predictor variables (reading speed, reading accuracy, reading prosody) that will be examined in this research were explained in the fluency section above.

Certainly there are other factors that influence reading comprehension. Children acquire the ability to read and write as a result of all of the cumulative circumstances and experiences in their lives (Morrow, 2005). These cumulative circumstances can be classified into two distinct categories: factors that are innate and factors that are environmental in nature. The factors within each of these two categories are each well-supported by rigorous studies. They are discussed here so that as many influential factors as possible are investigated in regards to their impact on reading comprehension.

However, these factors will not be included in the correlation analysis as most are either not quantifiable, a tool to measure them does not exist, or the time to measure them would be prohibitive. They were chosen because literature from the fields of education, reading, psychology, medicine, and sociology support their inclusion as factors that can potentially impact reading comprehension. Each of these factors may contribute to some degree of reading comprehension. Whether or not causation can be determined is a matter for future studies. It is worth noting that the majority of the risk factors that are associated with school failure are similar and can be changed with the correct intervention.

Innate factors. At-risk adolescents routinely read below the average for their peer age group (Christle & Yell, 2008; Harris, Baltodano, Bal, Jolivet, & Malcahy, 2009). This only compounds the problems that already exist among adolescent who are classified as at-risk. There are researchers who believe reading disability to be traceable

to a specific gene or group of genes (Bisgaard, Eibery, Moller, Niebuhr, & Mohr, 1987; Fisher, Stein, & Monaco, 1999). While that is yet to be determined, there are innate traits that research has connected to reading disability empirically. The number of aggravating innate factors that exist in poor readers are too numerous to investigate each of them thoroughly. An attempt is made in this study to choose the ones that are the most consistently mentioned in the reading research literature. Along with the three fluency independent variables that were part of this research, following are other innate factors that may be influential in regards to how quickly, or how successfully, at-risk adolescents attain adequate reading comprehension.

Reading disability (RD). It seems on the surface that all identified reading disabilities should have a very negative impact on reading comprehension. That is certainly not true. Some reading disabilities, such as dyslexia, cause problems with phonemic abilities, but do not lead to adolescent comprehension shortcomings if the disability has been dealt with at an earlier age using a program specifically designed to help correct the disability (Hazoury, Oweini, & Bahous, 2009).

Many of the participants in this study had reading disabilities that may influence reading comprehension more dramatically. A majority of the participants suffer from attention deficit hyperactivity disorder (ADHD) and/or have a RD. Such students face difficulties in reading comprehension that are more troublesome to overcome (Ghelani, Sidhu, Jain, & Tannock, 2004; Willcut et al., 2007). When a student has a RD, the success of intervention depends on the nature of the specific RD, the intervention used, when the intervention began, the intensity and frequency of the intervention, the motivation of the student, and the persistence of the instructor.

Motivation to comprehend what is read. Motivation to succeed in school is an extremely complicated matter. No teacher, literacy specialist, or researcher holds the key to motivating all students in all situations. Motivation to succeed is a largely individualized characteristic. The undeniable truth, however, is that motivation is essential to reading success at all reading levels, and for all ages (Zweirs, 2004). The motivational techniques that work with some students often do not work with others, or work to a lesser degree.

Motivation to read is even more elusive than motivation as a whole. A student could easily be motivated to do well in school or life and have no motivation to read anything other than what is absolutely necessary to get good grades and perform daily functions. High interest reading materials sometimes work, as do some other common motivational techniques (Frager, 2010; Guthrie, Coddington, & Wigfield, 2009). Eventually, however, the motivation to read has to begin to come from within, and not be placed there by external forces such as parents or teachers. The students whose archival data was analyzed for this study are largely unmotivated students in general, and unmotivated readers specifically. It is likely that the few students who are motivated to read comprehended what they read reasonably well.

Perception of the importance of reading. Another factor in reading success is how important students perceive reading to be in their own lives. Like so many other things, if adolescents do not see the value in an activity, they simply will not pursue it (Lapp & Fisher, 2009; Pitcher, Martinez, Dicembre, Fewster, & McCormick, 2010). Many teachers spend time trying to instill the value of reading in at-risk readers instead of motivating them in more tangible ways-some successfully, some not so successfully.

At-risk youth, who are often fighting a number of other life issues, are unlikely to see how reading well could positively impact their future. They are more interested in day-to-day survival. Unfortunately, even if adolescents do begin to see the importance of reading, they are often so far behind their grade-level peers that the reading they do in the classroom is frustrating to them. The most effective approach, once student see the value of reading well, appears to be catching them up to grade level with high-interest/low-level reading materials while still delivering grade-level content.

Stress. Stress plays havoc on the human mind and body. The chemical changes that stress causes in the brain can lead to depression and anxiety. Brinley (2006) said, the brain is where the effects of stress can become “neuro-chemically stamped to grow into full-fledged anxiety disorders, mental illness, phobias, sleep problems and/or depression” (p. 1). During adolescence, stressors are everywhere. Teenagers, especially at-risk teenagers, are constantly bombarded with information and demands from parents, teachers, counselors, and social workers. Of course, stress is compounded exponentially for the participants in this study, since they are incarcerated adolescents. It is likely that high levels of stress in the lives of students negatively impacts reading comprehension due to the depression of the serotonin and dopamine that decreases during adolescence due to a natural process called synaptic pruning (Huttenlocher, 1979). Resilience is necessary for them to overcome the stress and succeed.

Time spent reading per day. Adolescents today simply do not read as much as they did a generation ago (participants in this study are atypical due to the amount of time they spend alone, reading is often their only option other than sleep), which is regrettable because time spent reading is directly related to overall academic performance (Manzo,

2007). Unfortunately, struggling adolescent readers actually read less in school than on-level readers due to time spent on targeted intervention (Fisher et al., 2008). Clark (2006) found that reading just 20 minutes per day increased reading ability in adolescents who were at-risk readers. Many adolescents will report that they read (text messages, instant messages, emails, etc.), but they read very little text that exposes them to narrative or expository structure.

Some theorists surmise that educators should adjust their literacy instruction to match the technology that adolescents are using (Prensky, 2001; Williams, 2008). However, the way the brain processes language, visually and auditorally, has not changed. Reading the specialized text language and misspelled emails do more harm than good in terms of improving reading skills because it hardly resembles the reading skills that will be necessary to survive in high school (Manzo, 2007). Proper reading instruction and real reading opportunities increase neural connections (Wesson, 2003) and help the student to become a more culturally literate member of society (Hirsch, 1988).

Phonics ability. It is well known that ability in the area of phonics allows for better comprehension of material because of the increased speed with which text can be read (Biemiller, 1978; LaBerge & Samuels, 1974). However, while it is possible to have solid phonics skills and still have other issues that prevent adequate comprehension, it is not possible to comprehend well without a strong base in phonics. Phonetical ability is essential to all areas of reading; comprehension is no exception. Reading disabilities of all types are developmental in nature and “usually result from impaired phonological processing” (Willcut & Pennington, 2000, p. 1039). Students who have a RD are very

likely to suffer from deficiencies in orthographic coding (Warnke, 1999), making automatic reading nearly impossible, which in turn makes comprehension very unlikely. Conversely, intensive instruction in phonics and phonemic awareness has a profound impact on the brain, altering its very structure. Keller and Adams (2009) found that 100 hours of intensive remedial instruction affected the cerebral white matter of poor readers. The instruction resulted in significantly increased activity in the white matter (white matter is the tissue that allows for quick transportation of messages between areas of gray matter), which correlated with improvement in phonological decoding ability.

Presence of Attention Deficit Hyperactivity Disorder (ADHD). It is very difficult for students who have been diagnosed with ADHD to focus on any task, but especially an attention-intensive activity like reading. Willcut et al. (2007) found that ADHD has a “significant impact” on academic development (p. 190). They also noted that teachers should, and usually do not, receive instruction on how to conduct intervention for students with ADHD.

ADHD impacts reading comprehension in a variety of ways, but most obviously, students who cannot concentrate on their reading task will not be able to recall what they read. Comprehension certainly suffers when this happens. Paloyelis, Rijdsdijk, Wood, Asherson, and Kuntsi (2010) stated that “the co-occurrence between ADHD. . . and reading disability. . . is well-documented” (p. 1083). They also found that the relationship is driven by genetic factors, which means that the student with ADHD has an innate disadvantage in regards to reading acquisition. Therefore, ADHD most certainly impacts reading comprehension when present.

Listening comprehension. It stands to reason that if a person can listen and comprehend what is being said, he or she would be very likely to be able to read and comprehend as well. Both listening comprehension and reading comprehension require the ability to take in information and process it correctly; therefore, both should correlate highly with reading comprehension. Unfortunately, this is not always the case, especially with the target population in this study, so the correlation between listening comprehension and reading comprehension may not be as high with at-risk readers as reason would dictate. This is especially true considering the high incidence of ADHD among poor readers (Ghelani et al., 2004; Willcut et al., 2007). Additionally, Stothard, Snowling, Bishop, Chipchase, and Kaplan (1998), in a follow-up study of 71 adolescents with a history of speech-language impairments, found that early listening comprehension deficiencies caused reading problems that persisted into adulthood.

Intelligence. One of the age-old questions in the field of reading is: Do intelligent people read more because they are intelligent, or are they intelligent because they read more? Of course there are truly intelligent people who are not great readers, and therefore are not efficient comprehenders of text. Conversely, many intelligent people say they owe their academic aptitude and intelligence to years of vigilant wide reading of texts. Tiu, Thompson, and Lewis (2003) and Vellutino (2001) found that IQ is a significant predictor of reading comprehension ability in adolescent readers. It is also true that IQ predicts the success of reading intervention attempts (Stage, Abbott, Jenkins & Berninger, 2003). In addition, Johnson, Bouchard, Segal, and Samuels (2005) found that reading comprehension is related more with general intelligence than reading aptitude. Some studies have found contradictory results (Kortteinen, Narhi, Ahonen,

2009; Siegel, 1989), but the majority of reading experts believe that IQ and reading ability are strongly correlated. Admittedly, implicit in the comparison between IQ and reading comprehension is the assumption that intelligence can be measured by a standardized IQ test.

Brain-related factors. The adolescent brain is in a state of transition during adolescence (Casey, Jones, & Somerville, 2011.). Huttenlocher (1979) stated that adolescents are encountering a reconfiguration of the prefrontal cortex (responsible for thought and behavior) that is “meant to improve organization of thoughts, language mastery, and other higher order executive functions” (Huttenlocker, as cited by Schwartz, 2007, p. 89). Also, as the thickening of the frontal lobe occurs, “their emotional and behavioural responses are essentially unmediated by judgment and reasoning” (Schwartz, 2007, p. 88).

The good news concerning this reconfiguration of brain function, according to Yakolev and LaCours (1967), is that “their thinking is more efficient, their ability to process information is faster, and their decision-making is more automatic” (p. 86). Even when damage has occurred, it is possible to “bring about significant and durable changes in brain organization so that brain activation patterns resemble those of typical readers using an intensive evidence-based reading intervention” (Shaywitz, 2006, p. 627). As these brain changes occur, the adolescent is also charged with improving reading and language skills.

Problems with the mechanisms of hearing and speech. When a child cannot hear perfectly early in life, they have trouble hearing and/or reproducing the sounds of the English language. When a child with profound hearing loss graduates from high

school, they do so reading at an average of third-grade level (Holt, 1994). Since English is a phonics-based language (letter-sound correspondence is important), reading comprehension difficulty is a logical outcome of hearing loss. This was confirmed by Connor and Zwolon's (2004) study ($N = 91$) of students with hearing loss and speech problems who received cochlear implants are varying ages. Speech difficulties do not have as significant of an impact on reading comprehension as does a combination of speech difficulty and hearing loss.

Physical fatigue. One medical journal article stated that more than one-third of adolescents have fatigue four or more times per week (Viner & Christie, 2005). Teachers of adolescents often cite fatigue as a reason that concentration during school is difficult for their students. Fatigue that is chronic or frequent is even more impactful. Public school secondary teachers are aware that a large majority of students arrive at school each day sleep deprived; they also know how strongly that influences thinking, processing, and motivation. Maslow (1943) would place sleep in the "basic needs" category. Without sleep, no other need along the hierarchy will be able to be met.

Working memory. The ability to comprehend is diminished when the cognitive load on working memory exceeds the capacity of working memory to put forth anymore mental energy (LaBerge & Samuels, 1974; Wooley, 2010). Working memory is "a system for temporarily storing and managing information required to carry out complex cognitive tasks such as learning, reasoning, and comprehension" (Medterms.com). Working memory is limited (the average person can hold seven items in working memory), and when its capacity is exceeded, information is lost (Sung et al., 2009). Working memory is essential to reading comprehension. It actively holds information

that is needed for complex reading tasks and recalls it to meet task demands (Numminen, 2002). Another important facet of working memory, as found in Baddeley and Hitch's (1974) seminal study, is how it is influenced when the subject has a RD that impacts the central executive system that controls the flow of information to and from the visual and hearing centers in the brain.

Environmental factors. Environmental conditions are significantly more disruptive in poor readers than in students who read at or near grade level (Samuelsson & Lundberg, 1996). More troubling is their finding that these environmental influences are larger when considering more global, rather than more specific reading skills. Therefore, environmental influences play a bigger role in the development of reading comprehension than in the development of other reading subskills (Samuelsson & Lundberg, 1996). Following is a sampling of these environmental factors:

Prior remediation attempts. Prior attempts at remediation often have a great influence on a student's ability to read because they affect not only his or her motivation, but also influences his or her personal belief in the success of future remediation attempts. In addition, those prior attempts might have been largely ineffective (especially in this study's target participants), or even harmful due to untrained instructors or poor curriculum (Christle & Yell, 2008; Fisher et al., 2008). Therefore, future attempts to remediate comprehension difficulties have to actually undo prior harm before proper training can be actuated. If prior attempts had been effective, the student would likely not be encountering comprehension problems at the secondary level.

The biggest failure in this regard is the Individual Education Program (IEP) process, which regularly fails at addressing early reading deficiencies, very often causing them to

persist into high school (Catone & Brady, 2005). It is likely that as prior remediation attempts increase, adolescent comprehension problems increase proportionally. A student's response to intervention, if it were to occur at all, would likely come during an early remediation attempt; logically speaking, multiple attempts indicate a resistance to intervention.

Presence of a school literacy specialist. Targeted reading instruction for secondary struggling readers is becoming more common as the field of adolescent literacy grows. NCLB (2001) leaves little choice for school districts. Many secondary schools must employ literacy specialists in order to meet the needs of the growing number of students that arrive in middle and high school with deficient literacy skills. However, there are still far more secondary schools that do not employ literacy specialists than those that do (Blackford, 2002). The presence of a school, or even district, literacy expert in previous school settings is a variable that should correlate positively with reading comprehension for the at-risk students in this study.

Average amount of sleep per night. The amount of sleep that students get on average each night almost certainly influences the ability to comprehend text (Viner & Christie, 2005). Each night, the brain's short-term memory "downloads" all of the day's learning to the hippocampus, the brain's long-term memory storage center (Zhang, 2004). This transfer can only be made completely and effectively during times of deep sleep. Zhang (2004) said, "The function of sleep is to process, encode, and transfer the data from the temporary memory to the long-term memory" (p. 1). Obviously, if deep sleep is not occurring, only a very small percentage of what is in short-term memory is retained.

If the hippocampus does not have the schema, or files, that are created and updated during sleep time, accessing old information is not possible.

The student who does not sleep well and then picks up a book about World War II, for example, does not have a file for World War II information readily available because of the inability to download the previously-learned information. Since accessing prior information and vocabulary is such a large component of reading comprehension, the students will not be able to understand the World War II book as well as they otherwise might have if they had slept well. In addition, lack of sleep causes concentration and brain chemistry difficulties, which both influence the ability to comprehend well. Complicating the matter further is when the presence of a RD, such as dyslexia, makes retrieval of items stored in the long-term memory difficult (Warnke, 1999).

History of drug and alcohol use. Extended drug and alcohol use adversely impacts the brain by making the retention of information that has been read much more difficult (Zhang, 2004). Unfortunately, some of the damage done to the brain by drug use is irreversible, especially in some of the participants in this study because their drug use has typically been heavy and prolonged. With the prevalence of drug use among incarcerated adolescents, it is likely that nearly all of the students whose reading data will be analyzed for this study will have a history of drug and/or alcohol abuse. According to the *Summary of Findings from the 2009 National Household Survey on Drug Abuse* (2010), 10 million adolescents (ages 12-17) had used illicit drugs within the past month. Given these statistics, it is possible that drug and alcohol use plays a significant role in the reading ability of adolescents.

Socioeconomic status. Poverty has always been thought to be a strong predictor of student reading success (Bhattacharya, 2010; Crowe, Coyne, McDonald, & Petscher, 2009; Hecht & Greenfield, 2002). Studies like the one done by Saripinar and Erden (2010) bear this out. They found that “there were significant differences between reading comprehension scores at different socioeconomic levels” (p. 68). However, it is unlikely that reading comprehension is impacted very strongly by the socioeconomic status of students. Certainly poor students are likely to miss school, receive less support at home, and read less. Those things are the actual causes of poor reading comprehension, not poverty itself.

Parent level of education. Parent education is very similar to socioeconomic status in that it is seen as a predictor of student success, but the underlying variables are often ignored. Parents who are uneducated or who barely finished high school are less likely to provide the early childhood literacy experiences needed for their children to develop normally as readers (Senechal & Lefevre, 2002). Those things lead to poor performance in reading in general, and reading comprehension in particular, not the parents’ level of education. If a child is not being read to, he will not be as aware of story structure, words, and language patterns. The link between parental level of education and their children’s literacy skills has been made many times (Senechal, 2006; Sticht & McDonald, 1990), but has also been refuted in similar studies many times. One such study, done by Teale (1986), reported that the research on the issue is at fault because “children are tested . . . and their achievement levels are then correlated with particular home background characteristics. Such research provides no direct evidence for cause-effect relations. Yet . . . these studies suggest implications for instruction” (p. 14).

Modern home literacy programs are now the norm in elementary schools. Literacy experts spend time in the homes of incoming Kindergarten students to support literacy in homes where parents are either not literate or not aware of the importance of an early start in reading.

Level of parental involvement. Practically axiomatic is the concept that family involvement is important to adolescent development and educational attainment (Catsambis, 2001; Gregory & Rimm-Kaufman, 2008). The number of parents in the home and the involvement of those parents in the lives of their children create either feelings of security or feelings of insecurity. How a child feels when he or she goes to school in the morning plays a huge role in the amount of attention and effort that is put into reading during the day. Maslow's (1943) hierarchy is relevant to the student's preparation to tackle the academic challenges of the school day. If a child does not have parents who are involved and caring and does not feel secure when at home, reading comprehension will be very far from his or her mind during the school day.

History of abuse and neglect. The prevalence of a history of abuse and neglect amongst adolescents in the United States is astounding. Many abused and neglected children end up incarcerated as adolescents. One study conducted by the Massachusetts General Hospital for Children (2010) found that between 25-31% of adolescent offenders were abused and/or neglected before imprisonment. Serious abuse and neglect often leads to depression, or other psychoses that result in altered brain chemistry or altered personality. Other untreated health problems are also common amongst the at-risk population (Massachusetts General Hospital for Children). That is why it is easy to see

why reading deficiencies are so common in this group, and why reading comprehension is almost certainly affected by abuse and neglect.

Stability of housing. Students come to secondary schools with a number of different housing backgrounds. Some are homeless, some live with one or both parents, some with friends or relatives, and some in state-run foster care or long-term care facilities. Appropriate housing is an essential need that undergirds the security that is needed to achieve success as a reader (Maslow, 1943). A separate aspect of constantly changing or inappropriate housing is that the student misses reading instruction that is essential. If a student stays at one school for the duration of the school experience and only lives with only one guardian, the chance of receiving sequential, structured reading instruction is much more likely than if the student attends many different schools and has multiple guardians. One of the effects of housing stability is better reading ability in general, and better reading comprehension in particular.

Incarceration. Incarcerated adolescents often arrive at correctional facilities having not attended school for long periods of time due to suspensions, expulsions, or refusal to attend. Very often they have been identified as having emotional or behavioral disabilities. In fact, 47.7% of students in correctional facilities are diagnosed with an emotional or behavioral disability. That number is only 8.1% in public schools (Allen-DeBoer et al., 2006). Because of these disabilities, incarcerated adolescents are often unable to read proficiently; they are often several years below grade level. While large reading gains are common in correctional settings, it is unlikely that they will maintain that progress after release. Systematic reading instruction holds the most promise for

helping incarcerated youth (especially those with behavioral disabilities) succeed academically.

Conclusion

Adolescent at-risk readers perform more poorly (i.e., academically, socially, behaviorally) in the classroom than their peers who are not classified as at-risk (Klecker & Pollock, 2004). This fact cannot be ignored; it is not a coincidence. The innate and environmental obstacles faced by at-risk readers are overwhelming. The burden of work becomes overwhelming in the high school classroom if the student cannot process the information presented with a reasonable degree of fluency and comprehension, in addition to the other previously-mentioned factors constantly interfering with their ability to read effectively and efficiently. The same is true of the standardized tests that students face in high school. The amount and level of reading is often too much for a struggling adolescent reader to comprehend in the time allotted. Failure is frequently the result.

Unfortunately, reading deficiencies and disabilities are often ignored in high school settings. Secondary school teachers and administrators should take a stand against the exclusion of reading instruction because “adolescents are being shortchanged. No one is giving adolescent literacy much press . . . In the United States, most Title I budgets are allocated for early intervention. . . many people don’t recognize reading development as a continuum” (Moore, Bean, Birdyshaw, & Rycik, 1999, p. 2). Of course, it is imperative that early reading intervention remain a focus of funding, resources, and manpower because early reading ability strongly predicts reading ability at the time of high school graduation (Cunningham & Stanovich, 1997).

However, attention must be given to those who have either slipped through the cracks, arrived in this country during later school years, or regressed as readers over time. Even attention alone is not adequate; attention must be focused on the most effective, research-based instructional and intervention programs available. Despite the obvious need, the most valuable information to help make those types of programming determinations has not yet been the subject of adequate research. It is imperative to know which of the three fluency subskills are most highly correlated with reading comprehension if reading teachers are to maximize their instructional and intervention efforts.

CHAPTER THREE: METHODOLOGY

Introduction to the Study

The purpose of this correlational study was to utilize archival data to examine the relationship between reading speed and reading comprehension, reading accuracy and reading comprehension, and reading prosody (the pace, smoothness, expression, attention to textual clues, and suprasegmental ability with which one reads) and reading comprehension in at risk adolescents (ages 13-19) at a maximum security juvenile prison in the Northeastern United States. The fluency variables of interest were (a) reading speed, generally defined as how many words are read correctly in one minute, (b) reading accuracy, generally defined as how many words are read correctly as a percentage of the number of total words read, and (c) reading prosody, generally defined as how smoothly one reads. Bivariate correlational analyses were conducted to examine the relationship between each of these fluency subskills and reading comprehension, generally defined as how well one understands what is being read. Understanding the relationships between these variables will enable reading specialists to make reading intervention for at-risk adolescents more focused, efficient, and effective. This more focused, efficient, and effective approach to reading intervention will be possible because the results of the quantitative analyses shows which of the three fluency skills most highly correlate with reading comprehension, which is the most basic goal of all reading activity.

Research Design

The NRPR (2000) identified fluency as one of the five essential skills for reading success. The present study helped determine the effect size and order of importance of

each of these fluency subskills in relation to the reading comprehension variable of interest. According to Ary et al. (2006), a correlational research design seeks to “determine the strength and direction of relationships” (p. 29). A correlational design was chosen because it was a useful way to analyze the archival data and explore the relationship between the three fluency variables of interest and reading comprehension. Reading rate, reading accuracy, and reading prosody were chosen as the fluency variables for this study because they were identified by the NRPR (2000) as the three major skills that comprise reading fluency. Understanding the relationship between these variables enables classroom teachers and reading specialists to make reading intervention for at-risk adolescents more focused, efficient, and effective (Pikulski & Chard, 2005). Once the researcher quantified the relationships among the reading variables, the correlation coefficients were examined in order to answer the final research question, which asked which of the three fluency subskills were most strongly correlated with reading comprehension in at-risk adolescents. Visual representations of the data were produced to aid in interpretation.

The research questions examined are as follows:

1. Is there a statistically significant relationship between reading speed (as measured by the *QRI-4*) and reading comprehension (as measured by the MAP) in at-risk adolescent readers?
2. Is there a statistically significant relationship between reading accuracy (as measured by the *QRI-4*) and reading comprehension (as measured by the MAP) in at-risk adolescent readers?

3. Is there a statistically significant relationship between reading prosody (as measured by the MFS) and reading comprehension (as measured by the MAP) in at-risk adolescent readers?
4. Which of the three fluency variables (as measured by the MFS and *QRI-4*) is most strongly related to reading comprehension (as measured by the MAP) in at-risk adolescent readers?

The associated research hypotheses are as follows:

1. There is a statistically significant relationship between reading speed (as measured by the *QRI-4*) and reading comprehension (as measured by the MAP) in at-risk adolescent readers.
2. There is a statistically significant relationship between reading accuracy (as measured by the *QRI-4*) and reading comprehension (as measured by the MAP) in at-risk adolescent readers.
3. There is a statistically significant relationship between reading prosody (as measured by the MFS) and reading comprehension (as measured by the MAP) in at-risk adolescent readers.
4. The fluency variable (as measured by the MFS and *QRI-4*) that is most strongly related to reading comprehension in at-risk adolescent readers (as measured by the MAP) is reading prosody.

The null hypotheses are as follows:

1. There will be no statistically significant relationship between reading speed (as measured by the *QRI-4*) and reading comprehension (as measured by MAP) in at-risk adolescent readers.

2. There will be no statistically significant relationship between reading accuracy (as measured by the *QRI-4*) and reading comprehension (as measure by MAP) in at-risk adolescent readers.
3. There will be no statistically significant relationship between reading prosody (as measured by the MFS) and reading comprehension (as measure by MAP) in at-risk adolescent readers.
4. There will be no statistically significant difference between how strongly reading prosody (as measured by the MFS) is related to reading comprehension (as measured by MAP) and how strongly reading speed and reading accuracy (as measured by the *QRI-4*) are related to reading comprehension (as measured by MAP) in at-risk adolescent readers.

Participants

The focus of this study was a convenience sample of incarcerated at-risk adolescent readers from a school inside a maximum security juvenile prison in a rural section of the Northeastern United States. Even though a convenience sample was utilized, all of the participants met the “at-risk” criteria set for study participants. Archival reading data from 82 current and former students was gathered and analyzed. The smaller data pool helped the researcher retain practical utility in the results while still finding significant correlations (Ary et al., 2006). Incarcerated adolescents were the ideal group from which to gather archival data for a study on the reading ability of at-risk adolescents; they are the quintessential at-risk population. As a group, they have experienced nearly every obstacle to reading success that a person can experience. The pervasiveness of risk factors that are present in this population certainly helps the generalizability of the

results, although the uniqueness of the circumstances that the students face every day limits the study's generalizability, as discussed in Chapter 5. The criteria for a student's data to be used in the study was as follows:

- Age: 13-19 at the time assessments were administered
- Availability: Full data sets were available for analysis
- Gender: Male
- Ethnicity: Any could participate
- Identification: Participants must be considered at-risk (defined in this study as commitment to the target facility).

The participant qualification criteria were chosen because the purpose of the study was to determine the relationship between fluency subskills and reading comprehension in at-risk male adolescents. Incarcerated adolescents are considered at-risk because the majority of incarcerated youth have low literacy skills, although most have an abundance of other risk factors as well (Baltodano, Harris, & Rutherford, 2005; Cheesman & De Pry, 2010; Christle & Yell, 2010; Hodges, Giuliani, & Porpotage II, 1994; Krezmien & Mulcahy, 2008). The only students who were excluded from this study were middle school students who had not yet reached their thirteenth birthday, high school students who had already reached their twentieth birthday, or students for whom no complete data set could be located. Women were excluded from this study because reading problems are more persistent and widespread in adolescent males than in adolescent females, and therefore males were the focus of this preliminary study examining the relationship between reading fluency subskills and reading comprehension.

Additional school and participant information, including population demographics, can be seen in Table 1.

Table 1

Demographics of the Study Participants

| Demographic Category | <i>n</i> | % |
|--------------------------------------------------------------------------------------------|----------|------|
| Total Participants | 82 | 100 |
| Males | 82 | 100 |
| Caucasian | 78 | 95.1 |
| African-American | 3 | 3.6 |
| Native American | 1 | 1.2 |
| Limited English Proficiency | 0 | 0 |
| Students Performing Within One Standard Deviation of the Norm On MAP Reading Comprehension | 56 | 68.2 |
| Students Identified as Special Education | 60 | 73.1 |

Every student for whom a complete data set was available comprised the sampling frame. The only exclusions made were students for who no standardized test data could be gathered. For example, some students were nonreaders or lacked the mental stability to participate in testing, so no data exists on them to analyze. Most of the participants were identified as special education students or were enrolled in Title One. Title One is a federal program that provides funds for outside-the-classroom remediation of reading and math skills based on a complicated formula that takes into consideration the economics of the school district and the needs of the individual students (House Resolution 1, 2009).

According to Maine Special Education guidelines (Title 20-A: Education, Part 4: Specific Programs, Subpart 1: Special Education, Chapter 301: General Provisions), a child can be identified with a disability if he or she has been diagnosed as having one or more of the following conditions (source: Maine Unified Special Education Regulation Birth to Age Twenty, 05-071, Chapter 101):

(a) *Mental Retardation*: Mental retardation means significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behaviors and manifested during the developmental period that adversely affect the child's educational performance.

(b) *Hearing Impairment, Including Deafness*: Deafness means a hearing impairment that is so severe that the child is impaired in processing linguistic information through hearing, with or without amplification, that adversely affects the child's educational performance.

(c) *Speech or Language Impairment*: Speech or language impairment means a communication disorder such as stuttering, impaired articulation, a language impairment, or a voice impairment, that adversely affects the child's educational performance.

(d) *Visual Impairment, Including Blindness*: Visual impairment including blindness means an impairment in vision that, even with correction, adversely affects the child's educational performance. The term includes both partial sight and blindness.

(e) *Serious Emotional Disturbance*: Emotional Disturbance means a condition which exhibits one or more of the following characteristics over a long period of time and to a marked degree that adversely affects the child's educational performance: an inability to learn that cannot be explained by intellectual, sensory, or health factors; an inability to

build or maintain satisfactory interpersonal relationships with peers and teachers; inappropriate types of behaviors or feelings under normal circumstances; a general pervasive mood of unhappiness or depression; a tendency to develop physical symptoms or fears associated with personal or school problems. The term includes schizophrenia. The term does not apply to students who are socially maladjusted, unless it is determined that they have an emotional disability.

(f) *Orthopedic Impairment*: Orthopedic impairment means a severe orthopedic impairment that adversely affects a child's educational performance. The term includes impairments caused by a congenital anomaly, impairments caused by disease (e.g., poliomyelitis, bone tuberculosis) and impairments from other causes (e.g., cerebral palsy, amputations, and fractures or burns that cause contractures).

(g) *Autism*: Autism means a developmental disability significantly affecting verbal and non-verbal communication and social interaction, generally evident before age three that adversely affects educational performance.

(h) *Traumatic Brain Injury*: Traumatic brain injury means an acquired injury to the brain caused by an external physical force resulting in total or partial functional disability or psychosocial impairment or both that adversely affects a child's educational performance. The term applies to open or closed head injuries resulting in impairments in one or more areas, such as cognition, language, memory, attention, reasoning, abstract thinking, judgment, problem-solving, sensory, perceptual and motor abilities, psychosocial behavior, physical functions, information processing and speech. The term does not apply to brain injuries that are congenital or degenerative, or brain injuries induced by birth trauma.

(i) *Other Health Impairment*: Other health impairment means having limited strength, vitality or alertness, including a heightened alertness to environmental stimuli, that results in limited alertness with respect to the educational environment, that is due to chronic or acute health problems, such as asthma, attention deficit disorder, attention deficit hyperactivity disorder, diabetes, epilepsy, a heart condition, hemophilia, lead poisoning, leukemia, nephritis, rheumatic fever, or sickle cell anemia, Tourette Syndrome and adversely affects the child's educational performance.

(j) *Specific Learning Disabilities*: Specific learning disability means a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. Specific learning disabilities does not include learning problems that are primarily the result of visual, hearing, or motor disabilities, of mental retardation, of emotional disturbance, or environmental, cultural or economical disadvantage.

(k) *Deafness and Blindness*: Deaf-blindness means concomitant visual and hearing impairments, the combination of which causes such severe communication, and other developmental and educational needs that he cannot be accommodated in special education programs solely for children with deafness or children with blindness.

(l) *Multiple Disabilities*: Multiple disabilities means concomitant impairments the combination of which causes such severe educational needs that the child cannot be accommodated in special educational programs solely for one of the impairments.

Among the participants in this study, 73.1% were identified as special education students.

The breakdown of their specific disabilities is given in the Table 2.

Table 2

Breakdown of Participants By Special Education Classification

| Disability Category | <i>N</i> | % of SPED Participants | % of Total Participants |
|--------------------------------------|----------|---------------------------|----------------------------|
| Mental Retardation ^a | 0 | 0% | 0% |
| Hearing Impairment | 2 | 3.2% | 2.4% |
| Speech or Language Impairment | 4 | 6.4% | 4.8% |
| Visual Impairment | 1 | 1.6% | 1.2% |
| Emotional Disturbance | 26 | 42.6% | 31.7% |
| Orthopedic Impairment | 1 | 1.6% | 1.2% |
| Autism | 0 | 0% | 0% |
| Traumatic Brain Injury | 5 | 8.1% | 6.0% |
| Other Health Impairment ^b | 10 | 16.3% | 12.1% |
| Specific Learning Disability | 28 | 45.1% | 34.1% |
| Deafness and Blindness | 0 | 0% | 0% |
| Multiple Disabilities | 6 | 9.8% | 7.3% |

Note: The individual disabilities within the multiple disabilities category are not included in the other totals.

^aThe state of Maine does not allow commitment of mentally retarded individuals to this facility. ^bAll “Other Health Impairments” have been ADHD.

How the Number of Archival Data Sets Was Chosen

The number of archival data sets for this study was chosen by examining all of the available data and compiling complete data sets. The total number of complete data sets available was 82. Ary et al. (2006) state that “if a relationship exists, it will be evident in a sample of moderate size” (p. 380). Considering the relatively small population of students at this school, 82 complete data sets could be considered both moderate and adequate to conduct a proper statistical analysis (Ary et al., 2006).

Setting

The target school is one of two maximum security juvenile correctional facilities in a state in the Northeastern United States. The target facility has over 200 full-time staff, with approximately 30 of those working in the education department. The researcher is the only reading specialist on staff. The physical plant has the ability to house 133 juvenile offenders. Those offenders participate in programming that includes education, mental health services, individual therapy, drug therapy, family therapy, vocational rehabilitation, religious services, and volunteer opportunities. The education class size averages 4.5 students, sometimes with a security guard in the room along with the teacher.

Reading instruction takes place in the Title I classroom, where the researcher is the only teacher. The format of the reading intervention at this school is dependent upon the needs of the students. They have unique needs because of absenteeism, expulsion, and lack of effort. They often have skill gaps that need to be filled in, but have strengths in areas that one would not expect. For that reason, the researcher designed each student's reading and writing program upon their arrival in the classroom, and it often changes over the course of their stay. Even the methods and curriculum used to instruct are often quite different from a traditional school's Title I program.

The setting for the three reading fluency tests was the reading specialist's (also the researcher for this study) classroom. Usually, the testing occurred during class time in a separate section of the room from where the other students were working. The classes never had more than six students, so excessive noise and distraction were not a problem. The reading comprehension tests were also administered by the researcher.

However, they took place in a separate period put aside especially for testing new students, or retesting students every six months to measure academic progress. The environment was quiet, and the testing all took place on classroom computers. All testing occurred during first period (8:00 A.M.-9:15 A.M.) and took the place of the student's first period class for the days they were assigned to test.

Instrumentation

Three separate instruments were administered over a two-year period prior to collection of the archival data sets. The instruments are all designed to measure different aspects of reading performance. The *QRI-4* measures both reading speed and accuracy, the MFS measures reading prosody, and the MAP measures reading comprehension.

Reading Rate Instrument

The instrument that was used to measure the reading rate of the students was the QRI-4 (Leslie & Caldwell, 2006). The QRI-4 is a reading assessment that has been widely adopted by school districts for the purpose of informal measurement of reading skills. It measures reading speed and accuracy using the following steps:

1. The participant read word lists aloud while the assessor marked whether they read the word automatically, correctly after time, or not at all. The assessor then marked whether that word list was at the participant's independent reading level (90% or better), instructional reading level (80-89%), or frustration reading level (below 80%).
2. The word lists were read until the participant reached the frustration level. The assessor then reverted to the last list that the participant read at an independent reading level.

3. The teacher chose a reading passage from the *QRI-4* book at the level that the participant could read independently. He then asked a series of questions to determine if the subject of the text was familiar or unfamiliar to the participant. Independent level text was used for the *QRI-4* assessments so that the results were a reflection of their actual reading speed and accuracy, not their comprehension. If the text was so difficult (instructional or frustration level) that the participant could not comprehend, their speed and accuracy would naturally suffer. In that case, the researcher would not get an accurate measure of speed and accuracy ability because of the confounding impact of comprehension.
4. The participant read the text aloud while the teacher took a running record, which later served as the foundation of the miscue analysis. The participant's speed and accuracy was measured at this time. Silent reading was not used, despite it being the most common method of reading among adolescents, because it is nearly impossible to measure reading speed and accuracy accurately when the reading is done silently.
5. The participant was asked to do a retelling of the story and comprehension questions were asked to determine if comprehension fell within the acceptable range for the passage. Look-backs were allowed so that a true measure of comprehension could be ascertained; if look-backs were not allowed, the measurement would have been of comprehension *and* memory, not just comprehension. If the comprehension did fall within the acceptable range for the passage, the speed and accuracy calculations were

deemed legitimate for that passage and could then be used in the correlation analysis.

Reading inventories, such as the *QRI-4*, are considered a valid and reliable measure of student progress (Fuchs, L., Fuchs, D., & Maxwell, 1988; Fuchs, L., Fuchs, D., & Zumeta, 2008), and are an accurate indicator of general reading competence (Kame'enui & Simmons, 2001). One reason this particular book of instruments was chosen is that it contains reading passages at secondary levels, whereas most reading inventory books do not have any passages above either the sixth grade or eighth grade levels. The Flesch-Kincaid readability formula was used to determine text appropriateness for this study. An explanation of the Flesch-Kincaid readability formulas, as well as the readability scores and reading ease scores for each passage in the *QRI-4* manual, are included in Appendix B. To obtain the Flesch-Kincaid readability and reading ease scores for each reading selection, the researcher cut and pasted the passages into a Flesch-Kincaid calculator. The purpose of measuring each passage was to ensure that passages were not utilized for assessment that were determined by the *QRI-4* authors to be appropriate for a certain grade level, but in reality had readability that deviated significantly from that grade level. That would have skewed the results of the testing. The *QRI-4* book (Leslie & Caldwell, 2006) includes the retelling and comprehension assessments that accompany each passage. The purpose of these assessments is to ensure that students are actually reading and not just word-calling. Analyzing the level of comprehension is an important facet of measuring reading rate. For the purposes of this study, a comprehension rate of 90% was considered an adequate level of comprehension for the subject reading rate to be considered viable (Leslie & Caldwell, 2006).

The QRI-4 was piloted with over 1,000 participants (Leslie & Caldwell, 1989). Administration was consistent across all subjects. Like all reading assessments that measure a specific skill, the rating has the potential to be very subjective. However, the *QRI-4* has an inter-rater reliability of 98% when raters are testing prior knowledge, 99% when they are testing miscue identification, and 98% when they are testing comprehension. Students' instructional levels were consistent among raters as well. When determining instructional levels, the inter-rater reliability was always over .80, and over .90 seventy-five percent of the time, meaning that regardless of the passage chosen, the same instructional level would have been chosen by the rater most of the time. As for concurrent validity, the *QRI-4* scores correlated with norm-referenced achievement tests positively, and were always statistically significant. Scores for this instrument are reported in words read correctly per minute at the independent reading level (reading speed) and percentage of words read correctly at the independent reading level (reading accuracy). The range of scores for reading speed are not specified, but usually fall between 100-200 words correct per minute (WCPM) for high school students. Reading rate norms do not currently exist beyond ninth grade (see Recommendations for Future Research in Chapter Five), so no judgments about an adequate reading speed measure could be made. The reading speed score was higher when more words were read per minute.

Reading Accuracy Instrument

While the QRI-4 (Leslie & Caldwell, 2006) measures reading rate, it also measures reading accuracy by a commonly used method of subtracting errors from words per minute to arrive at a statistic known as WCPM. The correct words per minute

calculation is often used in elementary and middle schools to determine placement within a particular reading program, or as a tool that can help determine the need for remediation when compared to grade level norms. For purposes of this study, even self-corrected errors were counted as errors in the calculation of reading accuracy because they inhibit the reader's prosody and adversely impact fluency. Reading accuracy scores could range from 0-100%, with scores over 90% representing adequate reading accuracy for independent text. The reading accuracy score was higher when more words were read correctly per minute. See the Reading Speed Instrument section for *QRI-4* reliability, validity, and scoring information.

Text Difficulty

Text difficulty is an important aspect of measurement in this study. All of the fluency assessments were given to the students at their independent reading level. It was important to test at the students' independent reading level because neither elements of fluency nor comprehension would have been present (and therefore measurable) if the testing was done using grade level text with students who were reading four or five years below their grade level peers. This approach may be somewhat controversial because the outcome assessment (MAP) is written with grade level text, and scores are given by identifying equivalent grade levels. However, fluency assessments are almost always given using independent text; to do otherwise would give an inaccurate representation of reading skill. In addition, the fluency testing aspect of this research was seeking to discern what level of text the subject could read fluently, not whether or not they can read grade level text with fluency. Ary et al. (2006) said that instruments utilized in a

correlation study that are too hard or too easy do not discriminate between subjects, leading to smaller correlation coefficients.

The reading speed variable is reported in WCPM, as opposed to WPM. The reason for this choice was that simply reporting words read per minute may have given a false impression of how fast, or how fluently, the subject was really reading. If reading is fast, but is full of errors, at some point it ceases becoming reading at all because, by definition, reading requires an understanding of what is being read. Correctness and flow are two important elements of reading success. Even errors that were self-corrected were counted as errors in the calculation of WCPM because the flow of the reading was interrupted, even if the error was corrected.

The possible confounding variable of the difference in difficulty between narrative and expository text is beyond the scope of this study. Simply because of consistency and availability of reading passages, all participants were assessed with expository text, even though research has shown narrative text to be easier to read and recall for students at all grade levels (Graesser, Golding & Long, 1991). Additionally, middle and high school students are most often required to read unfamiliar expository text in subject area classes, such as the text found in the passages in the QRI-4. Therefore, expository oral reading is a better indicator of practical reading comprehension ability. Oral reading was preferred over silent reading for this study because without hearing the reader's voice, it would be impossible to discern whether or not he has understood the prosodic intent of the author (Chafe, 1987).

Reading Prosody Instrument

Prosody is a difficult construct to measure (Hudson et al., 2009). The reasons it is so difficult to measure are that (a) there are as many definitions of prosody as there are reading experts to define it, (b) the subskills of prosody are not agreed upon by reading experts, (c) each component skill has to be measured with a separate rubric, (d) the rubrics themselves are not universally normed, so any resultant measurement using those rubrics would not be universally considered valid, and (e) what each rater considers to fall within the proficient range of each prosodic skill is very subjective.

For those reasons, the correct course of action is to ensure that when a rubric is utilized for research purposes that it is standardized, valid and reliable, administered under similar conditions for each student, and administered by a literacy expert. Each of those standards was met for the archival data set with the use of a rubric authored by Zutell and Rasinski (1991) and administered by the school's reading specialist. That rubric measures reading prosody by giving a composite grade for (a) expression and volume, (b) phrasing, (c) smoothness, and (d) pace (note that these four elements are not exactly the same as the elements of prosody presented earlier in the literature review. This difference emphasizes the dissention among reading experts regarding the definition of reading prosody. However, the elements are not a significant departure from the earlier definition. The range of possible MFS scores is 4-16. The higher the number, the more prosodic the reading. Scores above eight usually represent adequately prosodic reading. The MFS is considered valid and reliable (Rasinski, 1985), and rater judgments can be applied accurately and consistently (intratester reliability coefficient was .99) with training (Zutell, 1988).

Other validity issues in prosody research, such as the difference between oral reading and silent reading, or to what degree the participants' physical make-up (speech impediments, trouble forming words, hearing loss) influences oral reading prosody, were not dealt with because of the narrow scope of this study. There are problems that accompany the use of the MFS, and those are discussed in the limitations section.

Reading Comprehension Instrument

The instrument that was used to measure the reading comprehension of the participants was the MAP, Reading Comprehension Subtest (Northwest Evaluation Association, 2005a). This computerized, adaptive test is used with individual students and was developed by the Northwest Evaluation Association to measure the general level of student achievement using a number of subtests. One of those subtests is the Reading Comprehension Subtest. The Reading Comprehension Subtest is adaptive, but usually has between 40-50 items, and can be administered to students of any grade, kindergarten through twelfth (Cizek, 2010).

The reason this test was chosen over other tests was that the MAP is the only standardized reading assessment in use at the target facility that measures reading comprehension. Also, the MAP was chosen because the students' reading comprehension scores are already reported within the framework of the MAP testing results report; no additional calculations are necessary.

The numerous options for results reporting provide a wealth of available information. The results can be reported in RITs (Rausch Units; Appendix C), scaled scores, percent scores, standard scores, percentile ranks, and vertical scales. For this study, the RIT scores will be utilized. A RIT score for reading comprehension can range

from 170-270. The higher the RIT, the better the reading comprehension. Another quality that makes the MAP more viable than other reading comprehension tests is its excellent reliability and validity data. Cizek (2010) found the reliability coefficient to be between .92 and .96, and the validity coefficient to be between .77 and .84. Internal consistency levels, high test coefficient values, and strong validity indicators are all strengths of this test (Northeast Evaluation Association, 2005a). Clearly, the MAP “can be used with confidence . . . to gauge student learning” (Cizek, 2010, para. 6). The norm group assessments included over 2.3 million students from across the United States.

Procedures

This study utilized archival reading assessment data. This section begins by detailing the permissions that were obtained in order to proceed with the study, then it describes how the data was collected by the researcher over a period of two years in his capacities as the school’s literacy specialist and tester. Finally, it tells how the data was later gathered for analysis and organized by the researcher in the role of primary researcher.

Permissions

The first step in the data collection process was to ensure that the proposed research complied with the target district’s policy on research within the school system (see Appendix D). That determination was made by submission of the research proposal to the state department of corrections for approval. Institutional Review Board (IRB) approval was also gained from the university where the researcher is enrolled. Once the IRB approval and permission from the state department of corrections were obtained (see Appendix E), the data collection process commenced.

Gathering QRI-4 Reading Rate and Reading Accuracy Scores

Reading rate and reading accuracy were measured simultaneously using the QRI-4, in the manner mentioned in the Instrumentation section. The *QRI-4* testing took approximately 45 minutes per participant. The same passage was used to assess each student at their specific independent reading level. In other words, each student who reads independently at the sixth grade level received the same passage. Using the same passage for students who are reading at the same independent reading level was done to avoid validity problems between passages by reducing the variability that different texts could potentially create. The students were tested during school hours within the target school. A sample completed assessment (a sample student score sheet and a sample miscue analysis sheet) can be seen in Appendix F.

The school's reading specialist administered the assessment and conducted a timed running record. The many different forms of running records that exist and their differing procedures could be a threat to reliability. For example, the Developmental Literacy Guide used by some school districts in this particular section of the Northeastern United States directs the raters to count self-corrections as errors and allows the students to preview the book, and some do not. Some running records, such as the ones found in the Wright Group's literacy assessment materials, direct the raters to count repeated words as errors, while others do not. Naturally, running records can be a very subjective endeavor. If multiple forms or formats are utilized in the assessment process, variability in scores could result because these different forms of running records exist, each with their own rules and markings. For this reason, all of the assessments were conducted by

one rater, using one instrument, in an attempt to limit variability in reading accuracy scores. The accuracy results will be reported in correct words read per minute (WCPM). The measurement of reading rate is much more straightforward. Reading rate will be reported in words read per minute (WPM). The researcher listened as the participant read the entire passage and counted the number of words read, then divided the number of words read by the number of minutes it took to read them. As long as the minimum requirement for comprehension was met (90%), the number of WPM calculated in this way stood as the student's reading rate number. The 90% requirement is a time-honored (Betts, 1946), well-supported benchmark (Leslie & Caldwell, 2006). If the comprehension threshold was not met, the student went through the process again with a lower level of text until their comprehension was adequate. These scores, combined with the reading accuracy scores gleaned from the QRI-4, will be the scores utilized to determine the correlation between reading rate and reading comprehension, as well as reading accuracy and reading comprehension.

Gathering MFS Scores

The MFS assessment (Zutell & Rasinski, 1991) data was collected separately from the other *QRI-4* data. The researcher administered this assessment to each student individually, but on a separate day from the *QRI-4* data. It took each student approximately five minutes to complete the MFS assessment. This separation of tests was done so that the researcher could avoid error by not having to listen for both accuracy and prosody simultaneously. However, the assessments were administered as close together in time as is possible given the researcher's availability and the availability of the students.

Gathering MAP, Reading Comprehension Subtest Scores

The most recent MAP assessment (Northwest Evaluation Association, 2005a) data for each student was used (the students take the MAP test every six months) to ensure that the correlations were as accurate as possible. The reading comprehension section of the test took each participant approximately 40 minutes to complete. Each student was pulled out of class during school hours to be administered the test. The measurement this study was concerned with was how the fluency subskills involved in the research related to the reading comprehension subtest of MAP. The validity of that correlation weakens as more time passes between the MAP assessment and the fluency assessment because reading skills may deteriorate or improve over time. Therefore, the assessments and data were collected as closely together as possible. The goal was to administer the tests within one month of each other.

The Northwest Evaluation Association website's manual shows the RIT norm scores (see Table 3) for each grade level (grades K-11). These scores are included here because they were important when reviewing how the students' performance on the MAP, Reading Comprehension Subtest correlated with the reading fluency variables. For example, if there was a strong correlation between a participant's reading prosody and RIT score, it became crucial to determine if the two scores fell within the normal range for the two tests. If they did not, a number of valuable conclusions could be made from that information.

Table 3

RIT Norms By Grade Level

| Grade | Beginning of Year | Middle of Year | End of Year |
|-------|-------------------|----------------|-------------|
|-------|-------------------|----------------|-------------|

| | | | |
|----|-------|-------|-------|
| K | 147.6 | 152.4 | 156.3 |
| 1 | 160.2 | 166.5 | 171.9 |
| 2 | 179.7 | 186.0 | 189.6 |
| 3 | 191.6 | 196.3 | 199.0 |
| 4 | 200.1 | 203.7 | 205.8 |
| 5 | 206.7 | 209.6 | 211.1 |
| 6 | 211.6 | 213.8 | 214.8 |
| 7 | 215.4 | 217.3 | 217.9 |
| 8 | 219.0 | 220.6 | 221.2 |
| 9 | 220.9 | 221.9 | 222.6 |
| 10 | 223.9 | 224.9 | 225.4 |
| 11 | 225.2 | 225.2 | 225.6 |

Source: Northwest Evaluation Association website (2008).

Archival Data Collection Procedures

The archival data obtained for this study was student reading assessment data gathered from January 2010 – August 2011 from the following three assessments: MFS, *QRI-4*, and MAP. The MFS and *QRI-4* assessment data had been collected for instructional purposes and was stored in a locked filing cabinet in the reading specialist's classroom, known as the multimedia classroom. The MAP data had been collected for academic tracking purposes and was kept on a digital Educational Assessment form on a computer hard drive in the education office. In addition to assessment data, the following demographic information was gathered: age at time of testing, ethnicity, reading disability status, ESL status, special education status, and special education category. All

of the demographic data needed for the study was available in the students' education files. These files are located on the Y Drive on the computers in the education office and are maintained by the computer technician, who is responsible for archiving data.

The archival reading assessment MFS and *QRI-4* data was gathered by the school secretary from the student reading files in the reading specialist's classroom where they are housed. The secretary recorded the assessment data on an Excel spreadsheet and forwarded the spreadsheet to the computer technician. Next, the school's computer technician, who is responsible for archiving student data, gathered the demographic data for students from their student records on the Y Drive in the education office. After the MAP scores and demographic data for each student had been gathered and recorded on the spreadsheet, the computer technician deleted the column with the names of the subjects from the spreadsheet and randomly assigned each participant an identifying case number. The spreadsheet was left with a participant number, MAP scores, MFS scores, *QRI-4* scores, and demographic information. Next the computer technician emailed the spreadsheet (with all identifying information removed) to the researcher. The researcher saved it on his personal computer under password protection and began the data analysis procedures.

Data Organization

Once the data was gathered, it was entered into an Excel spreadsheet for purposes of organization and manipulation. The Excel spreadsheet was organized by participant, each being represented by the number assigned to them by the school's computer technician. Each participant had his own row that displayed:

1. reading rate score, in WPM, from the *QRI-4*.

2. reading accuracy score, in WCPM, from the *QRI-4*.
3. prosody score, from the MFS
4. comprehension score, from the MAP, Reading Comprehension Subtest.

The data was then imported into Statistical Package for the Social Sciences (SPSS) for analysis. SPSS 19 was used to produce visual representations of the outcomes, including scatterplots, matrices, and tables (Field, 2009; Salkind & Green, 2011).

Data Analysis

Rationale for Type of Data Analysis

This research was nonexperimental and utilized nonparametric methods because the mean and standard deviations were known. The form that the data took was measurement, as opposed to frequency data.

A multivariate correlation would have been the most appropriate analysis to use for this study because it would have limited the probability of committing Type I errors (Tabachnik & Fidell, 2007). Type I errors occur when the same variables (in this case, reading comprehension) in a data set are used for too many statistical tests (Tabachnik & Fidell, 2007). However, due to the specific population examined in the study, a large enough sample size to ensure sufficient power for such an analysis was not possible. Thus, bivariate correlations were chosen as the most appropriate analysis. Pearson's r was chosen as the most appropriate analysis tool, as long as the statistical assumptions necessary to use the test were met. However, some assumptions were not found to be tenable, so a nonparametric analysis, Spearman's rho, was used instead (Howell, 2010). While the number of full data sets available for analysis was 82, only 79 were included in the statistical tests because of elimination of three cases due to extreme outliers.

Analysis of Hypothesis 1

Hypothesis 1 stated that there is a statistically significant relationship between reading speed (as measured by the *QRI-4*) and reading comprehension (as measured by the MAP). A correlation analysis was used to analyze how reading speed related to reading comprehension. Preliminary analyses were used to examine the assumptions of no extreme outliers, normality, linearity, and homoscedasticity. The assumption of no extreme outliers was assessed using the guideline of three standard deviations above or below the norm. There are many methods for setting criteria for eliminating outliers from a data set, and this decision is one made by each individual researcher. The benchmark of 3.29 standard deviations was chosen for this study because a data point has only a 0.27% chance of falling more than three standard deviations from the mean (Tabachnik & Fidell, 2007), meaning that very little data will ever be eliminated using this method. Removing as little data as possible was important to the researcher; the natural variability in ability and performance amongst the target population was an important aspect of this analysis and had to be reflected as much as possible so that a full and accurate representation of their reading ability could be retained. The assumption of normality was assessed using a normality histogram and by examination of the skewness and kurtosis numbers. Linearity and homoscedasticity were assessed by visual examination of a scatterplot. A Spearman's rho was deemed the most appropriate analysis to determine the strength of the relationship between the two continuous variables since the assumptions of no extreme outliers and homoscedasticity in the data set were violated (Tabachnik & Fidell, 2007).

A $p < .05$ level of significance was used for the analysis of Hypothesis 1 to determine if the null hypothesis could be rejected. The practical significance (effect size) of this bivariate correlation was calculated using the Spearman's rho statistic and was interpreted by Cohen's d (1988). Cohen's d (the difference between two means divided by the standard deviation for the data) categorizes effect sizes this way:

Small effect: .20

Medium effect: .50

Large effect: .80

The size of effects that lie between the Cohen points are left up to interpretation. For example, .40 may be considered a medium effect because it is closer to the medium effect number than the small effect number. However, it could be considered a small effect if the effects are viewed as ranges (.20-.49, .50-.79, .80-1.00). Assumption testing, specifics of the statistical procedures, and the findings are explained in Chapter 4.

Analysis of Hypothesis 2

Hypothesis 2 stated that there is a statistically significant relationship between reading accuracy (as measured by the *QRI-4*) and reading comprehension (as measured by the MAP). A correlation analysis was used to analyze how reading accuracy related to reading comprehension. Preliminary analyses were used to examine the assumptions of no extreme outliers, normality, linearity, and homoscedasticity. The assumption of no extreme outliers was assessed using the guideline of three standard deviations above or below the norm. The benchmark of three standard deviations was chosen for this study because a data point has only a 0.27% chance of falling more than three standard deviations from the mean (Tabachnik & Fidell, 2007), meaning that very little data will

ever be eliminated using this method. Removing as little data as possible was important to the researcher; the natural variability in ability and performance amongst the target population was an important aspect of this analysis and had to be reflected as much as possible so that a full and accurate representation of their reading ability could be retained. The assumption of normality was assessed using a normality histogram and by examination of the skewness and kurtosis numbers. Linearity and homoscedasticity were assessed by visual examination of a scatterplot. A Spearman's rho was deemed the most appropriate analysis to examine the relationship between the two continuous variables since the assumptions of no extreme outliers, normality, and homoscedasticity in the data set were all violated (Tabachnik & Fidell, 2007).

A $p < .05$ level of significance was used for the analysis of Hypothesis 2 to determine if the null hypothesis could be rejected. The practical significance (effect size) of this bivariate correlation was calculated using the Spearman's rho statistic and was interpreted by Cohen's d (1988) in the same manner as Hypothesis 1.

Analysis of Hypothesis 3

Hypothesis 3 stated that there is a statistically significant relationship between reading prosody (as measured by the MFS) and reading comprehension (as measured by the MAP). A correlation analysis was used to analyze how reading prosody related to reading comprehension. Preliminary analyses were used to examine the assumptions of no extreme outliers, normality, linearity, and homoscedasticity. The assumption of no extreme outliers was assessed using the guideline of three standard deviations above or below the norm. The benchmark of three standard deviations was chosen for this study because a data point has only a 0.27% chance of falling more than three standard

deviations from the mean (Tabachnik & Fidell, 2007), meaning that very little data will ever be eliminated using this method. Removing as little data as possible was important to the researcher; the natural variability in ability and performance amongst the target population was an important aspect of this analysis and had to be reflected as much as possible so that a full and accurate representation of their reading ability could be retained. The assumption of normality was assessed using a normality histogram and by examination of the skewness and kurtosis numbers. Linearity and homoscedasticity were assessed by visual examination of a scatterplot. A Spearman's rho was deemed the most appropriate analysis to examine the relationship between the two continuous variables since the assumption of no extreme outliers in the data set was violated (Tabachnik & Fidell, 2007).

A $p < .05$ level of significance was used for the analysis of Hypothesis 3 to determine if the null hypothesis could be rejected. The practical significance (effect size) of this bivariate correlation was calculated using the Spearman's rho statistic and was interpreted by Cohen's d (1988) in the same manner as Hypothesis 1.

Analysis of Hypothesis 4

Hypothesis 4 stated that reading prosody (as measured by the MFS) is the reading fluency variable that is most strongly correlated with reading comprehension (as measured by MAP). Correlation analyses were used to analyze which of the three fluency variables (reading speed, reading accuracy, and reading prosody) related most strongly to reading comprehension. Preliminary analyses were used to examine the assumptions of no extreme outliers, normality, linearity, and homoscedasticity. The assumption of no extreme outliers was assessed using the guideline of 3.29 standard

deviations above or below the norm. The benchmark of three standard deviations was chosen for this study because a data point has only a 0.27% chance of falling more than three standard deviations from the mean (Tabachnik & Fidell, 2007), meaning that very little data will ever be eliminated using this method. Removing as little data as possible was important to the researcher; the natural variability in ability and performance amongst the target population was an important aspect of this analysis and had to be reflected as much as possible so that a full and accurate representation of their reading ability could be retained. The assumption of normality was assessed using normality histograms and by examination of the skewness and kurtosis numbers. Linearity and homoscedasticity were assessed by visual examination of a scatterplot. A Spearman's rho was deemed the most appropriate analysis to examine the relationships between the three reading fluency variables and reading comprehension since the assumptions of no extreme outliers, normality, and homoscedasticity in the data set were all violated (Tabachnik & Fidell, 2007).

A $p < .05$ level of significance was used for the analysis of Hypothesis 4 to determine if the null hypothesis could be rejected. The practical significance (effect size) of this bivariate correlation was calculated using the Spearman's rho statistic and was interpreted by Cohen's d (1988) in the same manner as Hypothesis 1.

Issues with Data Analysis

There are many potential problems that can arise after the collection of archival data occurs. However, appropriate adjustments can be made prior to final analyses. Below, four of these problems are listed along with how the researcher controlled for each problem when it occurred.

Outliers

Extreme outliers (± 3.29 standard deviations from the norm; Tabachnik & Fidell, 2007) can have dramatic effects on correlations. There were extreme outliers in this study, which is not surprising considering that the study's participants' educational experiences are diverse and sporadic. Participants may have gained some skills while missing others due to school absence or lack of effort. Needless to say, one should never base important conclusions on the value of the correlation coefficient alone (Rodgers & Nicewander, 1988); examining the respective scatterplot is always necessary when an outlier is present. The easiest, and most commonly used method of dealing with outliers, is to eliminate any cases that are determined by the researcher to contain outliers (Barret & Lewis, 1994; Tabachnik & Fidell, 2001). That is the method that was used in this study in keeping with the researcher's desire to retain as much data as possible for analysis. Three cases were eliminated using this method. An extreme outlier (174 RIT) caused an elimination of case #17; an extreme outlier (88% comprehension) caused an elimination of case #21; an extreme outlier (175 RIT) caused an elimination of case #52. Trimming or replacing data, or other methods that may have eliminated too large of a percentage of the available cases, were unacceptable options to the researcher.

Normality

While many simple statistical tests are robust (sample data might deviate quite a bit from normality, but the test will still lead to the right conclusion about the null hypothesis) to the normality assumption (Salkind & Green, 2011), and normality does not necessarily have to be met for data to be analyzed with a parametric measure such as Pearson's r (Hettmansperger & McKean, 1998), it is preferable to use parametric

measures to decrease the likelihood of Type I errors (Tabachnik & Fidell, 2001). Since the assumption of normality was not met for one of the variables in this study, there were two reasonable options. A nonparametric test (such as Spearman's rho) could change the measurement data into rank data, or a data transformation method (such as logarithmic transformation) could be used to stabilize the variance of the sample (Bland, 2000). Nonparametric testing was chosen for this study when the assumption of normality was not met.

Linearity

When there is not a straight line relationship between two variables, the assumption of linearity is not met (Salkind & Green, 2011). It was possible, because of the small number of variables (four), to individually screen all of the possible pairs (three relationships) for linearity (Tabachnick & Fidell, 2001). SPSS scatterplot was used to produce the bivariate scatterplots from which linearity was visually determined. It was determined that the linearity assumption was met for all of the variables because none of the scatterplots displayed a curvilinear relationship (Tabachnik & Fidell, 2007).

Homoscedasticity

When the dependent variable (reading comprehension for this study), does not exhibit similar amounts of variance across the range of values for an independent variable the assumption of homoscedasticity is not met (Hamisci & Martinez, 2007). It was possible, because of the small number of variables (four), to screen all of the possible pairs (three relationships) for homoscedasticity. SPSS scatterplot was used to produce the bivariate scatterplots from which homoscedasticity was visually determined. When it was determined that the assumption was not met for two of the variables, the researcher

determined that a nonparametric test of correlation would be used in order to normalize the data for analysis.

Summary

Determining which of the three fluency subskills is most strongly related to reading comprehension in adolescent at-risk readers is a beneficial discovery for secondary level teachers and reading interventionists. Much time and many resources could be saved by being able to pinpoint the specific issue(s) that most influence overall reading comprehension performance. With this information at their fingertips, literacy specialists could more quickly and easily remediate comprehension problems instead of wasting valuable time searching for the root problem that is causing the comprehension deficit. Of course, other individual factors that might be outside the scope of this study could also influence overall reading comprehension. Yet, discovering a definite common starting point grounded in research would be an important finding, and could serve as the basis for future studies seeking to examine causality. The methodology presented here presents a logical and sequential plan for statistically identifying this starting point.

CHAPTER FOUR: FINDINGS

The primary purpose of this study was to determine the strength of the relationship between three reading fluency variables (reading speed, reading accuracy, and reading prosody) and reading comprehension. Three separate reading tests were administered over a 20 month period (December 2009 - August 2011) to students at a maximum security juvenile prison in a rural area of the Northeastern United States. Those scores were used to measure the strength of the relationships between the three reading fluency variables and reading comprehension. Complete archival data sets were available for 82 students who attended during this time frame. The four research questions in the study addressed the reading ability of those students in four separate areas: reading comprehension, reading speed, reading accuracy, and reading prosody. This chapter is organized into four sections. First, the descriptive data for the four variables of interest is displayed. In the next section, the assumptions tests for each research hypothesis is given. The third section describes the data analysis for the four hypotheses. The final section provides a summary of the results.

Results

Descriptive Data

The descriptive data for the four research variables can be seen in Table 4.

Table 4

Descriptive Statistics for the Individual Variables

| Variable | <i>N</i> Statistic | Minimum Statistic | Maximum Statistic | Mean Statistic | Std Error | <i>SD</i> Statistic | Variance Statistic |
|--------------------|-----------------------|----------------------|----------------------|-------------------|--------------|------------------------|-----------------------|
| Reading Comp. | 79 | 189.00 | 241.00 | 216.54 | 1.19 | 10.57 | 111.64 |
| Reading Speed | 79 | 71.00 | 208.00 | 129.16 | 3.10 | 27.58 | 760.73 |
| Reading Acc. | 79 | 89.00 | 100.00 | 95.90 | .27 | 2.36 | 5.58 |
| Reading Prosody | 79 | 5.00 | 16.00 | 10.76 | .25 | 2.20 | 4.86 |

Assumption Testing

Preliminary assumption testing for a correlation analysis was conducted. The assumptions tested were normality, linearity, and homoscedasticity (Tabachnik & Fidell, 2001). The assumption that data was normally distributed was determined by visual examination of a normality histogram (approximately one-third of the cases should be one standard deviation from the mean). The normality histograms for the four variables in this study can be seen in Figure 2, Figure 3, Figure 4, and Figure 5.

Figure 2. Normality Histogram for Reading Comprehension With Normal Curve Displayed

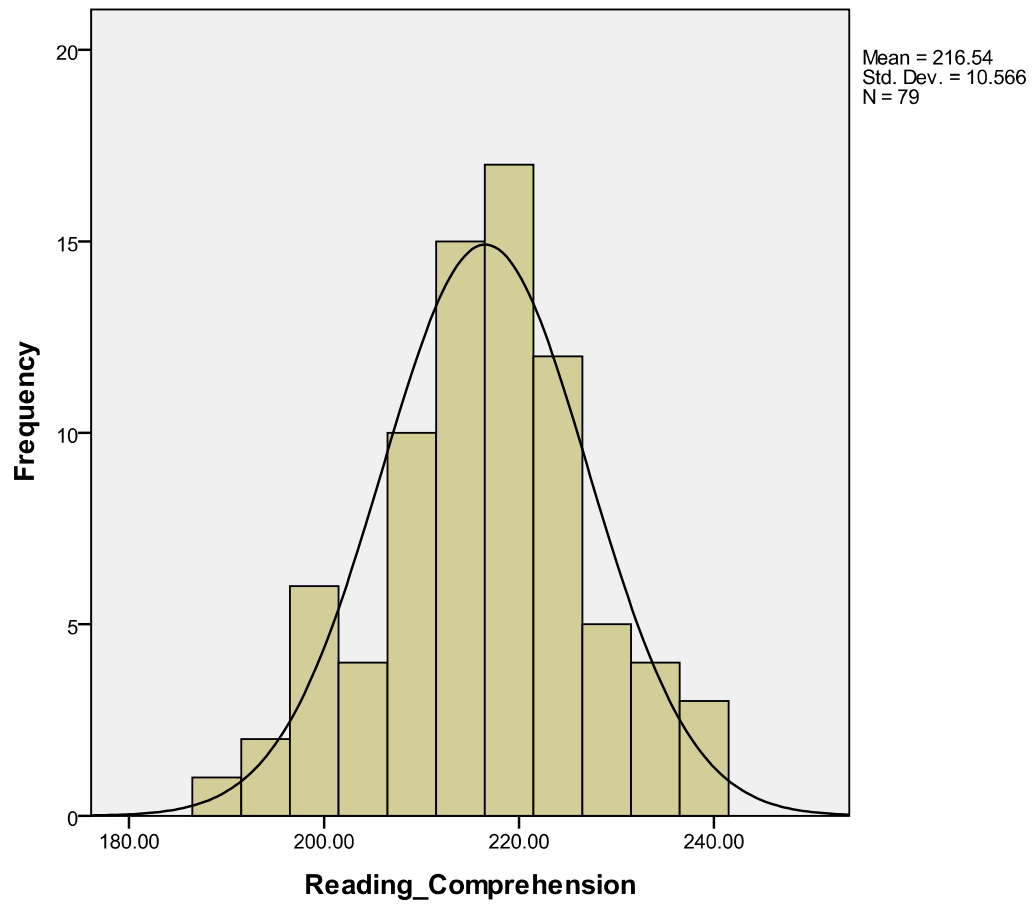


Figure 3. Normality Histogram for Reading Speed With Normal Curve Displayed

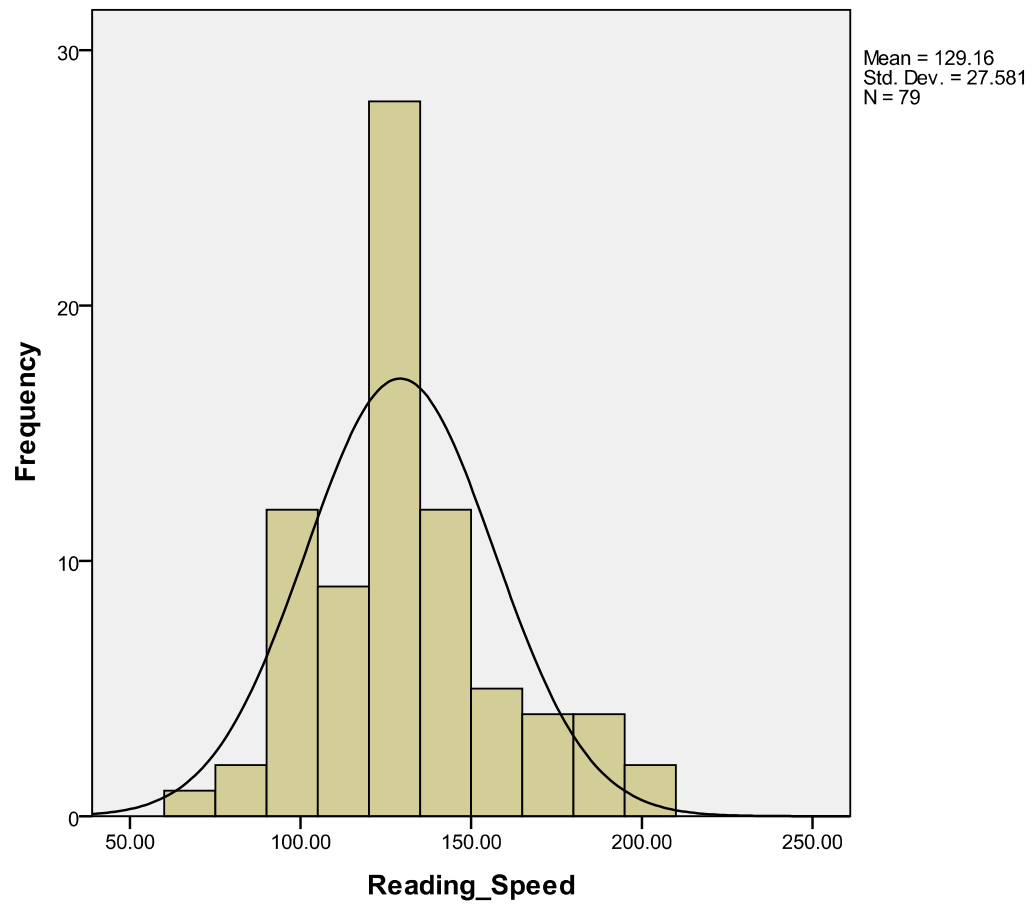


Figure 4. Normality Histogram for Reading Accuracy With Normal Curve Displayed

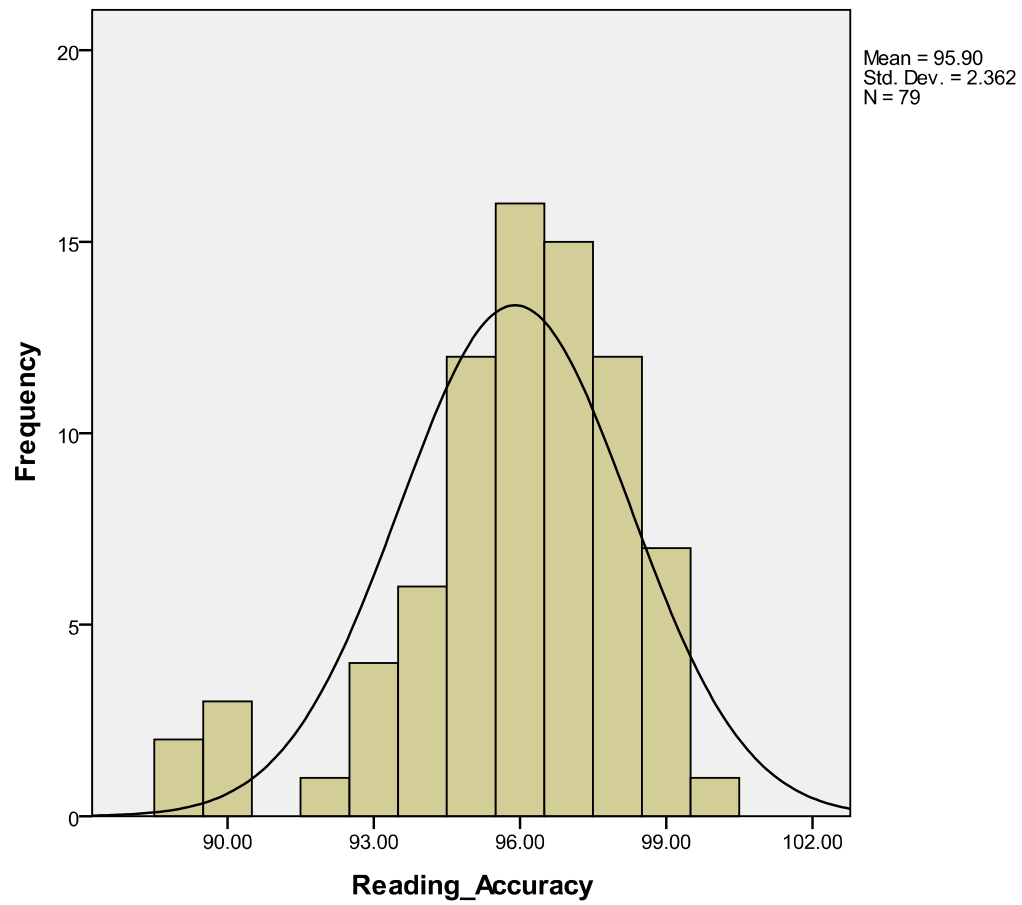
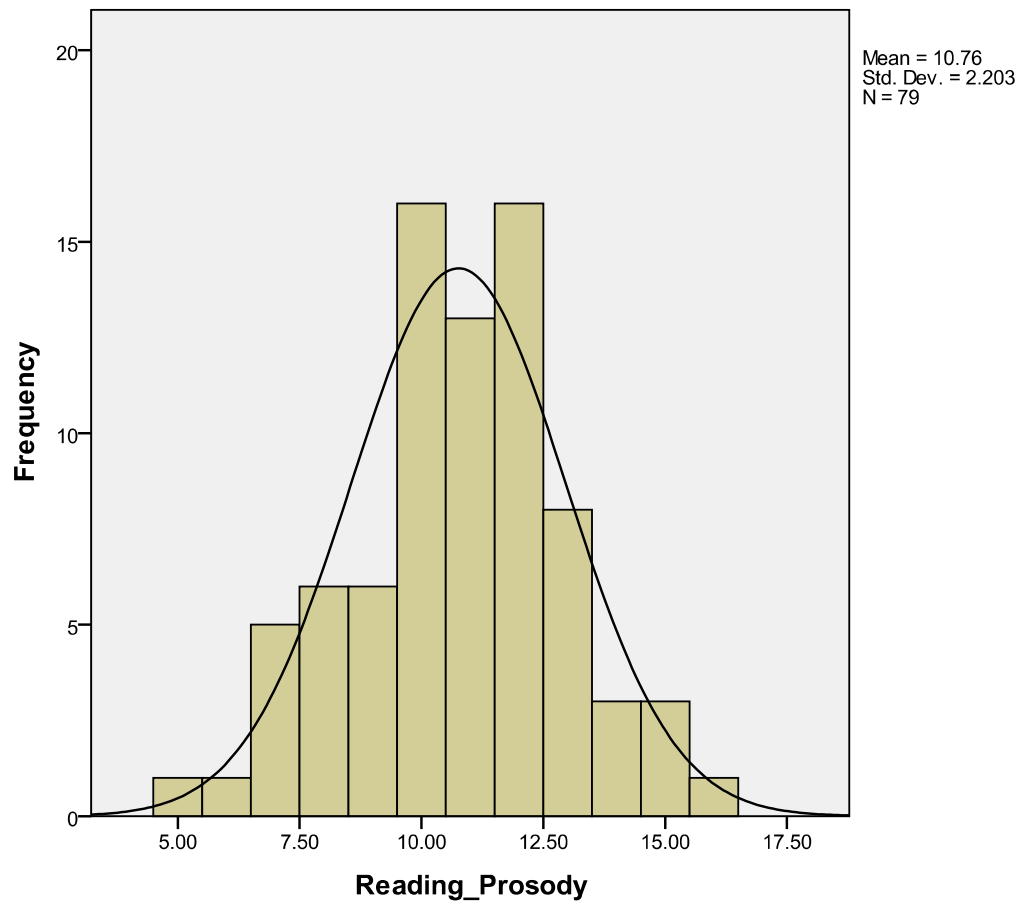


Figure 5. Normality Histogram for Reading Prosody With Normal Curve Displayed



Another way of determining normality is by employing statistical methods, such as using the skewness and kurtosis numbers given in SPSS. Skewness measures the symmetry of the distribution and kurtosis defines the shape of the distribution. If the skewness and kurtosis fall within a range that is +/- twice the standard error for skewness and kurtosis, then the distribution presents no problematic deviations from normality (De Carlo, 1997; Kendall, Stuart, Ord, & O'Hagan, 1999). For Reading Comprehension, skewness was -.08 and kurtosis was .02, both within the acceptable range to be considered normal. For Reading Speed, skewness was .56 and kurtosis was .50, both within the acceptable range to be considered normal. For Reading Prosody, skewness

was $-.32$ and kurtosis was $.15$, both within the acceptable range to be considered normal. Because the skewness and kurtosis numbers for Reading Accuracy (skewness was -1.09 and kurtosis was 1.41) were elevated above the threshold of \pm twice the standard error for skewness and kurtosis, the data could not be considered normal. Therefore, it was determined that the data was nonnormal and Spearman's rho (a nonparametric test of correlation) would be utilized to measure the correlation between the three fluency subskills and reading comprehension, rather than Pearson's r as originally planned (Salkind & Green, 2011).

The assumption that the data was linear was determined by examination of scatterplots that represent the relationship between the two variables in question. Those scatterplots can be seen in Figure 6, Figure 7, and Figure 8. None of the scatterplots show a curvilinear relationship, so the data was assumed to be linear (Tabachnik & Fidell, 2007). Even though all data was found to be linear, a nonparametric test was still deemed most appropriate for this analysis because neither the assumption of normality nor the assumption of homoscedasticity was tenable.

Figure 6. Linear Relationship Between Reading Comprehension and Reading Speed.

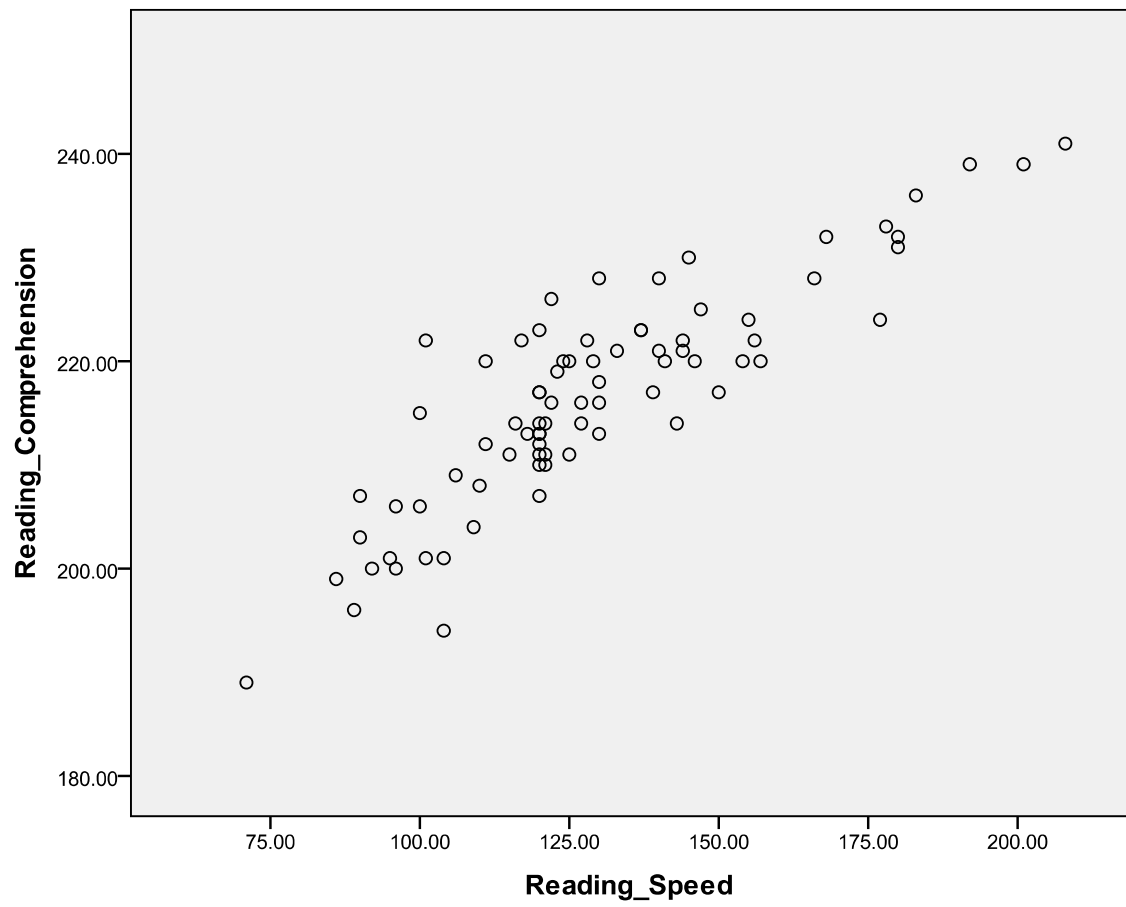


Figure 7. Linear Relationship Between Reading Comprehension and Reading Accuracy.

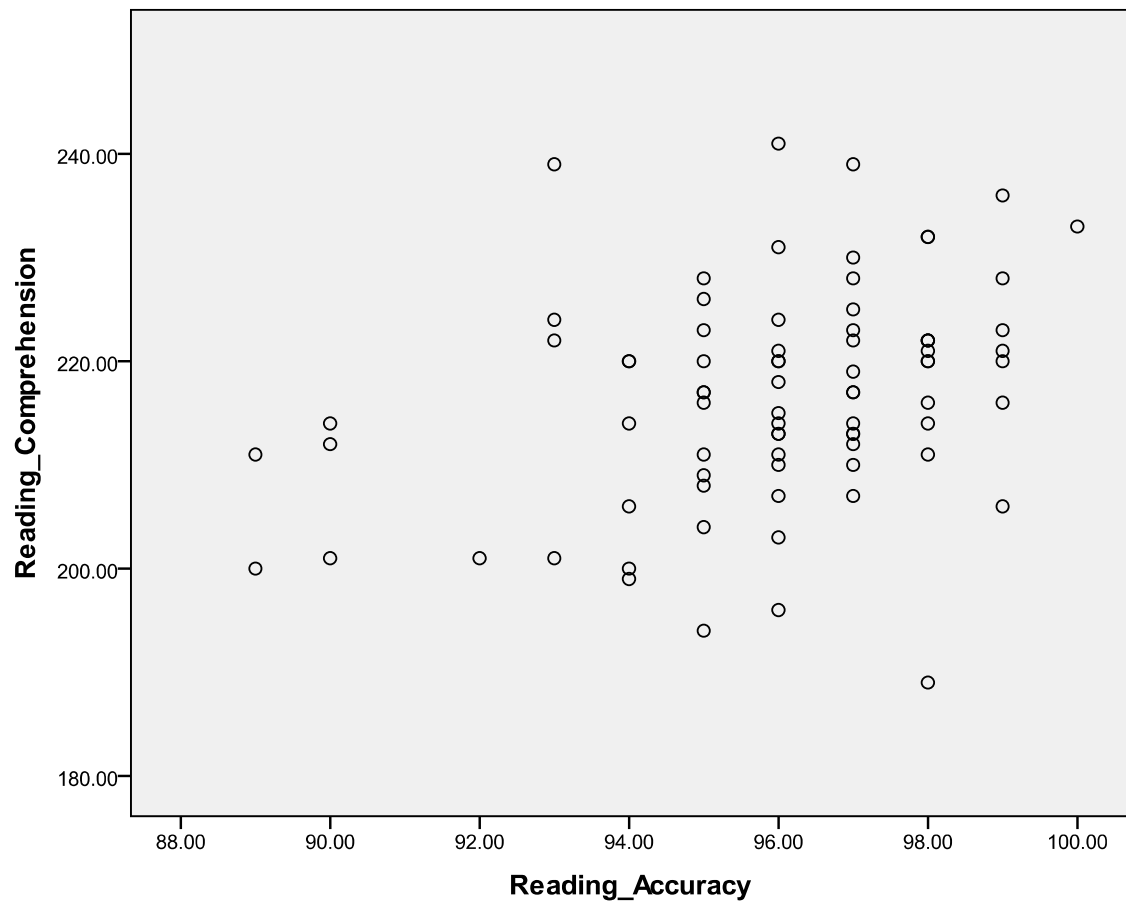
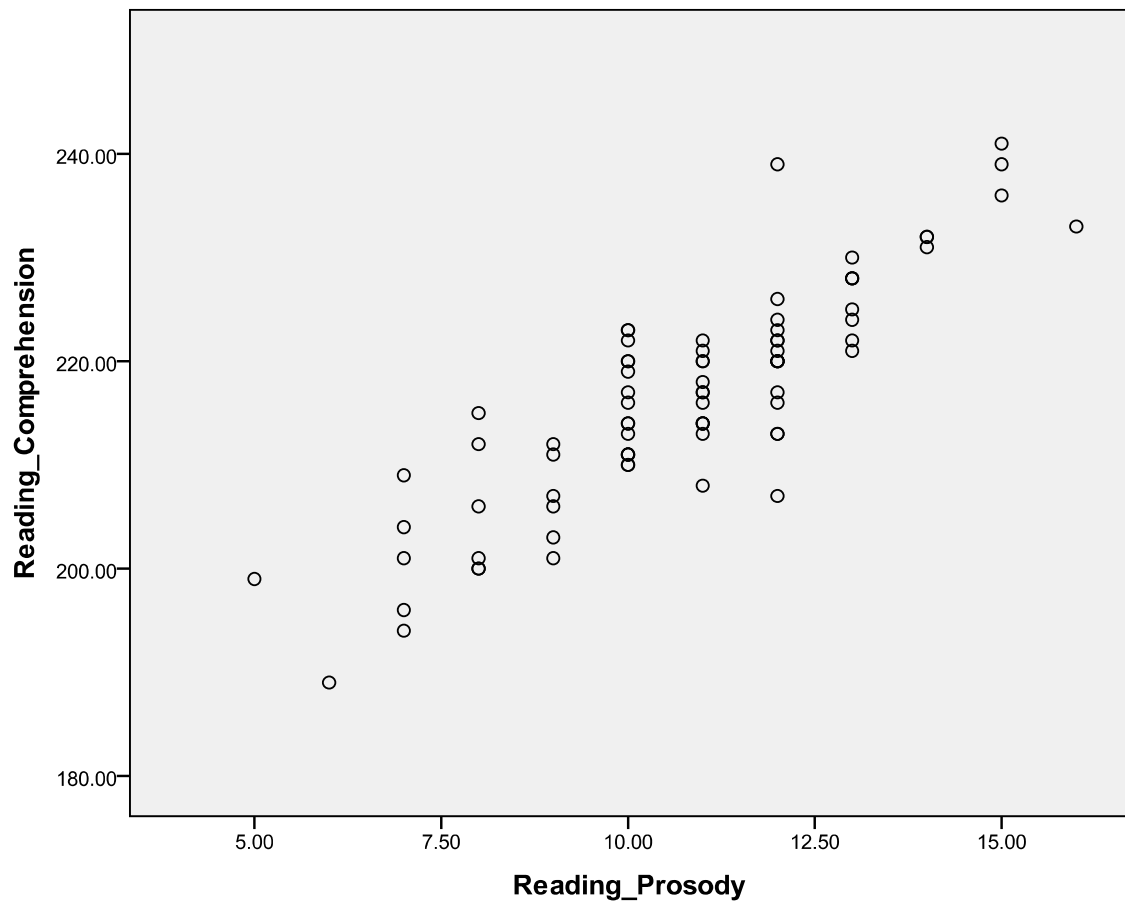


Figure 8. Linear Relationship Between Reading Comprehension and Reading Prosody.



The assumption that the data is homoscedastic means that a similar variability in scores exists at all values of the dependent variable (Tabachnik & Fidell, 2001).

Homoscedasticity can be easily determined by visual examination of the same scatterplots that were used to determine linearity. If the cluster of points is nearly the same width throughout the scatter, then the data is homoscedastic. Only Figure 8 clearly shows a homoscedastic pattern, while Figure 6 and Figure 7 display a heteroscedastic relationship. The inability to assume homoscedasticity further necessitated the use of Spearman's rho to measure the correlations in this study. Pearson's r is not a good summary of association if the data is heteroscedastic.

Data Analysis for Research Hypothesis 1

Research Hypothesis 1

There is a statistically significant relationship between reading speed (as measured by the *QRI-4*) and reading comprehension (as measured by the *Measures of Academic Progress* [MAP]).

Null Hypothesis 1

There will be no statistically significant relationship between reading speed (as measured by the *QRI-4*) and reading comprehension (as measure by MAP) in at-risk adolescent readers.

Results

Hypothesis 1 was tested by conducting a Spearman's rho correlation, using SPSS 19, between the reading speed variable and the reading comprehension variable. Using Spearman's rho instead of Pearson's r increased the likelihood of committing Type I errors. Therefore, the Bonferroni approach was used to control for Type I errors across the 3 correlations; a p value of less than .017 ($.05/3 = .017$) was required for significance (Salkind & Green, 2011). The correlation was statistically significant and positive, $r_s(77) = .835$, $p < .05$, thus allowing for rejection of Null Hypothesis 1. Because Null Hypothesis 1 could be rejected and the correlation coefficient was above .80, it could be concluded that reading speed was strongly correlated with reading comprehension because the effect size was large (Cohen, 1988).

Data Analysis for Research Hypothesis 2

Research Hypothesis 2

There is a statistically significant relationship between reading accuracy (as measured by the *QRI-4*) and reading comprehension (as measured by the MAP).

Null Hypothesis 2

There will be no statistically significant relationship between reading accuracy (as measured by the *QRI-4*) and reading comprehension (as measure by MAP) in at-risk adolescent readers.

Results

Hypothesis 2 was tested by conducting a Spearman's rho correlation, using SPSS 19, between the reading accuracy variable and the reading comprehension variable. Using Spearman's rho instead of Pearson's r increased the likelihood of committing Type I errors. Therefore, the Bonferroni approach was used to control for Type I errors across the 3 correlations; a p value of less than .017 ($.05/3 = .017$) was required for significance (Salkind & Green, 2011). The correlation was statistically significant and positive, $r_s(77) = .347$, $p < .05$, thus allowing for rejection of Null Hypothesis 2. Because Null Hypothesis 2 could be rejected and the correlation coefficient was above .20, it could be concluded that reading speed was weakly correlated with reading comprehension because the effect size was small (Cohen, 1988).

Data Analysis for Research Hypothesis 3

Research Hypothesis 3

There is a statistically significant relationship between reading prosody (as measured by the MFS) and reading comprehension (as measured by the MAP).

Null Hypothesis 3

There will be no statistically significant relationship between reading prosody (as measured by the MFS) and reading comprehension (as measure by MAP) in at-risk adolescent readers.

Results

Hypothesis 3 was tested by conducting a Spearman's rho correlation, using SPSS 19, between the reading prosody variable and the reading comprehension variable. Using Spearman's rho instead of Pearson's r increased the likelihood of committing Type I errors. Therefore, the Bonferroni approach was used to control for Type I errors across the 3 correlations; a p value of less than .017 ($.05/3 = .017$) was required for significance (Salkind & Green, 2011). The correlation was statistically significant and positive, $r_s(77) = .835$, $p < .05$, thus allowing for rejection of Null Hypothesis 3. Because Null Hypothesis 3 could be rejected and the correlation coefficient was above .80, it could be concluded that reading prosody was strongly correlated with reading comprehension because the effect size was large (Cohen, 1988).

Data Analysis for Research Hypothesis 4

Research Hypothesis 4

The fluency variable (as measured by the MFS) that is most strongly related to reading comprehension (as measured by the MAP) is reading prosody.

Null Hypothesis 4

There will be no statistically significant difference between how strongly reading prosody (as measured by the MFS) is related to reading comprehension (as measured by MAP) and how strongly reading speed and reading accuracy (as measured by the *QRI-4*)

are related to reading comprehension (as measured by MAP) in at-risk adolescent readers.

Results

The results of Research Hypothesis 4 were determined by comparing the individual Spearman's rho correlations that were ascertained during the testing of Hypotheses 1, 2, and 3 with each other. These results can be seen in a correlation matrix, which is presented in Table 5. The correlation between reading prosody and reading comprehension was tied for the strongest with the correlation between reading speed and reading comprehension (both were .835). Although this means that no correlations were stronger among the relationships being studied than the prosody-comprehension relationship, Null Hypothesis 4 could not be rejected because the prosody-comprehension relationship did not technically have the largest effect size. The correlation matrix also shows that reading speed and reading prosody are very strongly correlated, but that reading accuracy is not strongly correlated to any of the other variables. These are results that are discussed further in Chapter 5.

Table 5

Spearman's rho Correlation Matrix

| Variable | Statistic | Reading Comp. | Reading Speed | Reading Accuracy | Reading Prosody |
|---------------------|------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Reading Comp. | Correlation Coefficient Sig. | -- -- | .835* (<i>N</i> = 79) .000 | .347* (<i>N</i> = 79) .002 | .835* (<i>N</i> = 79) .000 |
| Reading Speed | Correlation Coefficient Sig. | .835* (<i>N</i> = 79) .000 | -- -- | .337 (<i>N</i> = 79) .002 | .800 (<i>N</i> = 79) .000 |
| Reading Accuracy | Correlation Coefficient Sig. | .347* (<i>N</i> = 79) .002 | .337 (<i>N</i> = 79) .002 | -- -- | .320 (<i>N</i> = 79) .004 |
| Reading Prosody | Correlation Coefficient Sig. | .835* (<i>N</i> = 79) .000 | .800 (<i>N</i> = 79) .000 | .320 (<i>N</i> = 79) .004 | -- -- |

p* < .05Summary**

This chapter presented the descriptive statistics, assumptions testing, and tests of hypotheses for this study. The data analysis revealed that some of the assumptions could be met for some of the variables, but that assumptions for the absence of extreme outliers, normality, and homoscedasticity could not be assumed for all of the variables. This led the researcher to reject use of Pearson's *r* because the data was not part of a normally distributed data set. Spearman's rho, a nonparametric measurement of correlation, was used instead.

The study addressed four research questions. Research Hypothesis 1 addressed the correlation between reading speed and reading comprehension. Reading speed and reading comprehension were found to be strongly correlated ($ES = .835$). Research Hypothesis 2 addressed the correlation between reading accuracy and reading comprehension. Reading accuracy and reading comprehension were found to be weakly correlated ($ES = .347$). Research Hypothesis 3 addressed the correlation between reading prosody and reading comprehension. Reading prosody and reading comprehension were found to be strongly correlated ($ES = .835$). Research Hypothesis 4 addressed whether or not reading prosody was the research variable most strongly correlated with reading comprehension. It was found that reading prosody and reading speed had an identical strength of correlation with reading comprehension ($ES = .835$). A correlational matrix was also presented in order to display the relationships between all of the variables that were measured in this study. The significance of these results is discussed in Chapter Five.

CHAPTER FIVE: DISCUSSION

The previous chapter presented data analysis which utilized Spearman's rho to measure the relationship between the three reading fluency subskills (reading speed, reading accuracy, and reading prosody) and reading comprehension in at-risk adolescent readers. The chapter presented descriptive statistics for each reading variable, assumption testing that showed the viability of utilizing parametric testing, and data analysis to test each of the research hypotheses.

The purpose of this chapter is to review the findings of the previous chapter and discuss them in light of related literature and the theoretical framework that guided this study. This chapter is divided into the following sections: summary of the findings, discussion and implications, delimitations/limitations/assumptions, recommendations, and conclusion.

Summary of the Findings

Research Hypothesis 1

Research Question 1 asked if there was a statistically significant relationship between reading speed and reading comprehension in at-risk adolescent readers. The researcher hypothesized that the correlation between the two variables would be significant. The Spearman's rho correlation statistic showed that this hypothesis was correct because the relationship was statistically significant, and the effect size was large ($ES = .835$).

Research Hypothesis 2

Research Question 2 asked if there was a statistically significant relationship between reading accuracy and reading comprehension in at-risk adolescent readers. The researcher hypothesized that the correlation between the two variables would be significant. The Spearman's rho correlation statistic showed that this hypothesis was correct because the relationship was statistically significant, but the effect size was small ($ES = .347$)

Research Hypothesis 3

Research Question 3 asked if there was a statistically significant relationship between reading prosody and reading comprehension in at-risk adolescent readers. The researcher hypothesized that the correlation between the two variables would be significant. The Spearman's rho correlation statistic showed that this hypothesis was correct because the relationship was statistically significant, and the effect size was large ($ES = .835$).

Research Hypothesis 4

Research Question 4 asked which of the three fluency subskills would be most highly correlated with reading comprehension in at-risk adolescent readers. The researcher hypothesized that reading prosody would be most strongly correlated with reading comprehension. The Spearman's rho correlation statistic revealed that this hypothesis was partially correct because reading speed and reading prosody were found to have equally strong relationships ($ES = .835$) with reading comprehension.

Discussion and Implications

As indicated by the correlation matrix in Table 5, reading speed and reading prosody are strongly correlated (.819). This was an expected result because speed and the specific component skills of prosody (pace, smoothness, suprasegmental ability, attention to textual features, and pitch) go hand in hand (Biemiller, 1978; LeBerge & Samuels, 1974). LaBerge and Samuels' (1974) theory of automaticity predicted that reading speed would increase as the prosodic elements of reading fluency increased, resulting in increased reading comprehension. This result indicates that implicit instruction of prosodic elements should help increase reading speed if the two are taught simultaneously, and vice-versa.

As indicated by the results of Research Hypothesis 2 testing, accuracy and comprehension are only weakly correlated. This was not an expected result because a lot of time is spent on teaching and remediating reading accuracy in elementary schools and middle schools. Perhaps the weak relationship between reading accuracy and reading comprehension is because at-risk struggling readers who read too slowly to maintain accuracy do not have enough thought units enter short term memory to fully comprehend text. Yet, today there are many programs (Wilson, Orton-Gillingham) that focus on improvement of phonics skills, spelling, pronunciation, and other subskills of reading accuracy in high schools. The Spearman's rho results indicate that focusing on reading accuracy is likely not an appropriate pedagogical approach when the goal is increased reading comprehension for at-risk adolescent readers. Chall's (1983) stages of reading suggest that adolescence is not the correct stage of development to work on phonics and spelling and other aspects of reading accuracy. The participants in this study have had severe disruptions to their natural development (Erickson, 1950; Piaget, 1969). If an at-

risk adolescent reader has not gained accuracy skills during the elementary school years because of those disruptions, it may be ineffective for secondary teachers to attempt to teach them as a means of improving overall reading comprehension. At-risk adolescents who did not acquire the accuracy skills at the correct time in their reading development have most likely already learned to compensate for their deficiency in accuracy in other ways (Shaywitz, 2003). This is clear when they are reading aloud and mispronounce or skip words that are unknown, yet are still able to comprehend. They have learned to rely on context to determine meaning when their accuracy skills fail.

The results of this study also indicate that reading accuracy and reading prosody are only weakly correlated and reading accuracy and reading speed are only weakly correlated. This suggests that reading fluency subskills may be more individual than previously thought; perhaps they do not develop together, but individually. Since reading fluency is such a complex task (Hudson et al., 2009; Kame'enui & Simmons, 2001), it may be necessary to focus on the fluency subskills individually rather than simultaneously through reading of real text or other “authentic” tasks. Reading teachers may need to focus their teaching for at-risk adolescent readers on explicit instruction that aims at developing specific fluency skills rather than activities that attempt to develop them together since the connection between the individual subskills of reading fluency is not strong for two out of the three relationships.

Reading prosody and reading speed are strongly correlated with reading comprehension. Research Hypothesis 4 stated that reading prosody would be the most strongly correlated with reading comprehension, but it was only tied for strongest with reading speed. If teachers of at-risk adolescent readers endeavor to improve the reading

comprehension skills of their students, these two fluency subskills should be the focus of much of the reading intervention time. As stated earlier, reading speed and reading prosody are also strongly correlated amongst themselves, increasing the likelihood that teaching the two skills simultaneously will indeed have the desired effect of improving reading comprehension. There are specific pedagogical approaches that secondary reading teachers can learn that will highlight reading prosody and reading speed during reading intervention sessions (Rasinski, 2003b).

One of the tenets of the theoretical framework developed for this study stated that every student has the potential to learn if their basic needs are met (Maslow, 1943). Using Maslow's theory, it is easy to predict that an adolescent whose basic needs are not met would not be interested in the nuances of reading acquisition. While teachers and researchers debate the appropriateness of teaching certain fluency subskills at certain times, the at-risk adolescent who is hungry, cold, tired, and unloved would not care about those things at all. Thus, it makes sense to ensure that the student has received the full benefit of the social services that the school offers before any attempts are made at reading remediation. Educators know that education is only slightly less necessary than the basic needs outlined in Maslow's (1943) hierarchy, but education is irrelevant to a teenager who is not being cared for, sheltered, fed, or made to feel safe.

The second tenet of the theoretical framework developed for this study stated that the problems that have prevented adolescents from acquiring reading comprehension proficiency are preventable if attacked in the correct manner and at the correct developmental stages (Chall, 1983; Erikson, 1950; Piaget, 1969). It is clear from the results of Research Hypothesis 2 that adolescence is not the correct time to attempt to

remediate reading accuracy deficits. Since reading accuracy is only weakly correlated with reading comprehension ($ES = .347$), the payoff for the amount of hard work put into reading accuracy instruction would be small. Reading accuracy instruction involves extensive and tedious attention to such skills as phonology and orthography. Accuracy remediation takes time and does not seem to translate into improved reading comprehension.

The third tenet of the theoretical framework developed for this study stated that reading fluency is a highly technical skill with numerous interactions between print, the eyes, speech organs, and the brain (Biemiller, 1978; Hudson et al., 2009; Kame'enui & Simmons, 2001; LaBerge & Samuels, 1974). The complicated nature of reading acquisition and remediation is clear from the results of this study. There are so many facets of reading development that it can be overwhelming to pinpoint how best to approach reading instruction with any student, but it is especially difficult when the variables inherent in an at-risk adolescent confound the process. For example, even with the clear results from this study, there are still many unknown factors that could have an influence on the reading comprehension of the participants. For example, reading prosody has at least five subskills (Rasinski, 1985; 2003b; Zutell & Rasinski, 1991), so finding that reading prosody is strongly correlated with reading comprehension creates further questions about which specific parts of reading prosody caused the correlation to be strong.

Recommendations

Recommendations for Practical Applications

Several implications may be drawn from the results of this research. These implications lead naturally to several practical applications of the findings that can be implemented during the instruction of reading:

- Accuracy should be developed and perfected during the elementary years because it is unlikely that it will be developed in the secondary schooling years, especially for at-risk adolescent readers. Reading accuracy can be improved through such pedagogical foci as explicit phonics instruction, the study of orthography, and the study of morphology.
- Reading teachers should spend less time on accuracy-related exercises in secondary reading classes. Accuracy that is not learned during the elementary school years is unlikely to be learned in later years. By this time, struggling readers have learned to compensate for their reading accuracy deficiencies by various means (Shaywitz, 2003). Even if reading accuracy is improved slightly during the secondary years, it does not have the potential to impact reading comprehension in any significant way like improvement in reading speed and reading prosody do, according to the results of this research.
- Reading teachers should spend more time on developing the ability to glean meaning from context. Since it is clear from this study that at-risk adolescents do not (or cannot) rely heavily on accuracy skills to comprehend text, then teachers should spend some time developing the skills that they do use—one of those is using context to determine meaning.

While the failure of the whole language philosophy has taught us that this skill cannot stand alone in terms of comprehension instruction (Eldredge & Baird, 1996; NRP, 2000), when coupled with prosody and speed exercises, it could have some value.

- Reading teachers should spend more time on prosody and speed related exercises in secondary reading classes. Examples of these exercises include timed readings, tape-assisted readings, adult/student reading, reading poetry aloud or reader's theatre, focusing on sentences that require attention to textual cues, choral reading in which pitch and tone are repeated after the teacher's annunciation, and activities that focus on the transition between letters, words, phrases, and sentences. Very little time is given to these types of activities at the secondary level.
- Secondary reading remediation activities should tie reading speed and reading prosody together. These types of activities are not currently in use, if they exist at all. More time needs to be devoted to the development of prosody and speed during remediation time. It seems that some type of prosody-focused timed reading might provide this type of dual focus during reading instruction.

Recommendations for Future Research

This research sheds light on the relationship between the three fluency subskills and reading comprehension. However, it also illuminates some research needs related to the issues that have been discussed. Recommendations for future research include ways to extend the current study as well as ideas for entirely separate investigations that are

now necessary because of gaps, weaknesses, or interesting revelations identified during this study.

The study should be repeated with both at risk males and females. It is equally important for teachers to know how strongly the three reading subskills correlate with reading comprehension in at-risk adolescent females as it is to know that information for at-risk adolescent males. A researcher could also repeat this study with just females and use that information for comparison purposes.

This study could be repeated with a more ethnically diverse group; Caucasian students comprised most of the participants (95.1%). At-risk students exist in all regions of the United States, so a researcher could find a location that is more ethnically diverse to conduct a similar research study. That research could include both male and female participants or just females, as mentioned previously.

Future research could include a norming study that includes students in grades 10-12. That study could develop reading fluency norms for grades 10-12 (which currently do not exist) so that proper reading speed can be determined and/or recognized when it is tested in secondary schools. Classroom teachers in grades 10-12 who are interested in remediating reading speed difficulties need a standard so that they can compare their students' WPM with a norm for their students' age group.

Future studies could expand this study by adding life variables (such as the ones identified in Chapter Two) to the reading variables to determine what influence life variables have on reading comprehension. This would require use of a multiple regression analysis procedure because of the number of variables and the possible interactions between those variables. It is very likely that life variables would be found

to be more influential on reading comprehension than the reading variables in this study. A larger sample size (minimum $N = 125$) would be needed to conduct this type of analysis.

Both reading prosody and reading accuracy have several subskills of their own. Finding that reading prosody or reading accuracy are correlated with reading comprehension is not enough information. It would be invaluable to know which of the subskills of prosody and accuracy are most responsible for the correlation with comprehension, and which have only a small part in the relationship. Future research should investigate those questions.

True experimental research should be undertaken that has the ability to produce a new reading remediation technique that combines attention to reading speed with attention to the several elements of reading prosody. A researcher could develop and test this type of program using at-risk adolescent struggling readers as the participants. One-half of the participants could be taught using the new dual focus technique and the other half could be instructed in the traditional manner with reading speed skills and reading prosody skills being taught separately.

This study should be repeated with students who are at-risk, but more emotionally stable. The participants in this study were diagnosed with mental illnesses, head trauma, emotional disturbances, and a myriad of stressful life situations. The reading comprehension test used in this study is administered when they first arrive at the facility. Obviously, this is a time of great upheaval in their lives. Couple that with the fact that they are often in the detoxification stage from years of drug use, and the result is that they are left emotionally and mentally fatigued. Future research could repeat this study with

students who are at-risk adolescents, but not quite as emotionally unstable. It could also be repeated at the same facility using tests that are administered further into the participants' commitment when their emotions and chemical balances have evened out. A longitudinal study that tracks elementary school at-risk students through the end of high school, based on the type of elementary school reading intervention they received and when they received it, would provide invaluable insight into what types of interventions are effective for at-risk youth. The factors that identify a student as at-risk are already well known. If the appropriate reading intervention (depending on their stage of development) can occur, perhaps some of those who are at risk could be guided in a more positive direction (Christle & Yell, 2008).

Delimitations, Limitations, and Assumptions

Delimitations

The content of this study was selected because of an identified gap in the research on adolescent at-risk readers in terms of which fluency subskills most highly correlate with reading comprehension. The research on struggling adolescent readers is growing exponentially, yet is still largely ignoring the individual factors that impact reading comprehension, as well the ways in which they influence reading comprehension. The original study design was a simple correlational study which sought to examine which of three independent variables (reading speed, reading accuracy, and reading prosody) correlated most highly with reading comprehension. To make the study more significant, the study was changed to a multivariate analysis which would determine which of the three predictor variables best predicted reading comprehension in at-risk adolescent readers. Later, in an attempt to identify all of the factors that combine to

impact reading comprehension, many other predictor variables were added. A review of the current literature supported inclusion of these new predictor variables, especially in regards to the lives of the target population of at-risk adolescents. However, after further consideration, research, and sample size analysis, the study was delimited to include only those variables that had valid and reliable instruments to measure them. The decision to use archival data was a result of the attempt to protect a vulnerable group of participants from possible harm.

Another consideration in the decision to limit the number of variables was the usability of the results. The choice of only three variables (rather than over 20 environmental and innate variables that were considered, and are mentioned in the review of literature) was made because if variables that are not under the control of teacher and reading specialists were found to be highly correlated with reading comprehension, what contribution would that really make to practitioners in the field? Those life variables would also have been very difficult to operationalize and quantify. Thus, the study intentionally excluded from the statistical analyses many factors that could largely influence a student's ability to comprehend what they read, specifically the environmental and innate variables mentioned in Chapter Two.

The study also intentionally excluded otherwise pertinent reading issues, such as evaluating specific classroom reading programs, some of the more technical aspects of reading that can lead to reading difficulties, the important question of setting standards for adequate reading speed in high school, and the developmental reading continuum. While these are all important issues, they were peripheral to the interests of this study. In order to obtain research results that were statistically stronger, the scope of the study was

delimited to include only the elements that would precisely answer this study's research questions. According to Pearl (2009), correlational interpretations can be made with more certainty when there are fewer confounding variables. Spending time on topics that were not directly relevant would have only hindered this goal.

Limitations

There are limitations in this study because of certain weaknesses that exist in the research methodology, design, analysis, and sample. There are three limitations that apply to every correlational study. There are also limitations that apply specifically to this study, and those are explained in this section as well.

Limitations due to study design. The sample for this study was not random. The participants were chosen based on the availability of complete data sets within a certain time frame. This may have inadvertently caused bias in the research design. While no particular control was put in place to limit the effects of a lack of randomization bias, the sample did include a representative demographic cross-section of students that have attended the school at the target facility (see Table 1).

Correlational studies are valuable in that they show that one variable is either related, or not related, to another variable. Correlation analyses also provide the strength of relationship between two variables. However, correlation is not an indicator of causation (Ary et al., 2006; Tabachnik & Fidell, 2001). One cannot say that one variable causes another variable just because they are correlated. For example, it was found in this study that reading speed and reading comprehension are strongly correlated, but that does not indicate that proficiency in reading speed causes proficiency in reading

comprehension. No control was needed to rectify this situation because causation was not stated or implied in the study, only correlation.

Another limitation of correlational studies is the directional limitation. It is impossible to determine if one variable is responsible for another variable, or if the relationship is the exact opposite (Hill & Lewicki, 2007). For example, it was found in this study that reading prosody and reading comprehension are strongly correlated, but it may be that reading comprehension ability impacts reading prosody, and not vice-versa. This is another reason that correlation cannot determine causation. No control was needed for directional limitation because the direction of the relationship was irrelevant to the results. Only the existence of statistically significant relationship was important, not the relationship's direction.

A final limitation of correlational studies is the possibility that a third variable simultaneously influences both of the variables that are being examined, resulting in a skewed correlation coefficient (Hill & Lewicki, 2007). For example, it was found in this study that reading speed was strongly correlated with reading comprehension, but it may be the case that reading prosody is a moderator variable because it impacts both of the variables being examined. Again, no control was needed for this limitation because it was already an established fact that reading is a recursive process in which the various skills interact with each other as the reader learns and develops reading ability; this is especially true of secondary students (Mateos, Martín, Villalón, & Luna, 2008). Consumers of reading research need to be aware of this and take it into consideration when viewing the results of the study.

Limitations due to study sample. There are a number of demographic limitations that were present in this study. The participants were all male, were spread out in age between 13-19 (mean age = 17.16 years), were nearly all Caucasian, and nearly all from rural areas. These limitations definitely influence the generalizability of the results to both sexes, all ages, all races, and all geographical areas. The researcher believes, however, that the results are applicable to all at-risk adolescent readers because the participants in this study are excellent representations of the category of at-risk adolescent reader.

This study was conducted at a maximum security juvenile prison where the researcher works as a literacy specialist. In that location, all of the students clearly fit the at-risk classification. However, the unique context of the study may produce more unreliable and less generalizable results. The MAP test is given to students for the first time within one week of arrival at the facility. Naturally, this is a tumultuous time in the lives of the students; they have just been committed to prison, they are often in the detoxification stage because they were previously addicted to illegal drugs and alcohol, and they are in an unfamiliar environment. Thus, the results of the MAP test (this study's measure of reading comprehension) given at the end of that first week may not be as reliable as the researcher would like. However, this is not very different than the uncertainty testers would face in a public school situation where there may still be apathy, challenging home environments, and the students may even still be addicted to drugs and alcohol.

In addition to the testing accuracy limitations, the site forced a correlational study due to the limited amount of archival data available for analysis. A multivariate

technique would have been a preferable research design because of its ability to identify which of the variables of interest actually predict reading comprehension; however, a minimum sample size of 125 was necessary (Tabachnik & Fidell, 2007) but not available.

Limitations due to study instrumentation and analysis. The use of Spearman's rho instead of Pearson's r increases the likelihood of a Type I error (the null hypothesis is true, but it is rejected). The research controlled for the Type I error by using a corrected significance level called the Bonferroni approach. Because three correlations were computed, the researcher was able to minimize the chances of making a Type I error with this approach. It required dividing the .05 significance level used in this study by the number of computed correlations (three). The three computed correlation coefficients were not considered significant unless their p values were less than the corrected significance level (.017). Using the Bonferroni approach, all three correlations were found to be significant, thus eliminating the concerns about Type I errors caused by the use of Spearman's rho (Salkind & Green, 2011).

Another limitation is the reading prosody rubric instrument. By their nature, rubrics are subjective and largely dependent on the knowledge, skill, and judgment of the rubric administrator. Even though this rubric has been validated through use in published studies, and even though the prosody testing was done by a trained reading specialist who had experience with the instrument, the possibility of error due to bias or subjectivity was still present.

With the elimination of outliers, there is a danger of obtaining results that do not accurately reflect the reality of the variability of the participants' reading ability, given the natural unreliability of the target population. Indiscriminant deletion of outliers is not

ever appropriate (Orr, Sackett, & DuBois, 1991). In fact, only 8% of researchers even screen their data for outliers (Osborne, Christiansen, & Gunter, 2001). However, Zimmerman (1994) noted that retention of outliers in the data set increases the error variance and reduces the power of statistical tests. Researchers must use their training and thoughtful consideration in making decisions concerning outliers. Therefore, the decision was made for this study to delete the cases that contained only extreme outliers because the main concern was that the findings about the majority of the population were accurate (Tabachnik & Fidell, 2007).

Limitations due to reliability and validity concerns. There were no large external threats to validity in this study. Generalizability was a minor external threat because of the large percentage of Caucasian participants. However, the area of the Northeastern United States where this study was conducted is overwhelmingly Caucasian (> 94%). Therefore, the sample (95.1% Caucasian) was representative of the general population. The results of a study that focuses on adolescent at-risk readers should be generalizable to any school that has a population that includes at-risk adolescent readers, regardless of the racial makeup of the sample. Ecological validity was similarly a minor problem in this study. The testing took place in the same classroom and with the same teacher for all participants. In addition, there was no activity or other people present at those times. Population validity was not a major problem in this study because the research examined a very specifically defined group (at-risk adolescent readers), thus the results are only generalizable to that group. A small threat existed because the participants are incarcerated, and their behaviors and problems are extreme, perhaps

meaning that their scores are less generalizable to nonincarcerated students who exhibit less extreme behaviors.

There were some potential internal threats to validity. The history threat was one such possible problem. The researcher designed the study so that as little time as possible passed between the collection of fluency assessment scores and the collection of MAP assessments, but a small amount of time did go by. However, as no treatment was administered in this study, the history effect, while present, was minimal.

Another threat that could have had a small influence on this study was compensatory rivalry. This is what is referred to as the “John Henry Effect” (Ary et al., 2006, p. 301). Students tend to try to read faster when they know that their fluency is being tested. This not only positively influences their reading rate, but negatively influences their accuracy, prosody, and recall as well.

A final group of threats to the validity of the study was related to the use of Spearman’s rho.

- *Homogenous group*: The students in this group were similar on at least one of the variables being studied, so the value of correlation coefficient may have been affected.
- *Unreliable measurement*: The measurements in this study were all published instruments found to be reliable and valid. However, there was a possibility of skewed results due to inconsistent administration.
- *Clumped scores due to ceilings or floors*: Because one of the fluency variables (reading prosody) had an upper ceiling and lower limit while the

reading comprehension variable did not, the scores were clumped together and an inaccurate correlation could have resulted.

Assumptions

The following assumptions apply to this research:

- There are definite skills that comprise every aspect of reading competence, and those skills can be developed given the correct instruction and internal motivation (Zweirs, 2004).
- The foundational ideas of LaBerge and Samuels (1974) show that automatic reading is the key to reading fluency, and correctly identifies how automatic reading occurs.
- The NRP (2000) report identified five essential reading skills that are necessary to teach and learn for optimal reading success to occur: phonemic awareness, phonics skill, fluency, vocabulary, and comprehension. The way in which they shed light on the problems of adolescent reading failure is especially important to this research.
- An understanding of Chall's (1983) stages of reading is essential to instructional success for teachers of reading. Chall (1983) demonstrated how teachers can optimize their teaching by knowing the stages of reading, what instruction is needed at each stage, and then providing it. Herber (1987) and Ehri (1995) also found that instruction in stages is beneficial to student learning.
- NCLB (2001), which mandates reading success for all students by grade three, and continued reading success through grade twelve, is an essential

document to parents, teachers, literacy specialists, and researchers who desire to remediate literacy problems at the secondary level. NCLB policy has made adolescent literacy a topic of immediate concern, which it has not been in the past.

Conclusion

Overall, the findings from this study demonstrated that both reading speed and reading prosody are strongly correlated with reading comprehension in at-risk adolescent readers. The study also revealed that the relationship between reading accuracy and reading comprehension is statistically significant, but the effect size is small ($ES = .347$).

Findings from this study suggest that the development of reading speed and reading prosody skills in at-risk adolescent readers may be the most essential factors in the development of their reading comprehension. This is pertinent information for secondary reading interventionists and secondary classroom teachers who often feel like their attempts at reading remediation with at-risk adolescents are futile. As more secondary reading specialists are introduced into the nation's middle and high schools in order to battle the growing problem of adolescent illiteracy, it is important for them to know the most effective and quickest route to success with the increasing population of at-risk adolescent struggling reader.

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Appendix A

Multidimensional Fluency Scale

| Dimension | 1 | 2 | 3 | 4 |
|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A. Expression and Volume | Reads with little expression or enthusiasm in voice. Reads words as if simply to get them out. Little sense of trying to make text sound like natural language. Tends to read in a quiet voice. | Some expression. Begins to use voice to make text sound like natural language in some areas of the text, but not others. Focus remains largely on saying the words. Still reads in a quiet voice. | Sounds like natural language throughout the better part of the passage. Occasionally slips into expressionless reading. Voice volume is generally appropriate throughout the text. | Reads with good expression and enthusiasm throughout the text. Sounds like natural language. The reader is able to vary expression and volume to match his/her interpretation of the passage. |
| B. Phrasing | Monotonic with little sense of phrase boundaries, frequent word-by-word reading. | Frequent two- and three-word phrases giving the impression of choppy reading; improper stress and intonation that fail to mark ends of sentences and clauses. | Mixture of run-ons, mid-sentence pauses for breath, and possibly some choppiness; reasonable stress/intonation. | Generally well phrased, mostly in clause and sentence units, with adequate attention to expression. |
| C. Smoothness | Frequent extended pauses, hesitations, false starts, sound-outs, repetitions, and/or multiple attempts. | Several "rough spots" in text where extended pauses, hesitations, etc., are more frequent and disruptive. | Occasional breaks in smoothness caused by difficulties with specific words and/or structures. | Generally smooth reading with some breaks, but word and structure difficulties are resolved quickly, usually through self-correction. |
| D. Pace (during sections of minimal disruption) | Slow and laborious. | Moderately slow. | Uneven mixture of fast and slow reading. | Consistently conversational. |

Zutell, J., & Rasinski, T. (1991). Training teachers to attend to their students' oral reading fluency. *Theory Into Practice*, 30, 211-217.

Appendix B

Explanation of Flesch-Kincaid Readability and Reading Ease Formulas and Readability Scores and Reading Ease Scores for Each QRI-4

Passage Used in the Study

The Flesch-Kincaid indicates how difficult documents will be to comprehend by calculating a document's Flesch-Kincaid Grade Level and Flesch Reading Ease Score. Like all readability indices, the Flesch-Kincaid Grade Level and the Flesch Reading Ease score only provide estimations and are only meant to be used as such.

The *Flesch-Kincaid Grade Level* is an index that gives the years of education required to comprehend a document. For example, a document with a Flesch-Kincaid Grade Level score of 10 would require that a reader have about 10 years (or a 10th grade level) of education to comprehend the document. It can be calculated using the following equation:

$$(0.39 \times \text{Average Sentence Length}) + (11.8 \times \text{Average Syllables per Word}) - 15.59$$

The *Flesch Reading Ease Score* indicates on a scale of 0 to 100 the difficulty of comprehending a document. A score of 100 indicates an extremely simple document, while a score of 0 would describe a very complex document. A Flesch Reading Ease Score in the range of 40–50 would correspond to a relatively complex document that might score a 12 as its Flesch-Kincaid Grade Level. The Flesch Reading Ease Score can be calculated by using the following equation:

$$206.835 - (1.015 \times \text{Average Sentence Length}) - 84.6 \times \text{Average Syllables per Word}$$

Readability Scores and Reading Ease Scores for Each QRI-4

Passage Used in the Study

| Passage Name | QRI-4 Level | Readability | Reading Ease |
|-------------------------------|-------------|-------------|--------------|
| Lost and Found | Pre-Primer | 1.12 | 94.97 |
| Spring and Fall | Pre-Primer | 0.69 | 111.07 |
| Who Do I See? | Pre-Primer | 1.41 | 113.82 |
| Just Like Mom | Pre-Primer | 1.98 | 116.41 |
| People at Work | Pre-Primer | 0.40 | 107.20 |
| A Trip | Primer | 2.01 | 92.00 |
| Fox and Mouse | Primer | 0.94 | 99.84 |
| The Pig Who Learner to Read | Primer | 1.84 | 94.93 |
| Who Lives Near Lakes | Primer | 2.66 | 86.66 |
| Living and Not Living | Primer | 2.07 | 89.56 |
| Mouse in a House | Grade 1 | 1.55 | 98.65 |
| Marva Finds a Friend | Grade 1 | 2.64 | 92.77 |
| The Bear and the Rabbit | Grade 1 | 2.04 | 95.15 |
| Air | Grade 1 | 0.46 | 107.93 |
| The Brain and the Five Senses | Grade 1 | 0.99 | 101.26 |
| The Lucky Cricket | Grade 2 | 2.95 | 91.46 |
| Father's New Game | Grade 2 | 3.69 | 84.69 |
| Whales and Fish | Grade 2 | 3.36 | 88.95 |
| Seasons | Grade 2 | 3.47 | 84.4 |
| Trip to the Zoo | Grade 3 | 4.27 | 84.59 |

| | | | |
|------------------------------------------|---------|------|-------|
| A Special Birthday for Rosa | Grade 3 | 6.46 | 72.07 |
| The Friend | Grade 3 | 4.74 | 81.87 |
| Cats, Lions, and Tigers in Your House | Grade 3 | 4.28 | 85.15 |
| Where Do People Live? | Grade 3 | 3.20 | 87.91 |
| Wool: From Sheep to You | Grade 3 | 4.27 | 83.61 |
| Johnny Appleseed | Grade 4 | 4.64 | 79.68 |
| Amelia Earhart | Grade 4 | 5.01 | 74.41 |
| Tomie dePaola | Grade 4 | 7.27 | 69.39 |
| Early Railroads | Grade 4 | 4.85 | 82.36 |
| The Busy Beaver | Grade 4 | 3.16 | 90.68 |
| Plant Structures for Survival | Grade 4 | 6.20 | 74.33 |
| Martin Luther King, Jr. | Grade 5 | 5.25 | 76.94 |
| Margaret Mead | Grade 5 | 6.81 | 66.22 |
| Patricia McKissack | Grade 5 | 8.98 | 57.89 |
| Farming on the Great Plains | Grade 5 | 5.58 | 76.43 |
| The Octopus | Grade 5 | 5.08 | 75.12 |
| How Does Your Body Take Oxygen? | Grade 5 | 6.24 | 72.95 |
| Pele | Grade 6 | 5.67 | 74.11 |
| Life of Lois Lowry | Grade 6 | 7.20 | 72.03 |
| The Lifeline of the Nile | Grade 6 | 7.48 | 63.63 |
| Building Pyramids | Grade 6 | 8.35 | 56.23 |

| | | | |
|------------------------------|---------|-------|-------|
| Temperature and Humidity | Grade 6 | 8.41 | 62.59 |
| Clouds and Precipitation | Grade 6 | 6.15 | 76.43 |
| Biddy Mason | M.S. | 3.61 | 85.33 |
| Malcolm X | M.S. | 8.67 | 61.71 |
| Immigration Part I | M.S. | 10.59 | 41.12 |
| Immigration Part II | M.S. | 8.30 | 59.37 |
| Life Cycle of Stars Part I | M.S. | 6.50 | 68.19 |
| Life Cycle of Stars Part II | M.S. | 6.12 | 72.14 |
| Where the Ashes Are Part I | H.S. | 5.66 | 76.72 |
| Where the Ashes Are Part II | H.S. | 6.31 | 74.03 |
| Where the Ashes Are Part III | H.S. | 7.13 | 68.00 |
| World War I Part I | H.S. | 12.36 | 42.22 |
| World War I Part II | H.S. | 8.67 | 60.36 |
| World War I Part III | H.S. | 9.27 | 57.19 |
| Characteristic of Viruses | H.S. | 9.74 | 49.18 |
| Part I | | | |
| Characteristics of Viruses | H.S. | 9.53 | 48.33 |
| Part II | | | |
| Characteristics of Viruses | H.S. | 11.54 | 32.49 |

Appendix C

Explanation of RIT Scores

The Rausch Unit Scale

The RIT Scale is a curriculum scale that uses individual item difficulty values to estimate student achievement. An advantage of the RIT scale is that it can relate the numbers on the scale directly to the difficulty of items on the tests. In addition, the RIT scale is an equal interval scale. Equal interval means that the difference between scores is the same regardless of whether a student is at the top, bottom, or middle of the RIT scale, and it has the same meaning regardless of grade level.

RIT scales, like scales underlying most educational tests, are built from data about the performance of individual examinees on individual items. The theory governing scale construction is called Item Response Theory (IRT). NWEA uses a specific IRT model conceived by Danish mathematician, Georg Rausch, (1901-1980). Rausch is best known for his contributions to psychometrics, and his model is used extensively in assessment in education, particularly for skill attainment and cognitive assessments (Northwest Evaluation Association, 2005b).

Characteristics of the RIT Scale include:

- It is an achievement scale.
- It is an accurate scale.
- It is an equal interval scale.
- It helps to measure growth over time.
- It has the same meaning regardless of grade or age of the student.

Scale Variance by Subject

Why do RIT scales vary from subject to subject (e.g. the mathematics RIT scale goes higher than other subject areas)? A ceiling effect exists when an assessment does not have sufficient range to accurately measure students at the highest performance levels. It has nothing to do with the actual numbers attached to the scale and everything to do with the position of students on it. For example, in reading, the RIT scale measures with relative accuracy up to about 245. This represents the 93rd percentile at grade 10, and the 95th percentile at grade 8. If a student scores above we know that student performed high but may not be able to accurately assess how high they performed. Relative to other tests, therefore, there is very little true ceiling effect in this assessment. Even most high performing 10th graders receive a technically accurate measure of their skill.

Appendix D

Department of Corrections Policy 1.24

I. AUTHORITY

The Commissioner of Corrections adopts this policy pursuant to the authority contained in 34-A M.R.S.A. Sections 1216 and 1403.

II. APPLICABILITY

Entire Maine Department of Corrections

III. POLICY

It is the policy of the Maine Department of Corrections to support, promote and participate in research, evaluation, and performance measurement functions relevant to correctional programs, services and operations, in order to accomplish the overall goals and mission of the Department. The Department shall continually seek to improve its effectiveness and efficiency by emphasizing the use of research, evaluation and performance measurement. All research must be approved by the Commissioner or the Deputy Commissioner for Legislative and Program Services.

IV. CONTENTS

Procedure A: Client Participation in Research

Procedure B: Application for Permission to Conduct Research

Procedure C: Requirements for Approval

Procedure D: Conduct of Research

Procedure E: Dissemination of Finding

V. ATTACHMENTS

ATTACHMENT A: RESEARCH AGREEMENT

Attachment B1: Research Consent Form (Client)

Attachment B2: Research Consent Form (Staff)

VI. PROCEDURES

PROCEDURE A: CLIENT PARTICIPATION IN RESEARCH

1. Clients are prohibited from participating in testing for medical, mental health, pharmaceutical or cosmetic experimental or research projects.
2. Client participation in research, other than that prohibited above, shall be permitted only with the voluntary consent of the client.

PROCEDURE B: APPLICATION FOR PERMISSION TO CONDUCT RESEARCH

1. Any person wishing to conduct research shall submit an application to the Department's Deputy Commissioner for Legislative and Program Services.
2. The application shall include the following information:
 - a. Title of project;
 - b. Names, addresses and telephone numbers of principal researcher and all research assistants and other information necessary for the completion of background checks.
 - c. Documentation that the applicant is a member of a recognized organization, such as a university, college, private foundation or consulting firm, or a public agency and has the permission of that organization or agency to perform the proposed research.

- d. A summary of the goals of the project and the justification for the research; and
 - e. A detailed research design including the following elements:
 - i. Departmental resources, including staff, that may be needed for the project and the extent of the need;
 - ii. Criteria and procedures for selection of subjects or records for the research;
 - iii. Type of data to be collected;
 - iv. Procedures for data collection and copies of research instruments to be used, including interview schedules, questionnaires, data collection forms, and tests;
 - v. Procedures to protect the privacy of participants and the confidentiality of protected information, including copies of proposed consent forms; and
 - vi. A written summary explaining to potential subjects the goals and methods of the project.
3. If the project is to be conducted at a Departmental facility or in a community corrections region, upon request of the Commissioner or the Deputy Commissioner for Legislative and Program Services, the facility Chief Administrative Officer or Regional Correctional Administrator shall review the project proposal and shall recommend whether or not the project should be approved.

4. The Deputy Commissioner for Legislative and Program Services shall ensure that all researchers receive a copy of this policy and agree to comply with it. The Research Agreement (Attachment A) shall be signed by the principal researcher and all research assistants. The Commissioner or the Deputy Commissioner shall indicate approval of the research project by signing the Research Agreement and returning a copy to the principal researcher, with a copy to the Chief Administrative Officer or Regional Correctional Administrator, if applicable.
5. No research project shall be conducted without the prior written approval of the Commissioner or Deputy Commissioner for Legislative and Program Services.

PROCEDURE C: REQUIREMENTS FOR APPROVAL

1. An approval of a request to conduct a research project shall not be given unless the following requirements are met:
 - a. The research is requested by and is to be conducted by professional researchers, university or college faculty, graduate students as part of a degree program, or qualified public agency staff.
 - b. The principal researcher and all research assistants pass any background checks.
 - c. An acceptable application for the proposed project is submitted.
 - d. The proposed project is likely to promote the overall goals and mission of the Department.

- e. The project will not significantly disrupt Department routine or interfere with staff carrying out their duties.
 - f. Participation of staff and clients is to be done strictly on a voluntary basis.
 - g. Subjects participating in the project will not be identified by name or number or in any other way which might lead to the subject's identification.
 - h. The principal researcher agrees to submit a draft of the research report to the Commissioner or Deputy Commissioner for Legislative and Program Services for review prior to completion and publication and to make revisions as requested. This review shall be concerned only with factual errors, misinterpretations of Departmental policies, procedures, or practices, and violations of confidentiality, and not with the findings or conclusions reached by the researcher.
- 2. It is within the complete discretion of the Commissioner or the Deputy Commissioner for Legislative and Program Services to determine whether to approve a research project that fulfills the above requirements.
 - 3. Approval to conduct research may be withdrawn at any time, whether prior to or during the project, at the complete discretion of the Commissioner or the Deputy Commissioner for Legislative and Program Services.

PROCEDURE D: CONDUCT OF RESEARCH

1. The principal researcher or research assistants shall explain the goals and methods of the project to all potential subjects. A written summary shall be provided to each potential subject. All staff and clients shall be informed that their participation in the research is purely voluntary. All clients shall be informed that regardless of whether they agree to participate or not, there will be no effect on the length, terms or conditions of their custody or supervision.
2. The principal researcher or research assistants shall obtain a signed consent form (Attachment B) from staff and clients who agree to participate in the research, including the consent of a parent or guardian of a client, as necessary. If required by the organization or agency sponsoring the research project, participants may also be asked to sign additional consent forms.
3. The researcher shall provide foreign language assistance to those non-English speaking clients who are to be included in the research project.
4. Neither the principal researcher nor any research assistant may remove an original record or copy of a record or identifying data from the Department facility or office where the record is kept.
5. Neither the principal researcher nor any research assistant may disclose, in writing or orally, any information regarding security practices, the custody or supervision of clients, or any other matter concerning the operations of the Department or concerning clients or staff knowledge of which has been obtained, directly or indirectly, by virtue of participating in the

research project, except to the extent the information is collected and reported as described in the project proposal and in the written summary provided to the subjects prior to participation in the project.

6. Any data collected during the course of the research shall be used only in the manner described in the project proposal and in the written summary provided to the subjects prior to participation in the project.
7. No staff of the Department or client shall receive compensation of any kind for participation in the research project, unless specifically approved, in writing, by the Commissioner or Deputy Commissioner for Legislative and Program Services.
8. The principal researcher and research assistants shall abide by all Department security practices and shall comply with all instructions of Department staff in the event of an emergency or critical incident.

PROCEDURE E: DISSEMINATION OF FINDINGS

1. The Department reserves the right to disseminate any findings or conclusions reached as a result of the research within the Department or to other state agencies or criminal justice agencies.
2. All requests for information received by the Department related to a research project shall be referred to the Department's Public Affairs Coordinator.

VII. PROFESSIONAL STANDARDS

ACA:

ACI - 4-4108 The institution or parent agency supports and engages in research activities relevant to its programs, services, and operations.

ACI - 4-4109 Written policy, procedure, and practice provide that the warden/superintendent encourages and uses research conducted by outside professionals.

ACI - 4-4110 Operational personnel assist research personnel in carrying out research and evaluation.

ACI - 4-4111 Written policy and procedure govern the conduct of research in the institution, including compliance with professional and scientific ethics and with state and federal guidelines for the use and dissemination of research findings.

ACI – 4-4112 The warden/superintendent reviews and approves all institutional research projects prior to implementation to ensure they conform with the policies of the parent agency.

ACI - 4-4113 Written policy and procedure govern voluntary inmate participation in non-medical, non-pharmaceutical, and noncosmetic research programs.

ACI - 4-4402 (MANDATORY) The use of offenders for medical, pharmaceutical, or cosmetic experiments is prohibited. This does not preclude offender participation in clinical trials that are approved by an institutional review board based on his/her need for a specific medical intervention. Institutions electing to perform research will be in compliance with all state and federal guidelines.

4-ACRS-7D-12 In facilities that engage in, or allow the conduct of research, the facility complies with state and federal guidelines for the use and dissemination of research findings, with accepted professional and scientific ethics, and issues of legal consent and release of information. Procedures govern the voluntary participation of

offenders in nonmedical, nonpharmaceutical, and noncosmetic research programs. The facility administrator reviews and approves all research projects prior to implementation. All research results are made available to the facility administrator for review and comment prior to publication or dissemination.

4-JCF-6F-06 The facility or parent agency supports, engages in, and uses research activities relevant to its programs, services, and operations.

1. The facility administrator reviews and approves all research prior to implementation to ensure compliance with professional/scientific ethics, agency policy, and state and federal guidelines for the use and dissemination of research findings.
2. Juvenile participation is voluntary in nonmedical, nonpharmaceutical, and noncosmetic research programs.
3. Access to records is granted for the purpose of research, evaluation, and statistical analysis in accordance with a formal written agreement that authorizes access, specifies use of data, and ensures confidentiality.
4. All research results are made available to the facility administrator for review and comment prior to publication or dissemination.

Appendix F

Example of a Completed QRI-4 Assessment

(Leslie & Caldwell, 2006) Assessments

Figure 14.1 Student Profile Sheet

Name Jamie Birthdate 11/12 Grade 5 (retained)
Sex M Date of Test 11/8 Examiner YC



Word Identification

| Grade | 3 | 4 | 5 | | | | | | |
|-------------------|-----------|----------|----------|--|--|--|--|--|--|
| Level/% Automatic | 70 ins | 55 fr | 25 fr | | | | | | |
| Level/% Total | 85 ins | 65 fr | 40 fr | | | | | | |

Oral Reading

| | | | | | | | | | |
|------------------------------------|-----------|-----------|----------|--|-----------|--|--|--|--|
| Passage Name | zoo | Amelia | MLK | | Beavers | | | | |
| Readability Level | 3 | 4 | 5 | | 4 | | | | |
| Passage Type Narrative/Expository | N | N | N | | E | | | | |
| Concepts Familiar/Unfamiliar: % | 92 F | 75 F | 75 F | | 83 F | | | | |
| Level/% Total Accuracy | 95 ins | 95 ins | 88 fr | | 95 ins | | | | |
| Level/% Total Acceptability | 96 ins | 98 ins | 91 fr | | 97 ins | | | | |
| Retelling % Number of Ideas | 7% | 11% | 11% | | 8% | | | | |
| # Explicit Correct | 4 | 4 | 3 | | 2 | | | | |
| # Explicit Correct w/Look-backs | | | | | 3 | | | | |
| # Implicit Correct | 3 | 3 | 3 | | 0 | | | | |
| # Implicit Correct w/Look-backs | | | | | 1 | | | | |
| Level/% Comprehension | 88 | 75 | 63 | | 25 fr | | | | |
| Level/% Comprehension w/Look-backs | | | | | 50 fr | | | | |
| Rate WPM/CWPM | 60 wpm | 52 wpm | 50 wpm | | 54 wpm | | | | |
| Total Passage Level | ins | ins | fr | | fr | | | | |

Silent Reading

| | | | | | | | | | |
|------------------------------------|------|--|--|--|--|--|--|--|--|
| Passage Name/Section | John | | | | | | | | |
| Readability Level | 4 | | | | | | | | |
| Passage Type Narrative/Expository | N | | | | | | | | |
| Concepts Familiar/Unfamiliar % | 83 F | | | | | | | | |
| Retelling % Number of Ideas | 6% | | | | | | | | |
| # Correct Explicit | 3 | | | | | | | | |
| # Correct Explicit w/Look-backs | 3 | | | | | | | | |
| # Correct Implicit | 2 | | | | | | | | |
| # Correct Implicit w/Look-backs | 2 | | | | | | | | |
| Level/% Comprehension | 50 | | | | | | | | |
| Level/% Comprehension w/Look-backs | 50 | | | | | | | | |
| Rate: WPM | 54 | | | | | | | | |