

**UNDERSTANDING READING COMPREHENSION:
MULTIPLE AND FOCUSED STRATEGY INTERVENTIONS FOR
STRUGGLING ADOLESCENT READERS**

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By
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DEDICATION

This thesis is dedicated to my mom who:

- a) persisted in loving me despite the significant challenges I presented to the maternal attachment process; and
- b) provided me with all the tools and support I ever needed to be successful and happy in life (including a genetic predisposition towards curiosity and intelligence), then asked me *what do you want to do?*

I love her dearly & owe my every success to her.

ABSTRACT

The purpose of this study was to investigate methods for improving reading comprehension among struggling adolescent readers. More specifically, this study was concerned with: the effectiveness of pull-out intervention for reading outcomes in this population; the most effective type of intervention; and the contributions of instructional method to reading comprehension after decoding has been removed. These questions were answered with the help of 29 students from a rural school division in Saskatchewan who volunteered to participate in testing and various forms of reading intervention for a period of four to five weeks. Students were placed into one of three groups: the MSI group practiced decoding and learned six comprehension strategies; the FSI group practiced decoding and learned just two comprehension strategies; and the control group who participated in their typical education program.

The effectiveness of pull-out as a method of intervention was determined by collapsing the MSI and FSI groups into one and then comparing these scores with that of the control group using a repeated measures ANOVA. The groups' improvements in reading were analyzed by comparing pre- and post-test standard scores on the GORT-4 reading comprehension subtest, and on a decoding measure (i.e., WJ-III and WIAT-II) in a repeated measures MANOVA. These results led to supplementary post hoc testing using repeated measures ANOVAs to determine the exact nature of improvements made by each of the groups. Further contributions of decoding and instructional method were determined through the use of a multiple regression.

In sum, the analysis produced the following results:

1. Pull-out intervention (pre-test $M = 6.00$; post-test $M = 7.33$) did not offer a statistically significant advantage over the typical classroom setting (pre-

test $M = 7.00$; post-test $M = 7.05$) when attempting to remediate reading comprehension;

2. Participants in the MSI group demonstrated significant improvement on measures of decoding ($p = .001$; $\eta_p^2 = .75$);
3. Although statistical testing did not reveal significant results, effect sizes were large for: participants in the MSI group on measures of fluency ($\eta_p^2 = .39$); participants in the FSI group on measures of fluency ($\eta_p^2 = .53$) and the Oral Reading Quotient ($\eta_p^2 = .37$); participants in the control group on measures of decoding ($\eta_p^2 = .21$), comprehension ($\eta_p^2 = .38$), fluency ($\eta_p^2 = .32$), and the Oral Reading Quotient ($\eta_p^2 = .50$); and
4. Decoding accounted for a statistically significant 15.4% of the unique variance in post-test comprehension scores ($p = .03$), but differences in grouping contributed a negligible amount ($p = .1$; R^2 change = .004).

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CHAPTER ONE

Introduction

Reading is vital for academic achievement and is an important and necessary skill for successful functioning as a competent adult in today's society (Human Resources and Social Development Canada, 2003c). As an adult, the ability to read is not only important for practical and legal reasons (i.e., reading contracts or forms) but also for personal adaptive reasons (i.e., maintaining a sense of self-efficacy in a literate culture) and larger socio-political reasons (i.e., to be informed about and participate in social or political discourse via written media like the newspaper; Alves-Martins, Peixoto, Gouveia-Pereira, Amaral, & Pedro, 2002; Human Resources and Social Development Canada, 2003a). The ability to read allows us to feel successful, access information, and orient ourselves in the world among competing paradigms. It also facilitates the exercise of power in North American mainstream society (Pressley, 2002b), allowing readers to see how others have transformed the world through the written word (Freire & Macedo, 1987). Reading helps us live and act in society with others. An *inability* to read, then, can lead to a profound sense of disengagement and uselessness.

Poor literacy has been linked with poor self-esteem and maladaptive internalizing and externalizing behaviours (Alves-Martins et al., 2002; Willcutt & Pennington, 2000b). People who have a low level of literacy may encounter multiple situations where their inability to read draws the attention, and possible ridicule, of others. A person who struggles to read may thus struggle to feel a sense of self-worth

(Alves-Martins et al., 2002). An inability to read has been found to correlate with symptoms of anxiety and depression (Willcutt & Pennington, 2000b). If people cannot believe in themselves, their skills and ideas, it is difficult to imagine that they would feel empowered to improve their social or political world, or to even ask for help. The tragedy of illiteracy lies in the wasted hopes and dreams of creative, talented, or intelligent men and women who feel they have nothing to offer.

This waste of talent is illustrated in the substantial proportion of Canadians who struggle to read. A surprising 22% of Canadians 16 years of age and over struggle with text; and an additional 24 to 26% can only deal with very simple text that is clearly laid out and does not require complex processing (Human Resources and Social Development Canada, 2003c). This means as many as 48% of Canadians do not meet the “minimum desirable threshold” of literacy as defined in the International Adult Literacy Survey (Human Resources and Social Development Canada, 2003b). This threshold is the lowest literacy skill level considered adequate for dealing with the demands of everyday life and work in a complex society (Human Resources and Social Development Canada, 2003a). Decreased literacy levels are also linked to decreased earning potential (Green & Riddell, 2007). Green and Riddell (2007) illustrate that literacy skills have a direct impact on weekly wages. So for example, one may expect a high earning professional such as a lawyer or doctor, to have higher literacy skills than a lower wage earner such as an employee for a fast food restaurant or retail company. People with lower levels of literacy may struggle with everyday activities, financial difficulties, or low self-esteem, and feel socially and politically impotent (Alves-Martins et al., 2002; Freire & Macedo, 1987; Green & Riddell, 2007; Human Resources and Social Development Canada, 2003c; Willcutt & Pennington, 2000b). Therefore, it is

vital that public school systems in Canada continue to not only improve methods of teaching students how to read, but also to understand what they have read.

High school represents the last opportunity students have, in a publically funded education system, to maximize their reading ability. It is often the case that students did not learn to read effectively in their elementary years (Hock & Deshler, 2003).

Although there can be multiple explanations for this situation (Fletcher, Lyon, Fuchs, & Barnes, 2007), focus must remain on the eventual outcome for students. Since the ability to read facilitates a sense of self-worth, in addition to social, political, and financial success (Alves-Martins et al., 2002; Freire & Macedo, 1987; Green & Riddell, 2007; Human Resources and Social Development Canada, 2003c; Willcutt & Pennington, 2000b), all reasonable efforts must be made to help students learn to read. In order to capitalize on this final opportunity, teachers need to know which reading intervention methods can provide the best results for students experiencing reading difficulties, in a relatively short period of time. Effectiveness and efficiency are further required by the financial realities of a publically funded educational system where many needs must be served with relatively few resources, especially in the area of special education (Kozey & Siegel, 2008). If the appropriate interventions can be found, educators have a better chance of successfully addressing illiteracy among adolescents.

Definition of Terms

An in-depth understanding of concepts related to reading will be developed further in subsequent sections; however, a cursory definition of terms may be useful at this point. Although a multitude of skills are brought into practice when reading, the skills are sometimes broadly categorized into decoding and comprehension (e.g., Catts, Adlof, & Weismer, 2006; Hoover & Gough, 1990; Keenan, Betjemann, & Olson, 2008).

It is important to note, however, that these categories are not discreet (As is the case with inferencing in Perfetti, Landi, & Oakhill, 2005), but rather serve as a rough description of outcomes that occur as one reads.

Decoding. Decoding may be thought of as the process through which a reader can translate symbols on a page into language (Hoover & Gough, 1990). As a reader looks at a page of print, certain skills are called upon in order to recognize the symbols as letters and to then combine the letters into words that the reader can identify. For example, a small circle can be translated as the letter *o*, and, when placed to the left of the letter *n*, helps to form the word *on*.

Reading comprehension. Reading comprehension can be understood as the process through which the recognized words are transformed into a meaningful idea (Hoover & Gough, 1990). It is a complex process that requires the activation of numerous cognitive skills (Kintsch, 1998). There are also different depths of understanding (Perfetti et al., 2005). At the most basic level, reading comprehension may involve the picture that comes to mind when reading the word *cat*. It may be as in-depth as the symbolic representation of a cat as having god-like qualities, as is sometimes associated with Ancient Egyptians. Comprehension is the reason for reading; it encompasses the learning, growing, and evolution of ideas that occur as one reads.

The goal of reading. The understanding of reading that includes both decoding and comprehension forms the foundation of this study. If a reader can both decode and comprehend the printed word, she/he has attained a skill in reading that offers the most personal fulfillment and future success (Human Resources and Social Development Canada, 2003b). As such, reading which involves both proficient decoding and skilful comprehension is the ultimate goal of reading instruction.

Statement of Purpose

There is a lack of information on effective and efficient reading comprehension interventions (Kamhi, 2005). Therefore, this study examined two approaches to remediate comprehension difficulties in adolescent readers: (1) a multiple strategy approach where six main comprehension strategies were taught, along with a decoding intervention for 90 minutes/week for four weeks; and (2) a focused strategy approach where just two strategies were taught, along with a decoding intervention for 30 minutes/week for five weeks. Specifically, this study focused on the following research questions:

- 1a. What effect does small-group pull-out intervention have on reading comprehension, as opposed to instruction received in the typical educational setting?
- 1b. What type of instruction (Multiple Strategy Instruction, Focused Strategy Instruction, or typical educational setting) leads to the greatest gains in reading comprehension and decoding?
2. How much unique variance does the type of comprehension instruction and decoding instruction contribute to reading comprehension?

Significance of the Study

Reading comprehension theory, instruction, and remediation research is still in its infancy. Scientific research at the academic level was so scant in 2000 that the National Reading Panel could not make a conclusive meta-analysis of research literature in the area of reading comprehension (National Institute of Child Health and Human Development, 2000). Teachers are noticing gaps in reading comprehension, but are unable to implement research-based strategies to address these skill deficits (Gill, 2008).

Teachers require scientifically validated intervention methods to provide effective and efficient reading interventions for adolescent readers. Research has been conducted in the area of decoding (See National Institute of Child Health and Human Development, 2000 for a meta-analysis of research literature), but further information is required about specific methods of teaching reading comprehension (National Institute of Child Health and Human Development, 2000). Comprehension difficulties often become an obstacle in the older grades because curriculum increasingly focuses on progressively complex content. Researchers and practitioners are beginning to put together the pieces for appropriate instruction. This study may offer some insights as to the most effective and efficient instructional design.

Chapter Organization

This thesis is organized into five chapters. Following this overview, Chapter 2 surveys existing research literature to develop a model of reading, notes major considerations with the population under study, and discusses prevailing intervention strategies within this context. Chapter 3 focuses on the methodology employed in the course of the study. Chapter 4 provides the results from the data analysis. Chapter 5 discusses the implications, limitations and future directions for this area of study.

CHAPTER TWO

Literature Review

Scientifically validated research can be strongly tied to theory and previous research. Consideration of existing literature entrenches a study firmly within contemporary and historical thought (Morris, 2004). To meet this end, the following literature review will examine current theory and practice to gain an understanding of reading and reading intervention. The literature review is divided into three sections. Section one examines reading theory and consolidates several ideas from various disciplines into a cohesive Model of Meaningful Reading. Section two defines and discusses the importance of targeting struggling adolescent readers. Section three examines research-based interventions, with a focus on comprehension intervention strategies. These basic understandings form an important foundation for further exploration of reading comprehension intervention for adolescent struggling readers.

Reading Theory

There has been a plethora of theories of reading set forth by multiple disciplines including speech-language pathology (e.g., Kamhi & Catts, 2005), educational psychology (e.g., Berninger, 2001b; Pressley & Afflerbach, 1995), cognitive psychology (e.g., Kintsch, 1998) and medicine (e.g., Shaywitz, 2003; Sousa, 2007). Although these theories are useful to gain an understanding of reading, they are typically shaped by the prevailing concerns of the field. For example, medical theories are aimed at definitive diagnosis through functional magnetic resonance imaging (fMRI), and subsequent remedies (Shaywitz & Shaywitz, 2004). Cognitive psychology, in contrast, deals with

highly abstract and nearly entirely theoretically based constructs of reading (e.g., Kintsch, 1998; Kintsch & Rawson, 2005). A consolidation of these theories can provide a more holistic understanding of the reading process. The following section will begin with a review of A Simple View of reading (Hoover & Gough, 1990), and expand this model using the Modified Triangle (Bishop & Snowling, 2004). From here various theories and ideas about reading comprehension (Cain & Oakhill, 2006; Graesser & Britton, 1996; Kamhi & Catts, 2005; Kintsch, 1998; Kintsch & Rawson, 2005; Perfetti et al., 2005; Pressley, 2002b; Snow & Juel, 2005) will be pulled together to form a foundational model of the cognitive processes involved in reading.

A Simple View. A Simple View of Reading is a basic theory of reading comprehension developed by Hoover and Gough (1990). A Simple View consists of two factors, decoding and oral language, which have reading comprehension as their product (Hoover & Gough, 1990). This point of view suggests that reading comprehension is a form of linguistic comprehension that enters the brain through visual decoding (Hoover & Gough, 1990). Decoding is the translation of symbols on the page into a word in the reader's aural vocabulary. From this point, oral language comprehension helps to interpret the meaning of the words. The relationship can be conceptualized as follows:

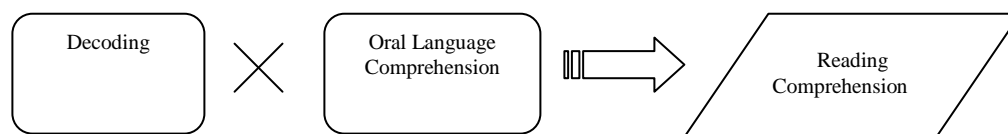


Figure 1. A Simple View of Reading.

Both factors are needed to support reading comprehension; if either factor is reduced, the overall result will also be reduced (Hoover & Gough, 1990). Likewise,

when one skill area improves, the product, reading comprehension, will also improve if skill level in either factor is a non-zero (Hoover & Gough, 1990). The model further suggests that an inverse correlation exists between decoding and oral language comprehension if a state of illiteracy exists (Hoover & Gough, 1990). This model provides a good starting point for understanding reading processes.

A Simple View has some strong support as a method for both understanding reading, and reading deficits (Catts & Kamhi, 2005c; Catts et al., 2006; Hoover & Gough, 1990; Roberts & Scott, 2006; Stuart, Stainthorp, & Snowling, 2008). A major part of decoding involves mapping phonemes (i.e., sounds) onto graphemes (i.e., letters). Phonological awareness, an understanding of the sounds of language, has been studied as a major component of decoding for three decades (see Scarborough, 2005 for an overview). Studies also suggest strong correlations between oral language skills, or listening skills, and reading comprehension both in children and adults (Bell & Perfetti, 1994; Nation & Snowling, 2004; Wise, Sevcik, Morris, Lovett, & Wolf, 2007). These aspects of reading and thinking are thus married in A Simple View to produce reading comprehension.

A Simple View is also a good basic tool for categorizing assessment of reading disabilities (Catts & Kamhi, 2005b; Hoover & Gough, 1990). Generally speaking, individuals who are low in decoding, but high in oral language abilities are referred to as Dyslexic; those who are low in oral language, but are strong decoders have a Specific Language Impairment (SLI; Catts & Kamhi, 2005b). These divisions constitute broad guidelines and do not provide specific diagnostic criteria in terms of cut-off points due to the lack of psychometric evidence for precise definitions (Bishop & Snowling, 2004; Fletcher et al., 2007). Groups can be further divided into sub-types (Catts & Kamhi,

2005b). Using A Simple View as a model for categorizing reading disabilities can lead to more efficient assessment and intervention by suggesting a starting point (Catts & Kamhi, 2005b). For those who are completely unfamiliar with the cognitive processes of reading, the model provides a simple way of understanding the reading process. Problems in the reading process can be identified in a general way, providing some guidance as to where intervention might start to take place (Catts & Kamhi, 2005b; Hoover & Gough, 1990).

For most casual discussion purposes, the broad categories in A Simple View are a sufficient breakdown of reading skills; however, for a more refined understanding of reading, this model is too simplistic (Hoover & Gough, 1990; Pressley et al., 2009). A Simple View is a starting point. Hoover and Gough (1990) suggested that the factors in A Simple View be seen as categories of skills; each category contains many discreet skill areas (as will be discussed further in subsequent sections). However, if intervention is to occur at critical points of deficit, a more precise model is required. For example, if an educator is merely given *comprehension* as an area of weakness it is nearly impossible to remediate because reading comprehension may encompass over 30 different skills (i.e., summarizing, analyzing, creating themes, predicting, reflecting, inferencing, etc.; Block & Pressley, 2002). Without a firm appreciation of the finer skills involved in each category, educators are in danger of implementing ineffective programs; wasting time and wearing down the self-esteem of struggling students who may already feel they are a lost cause.

Theoretically, A Simple View is unable to accommodate the differences between oral and written language (Kamhi & Catts, 2005). Written text can be more symbolic, abstract and contain many difficult ideas in a short amount of text. This type of dense

text can be found in many academic articles or highly regarded pieces of cultural literature. Although some oral cultures (such as Cree) may use dense dialogue and higher-order constructs in spoken communication, the majority of North American oral communication is repetitive, straightforward, and concrete (Kamhi & Catts, 2005). Hoover and Gough (1990) briefly recognized these differences between formal and natural language, but did not adequately address the differences in their article. Furthermore, in spoken language, communicators can ask each other questions and get an immediate response if comprehension is incomplete. Written text requires the pervasive use of inferencing to fill the gaps in a text. For example, if someone were to say “I spilled eggs on Olivia, but she licked it off her fur,” the listener could ask, “Is Olivia your cat?” whereas the reader would be left to make her/his own inferences to fill in this gap. Pressley and colleagues (2009) contended that although oral language skills may account for some cognitive processes that occur while reading, many processes such as motivation, working memory, and processing speed, are not fully explained in A Simple View. A Simple View does not adequately account for the differences in cognition which must take place both as a result of the process of reading and as a function of the way ideas are transcribed.

Another problem with A Simple View is that it can only explain comprehension that occurs through phonological processing. However, the Dual Route Approach would suggest that one pathway for reading, the lexical pathway, is taken directly from the text itself, by-passing phoneme-grapheme rules altogether (Castles, Bates, Coltheart, Luciano, & Martin, 2006). Although this theory is primarily concerned with explaining the phenomenon of sight words, it may be further suggested that in some instances words that are not a part of the oral vocabulary of the reader may figure prominently in

the visual lexicon (Seidenberg & McClelland, 1989). A reader can visually analyze both the context and the parts of a word to arrive at an accurate understanding of its meaning without having previously heard the word (Seidenberg & McClelland, 1989). Repeated exposure to a word in various written contexts can allow a reader to construct a semantic tag for the word without ever having heard it. If a reader encountered the word *immaculate*, for example, in a story indicating the cleanliness of a house; and again in the bible; and again in a story describing a white shirt; she/he may be able to create the tag of *clean* or *pure* for *immaculate*. Another example can illustrate how visual analysis can aid in comprehension. A reader may know a root word, such as *compensate* from her/his oral vocabulary. Knowing that the *-tory* or *-tive* suffixes indicate an adjective, the reader can then construct a meaning for the words *compensatory* or *compensative* without ever having heard the word itself. Thus an individual may understand the meaning and usage of a word without knowing the correct pronunciation. Furthermore, as Seidenburg and McClelland (1989) pointed out, people who are deaf or hard of hearing can learn to read without ever accessing the oral phonological route. A Simple View sidesteps alternative modes of comprehension which do not involve phonological processing by focusing on beginning readers, who, the authors claim, do not yet use a visual route (Hoover & Gough, 1990). This is a logical argument, but makes the model incomplete for the majority of readers (Pressley et al., 2009). The Simple View does not account for the depth or amount of processing that is required for reading comprehension, nor for the possibility that comprehension may occur independently of oral language. Thus, the model needs to be expanded to include more detailed information about the skills involved in each category. The Modified Triangle provides a good starting point.

The modified triangle. The Modified Triangle, adapted by Bishop and Snowling (2004) from Seidenberg and McClelland (1989), details the different processes required for decoding and can be applied to the thinking of both beginning and more advanced readers (Bishop & Snowling, 2004). This model shows the back and forth (connectionist) relationship between orthography (written text) and phonology (the sounds of language). These components work in a bi-directional relationship with each other and with grammar and discourse to create word meaning (Bishop & Snowling, 2004). Grammar refers both to the grammatical morphology (word form) and syntactic context (arrangement of words) of a word that can offer clues about meaning (Bishop & Snowling, 2004). Discourse refers to inferences used to tie sentences together into a comprehensible body of text (Bishop & Snowling, 2004). For example, a reader sees the letters: c-a-t and attempts to map sounds onto the letters. The letter *c* (orthography) can make the /k/ or the /s/ sounds (phonology). The reader returns to the word and tries to match it with *cat* or *sat*. At this point syntactic knowledge (i.e., grammar) works to inform semantics (word meaning). So this reader looks at the sentence, *The cat is fat*, and decides that *sat* is not a grammatical fit with the sentence. She/he knows that cats can be overweight and thus infers (discourse processing) that c-a-t must be *cat*.

Qualitative studies of adult readers who have overcome dyslexia suggest that knowledge about the vocabulary in a subject area helped them decode words (Fink, 1998); illustrating the role that discourse can play in decoding. The Modified Triangle can be integrated with A Simple View as follows:

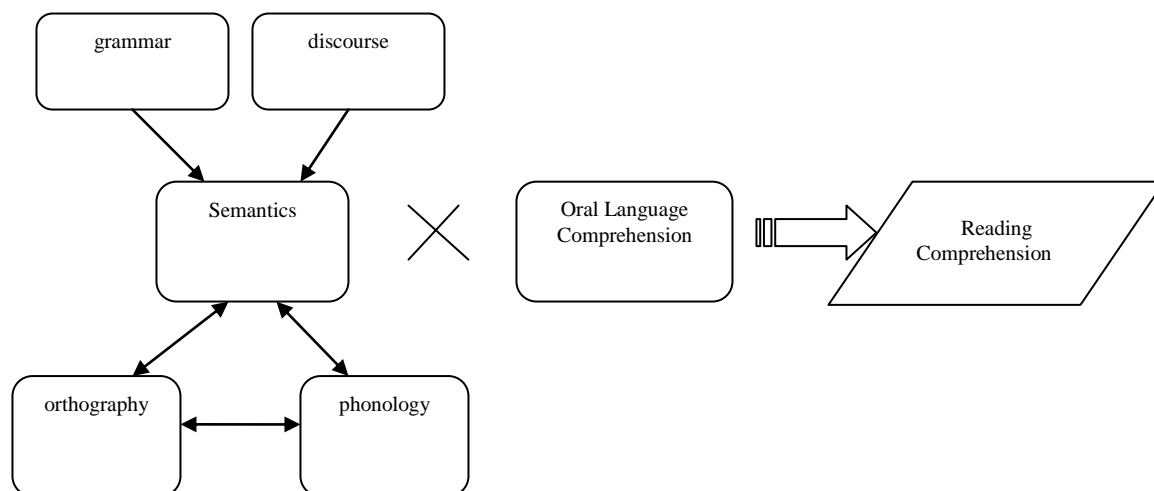


Figure 2. A Simple View of Reading combined with the Modified Triangle.

This expansion provides a more precise analysis of decoding skills. It allows for the specific identification of weaknesses and illustrates how that weakness can influence other processes. For example, a deficit in phonological processing influences both orthography and semantics. A student experiencing a delay in phonology likely struggles to read and write, being unable to access the written code, and may miss a lot of the meaning. The model is thus better able to explain how various observed behaviours relate to core skills in the area of decoding. However, this new model maintains the shortcomings of oral language as an explanation for all further thought processes, as previously discussed. To further refine the reading comprehension process, the oral language component requires more explanation.

Reading comprehension. Reading comprehension processes are exceedingly complex and not as concrete and measurable as decoding processes (Kamhi, 2005). A logical model can facilitate conceptualization of this process. Decoding can be thought of as the ability to transform symbols into basic units of meaning, sometimes referred to as the surface code (Perfetti et al., 2005). The next step of the model involves putting

these smaller bits of meaning together to produce a basic understanding of the text as a whole. Much of the literature on reading comprehension does not differentiate between this stage and the next (e.g., Block & Pressley, 2002; Keene & Zimmermann, 2007; Kintsch & Rawson, 2005). However, a distinction is vital to illustrate that processing can stop at this point, or proceed. A functional understanding of the text can occur without further processing. Not every text will change the cognitive patterns of every reader who understands the text; but a functional understanding is critical to further cognitive processing. Perfetti, Landi, and Oakhill (2005) distinguished between the two upper levels of reading comprehension by referring to them as text-based representations versus situational models. These levels roughly match with the levels of functional understanding and transformative understanding, as discussed in the following model.

To develop a functional understanding of a text, further discourse processing (through the process of making inferences) is necessary. Discourse appears in every step of the model, since it plays a pivotal role at different levels of the reading process. To begin to understand, a reader must put pieces of decoded meaning together in coherent representations (Graesser & Britton, 1996). Where coherence fails, lower level text-based inferences are called in to fill in the gaps (Perfetti et al., 2005). For example, if a reader reads the sentence: *Jimmy walked into the store and came out with a shiny new pair of shoes*, she/he will need to infer that Jimmy likely looked at different styles of shoes, tried some on, and decided to purchase a shiny pair. Many minute details are missing from the actual sentence, but proficient readers will naturally fill in this missing information (Perfetti et al., 2005). A reader may have to make many inferences, sometimes referred to as bridging (Barnes, Johnston, & Dennis, 2007), in order to understand a full paragraph. As this process occurs, a reader begins to understand the

main idea of the paragraph and text. The main idea becomes increasingly solidified by further reading and inferencing. At this point sensory representations may begin to accompany the text, especially if the text is a narrative (Keene & Zimmermann, 2007). This process can be understood as making movies in one's head during the course of the story. Readers may find themselves questioning, clarifying, comparing or contrasting, organizing or creating themes (Block & Pressley, 2002). At this point a reader understands the text, has constructed a functional understanding, but has not yet progressed to a transformative understanding, which forms the last stage of the model.

The last stage of the model involves some kind of reconciliation between the reader's background knowledge and the text, which usually results in either a transformation or an extension of existing knowledge. This stage has similarities with a traditional schema approach, while incorporating elements of construction-integration theory (Kintsch, 1998). Background knowledge can include: (1) schema related to specific content knowledge, which involves knowledge about particular subject domains; and (2) interpersonal knowledge, which involves knowledge about human needs, behaviour, values, emotions, relationships, etc. (Kamhi & Catts, 2005). Further to this, background knowledge can also include personal values, emotions, or memories. A reader uses this personal system of background knowledge and schema to create a network through which ideas, understood from the text, are passed. Ideas from the text may be linked to background knowledge, synthesized, analyzed, judged for bias, prioritized in terms of importance, evaluated, or reflected upon (Block & Pressley, 2002). The reader may call upon more sophisticated inferences to facilitate this process, including predictive (i.e., anticipate what will happen), associative (i.e., make connections within or outside the text), or explanatory (i.e., elaborate on what is

described in the text) inferences (Kamhi & Catts, 2005). These inferences serve different functions in gaining a more abstract and deeper understanding of the text. The network then activates various elements that fit together; accepting, rejecting, or reconfiguring various aspects of the total set of information (Kintsch, 1998). In the end, the reader has integrated the new ideas into her or his way of thinking, and thus has produced a new body of synthesized cognition (Kintsch, 1998). New thoughts have been generated from the combination of ideas and cognitive processes.

At this point a cycle occurs, where new cognition feeds back into a lower level discourse processing that once again informs decoding and the entire comprehension process takes place again. This cyclical nature refers to the concept of reading as both a top-down and bottom-up process. A reader both builds meaning from smaller units of language, but also uses larger ideas to inform her or his ability to decode smaller units (Bishop & Snowling, 2004; Kamhi & Catts, 2005; Pressley, 2002b; Swanson, 1999). This complex process can be assisted or suppressed by the whims of metacognition and emotion. Thus these two factors will be briefly considered in the following section.

Role of metacognition and emotion. The entire reading comprehension process takes place within the context of metacognition (i.e., the ability to think about thinking) and emotion. Metacognition has two main functions: self-management, as is the case in planning and allocating attention; and self-appraisal, which allows a reader to monitor her/his understanding and go back and amend meaning where necessary (Westby, 2005). Metacognition is important for reading comprehension because it gives a reader an approach and orientation to the text; a plan or purpose for reading (Perfetti et al., 2005; Westby, 2005). In addition, there are instances in every reader's experience when comprehension breaks down. Metacognition monitors the state of comprehension and

produces fix-up strategies (i.e., re-reading, searching the context for clues, etc.) if needed (Perfetti et al., 2005). The entire comprehension process rests on the ability to be an active, metacognitive reader before, during, and after reading (Pressley, 2002). This allows good readers to use a number of different comprehension strategies during an interaction with text (Pressley, 2002). Difficulties in metacognition, and specifically fewer instances of self-monitoring, have been associated with lower comprehension across ages (Hacker, 1997).

Emotion is another component of context that can include feelings such as interest and motivation. Neuroscience offers an interesting perspective on motivation. Motivation is a desire to do something; it is a feeling. The limbic area of the brain, sometimes referred to as the old mammalian brain, is used in the generation and memory of emotions (Sousa, 2007). Paradoxically, this old mammalian brain requires stimulation in order to access those higher-order thought processes needed for reading. To read, the brain is required to coordinate the visual cortex, temporal lobe, and the frontal lobe to organize visual, auditory, and comprehension processes (Sousa, 2007). Most importantly, however, is the fact that the temporal lobe, this incredible tool for higher-order thinking and planning, is ruled by the basic mammalian brain, or limbic area (Sousa, 2007). Experts have repeatedly acknowledged that reading can only occur when a combination of skill and will are present (Block & Pressley, 2002; Perfetti et al., 2005). Thus motivation must be stimulated in the limbic region before reading processes in the frontal lobe can be affected (Sousa, 2007). The entire context works to facilitate or inhibit the course of creating meaning at any point in the process.

A model of meaningful reading. These ideas about decoding, comprehension and the context in which they occur can be visually represented in a model. Sensory input

occurs in the orthography (written word), which is informed by phonology (Bishop & Snowling, 2004). Grammatical structures and discourse aid in the discernment of the meaning of the word (i.e., semantics; Bishop & Snowling, 2004). Discourse processing helps to form a functional understanding of the text (Perfetti et al., 2005). From this point, the ideas in the text are integrated with a network of further inferences and background knowledge (Kintsch, 1988). The result is a combination of new and old ideas (i.e., synthesized cognition). Thus the final Model for Meaningful Reading appears as follows:

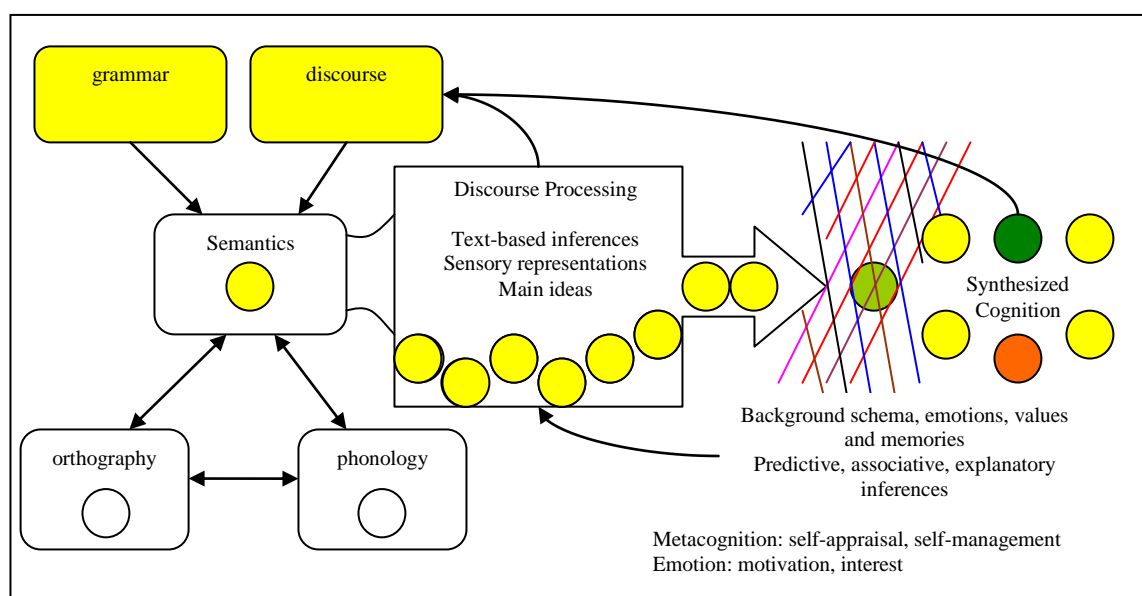


Figure 3. A model of meaningful reading.

Discourse processing figures prominently in the model and thus warrants a little more explanation. Inferencing is the key skill associated with discourse processing (Bishop & Snowling, 2004). Inferences have been found to be a leading predictor of global reading comprehension ability, even when background knowledge, vocabulary, and decoding ability have been controlled (Cain & Oakhill, 1999). Kintsch and Rawson (2005) noted that the role of inferencing in reading comprehension cannot be

overestimated since this skill is necessary for comprehension at local (sentence) or global (manuscript) levels. Of particular interest is their discussion of the role of active, controlled, and constructive inferences in the acquisition of new information (Kintsch & Rawson, 2005). Inferences access background knowledge to fill in missing information with educated guesses, which are verified by the text. If a reader is very unfamiliar with a topic, she/he is lacking a detailed network of background knowledge. Inferences are necessary to tap into any speck of relevant pre-existing experience or information – a laborious process requiring conscious control (Kintsch & Rawson, 2005). Without this process, new knowledge will remain meaningless with no way of being evaluated or hooking into previous understandings (Kintsch & Rawson, 2005). Even if readers are familiar with the topic of a text, better readers have been shown to make a greater number of appropriate inferences (Cain & Oakhill, 1999).

Good readers use inferences to fill in meaning where it is missing. Readers tend to infer only as needed to achieve coherence because inferencing can be such an effortful process (Perfetti et al., 2005). Readers will exert mental effort until they judge themselves to understand the text, thus achieving a standard of coherence. A high standard of coherence causes readers to think more deeply about ideas in a text. Although all readers may lower their standards from time to time, Perfetti, et al. (2005) noted that more effective readers have a high standard of coherence as a default setting. Thus motivation and metacognition return as an important context for reading skills. A reader will exert more effort if she/he is motivated and able to effectively monitor her or his level of understanding to achieve a higher standard of coherence (Perfetti et al., 2005).

The Model of Meaningful Reading clearly shows the complexity of various processes (as discussed in Sousa, 2007) working in coordination to produce higher level reading. Good readers use these processes proficiently to produce reading comprehension and adjust thoughts and beliefs accordingly. When breakdowns occur at various points throughout the process, reading becomes difficult or nearly impossible. Factors such as age (Johnston, Barnes, & Desrochers, 2008) and diagnosis (Fletcher et al., 2007) impact on the kinds of problems a reader may encounter, and will thus influence the type of intervention most appropriate for the individual (Shaywitz, 2003). Therefore, a discussion of major considerations for struggling adolescent readers is required before appropriate interventions can be contemplated.

Target Population: Struggling Adolescent Readers

Struggling readers can be broadly separated into two categories: students with reading disabilities and low achievers (Catts & Kamhi, 2005c). The vigorous debate within the field of reading and learning disabilities makes the distinction between these two groups hazy, at best (Fletcher et al., 2007). A lack of differentiated funding for either group means that in reality schools rarely distinguish types of struggling readers (Kozey & Siegel, 2008). Therefore, any examination of struggling readers, as they occur in an authentic school population, must include students who may be considered as low achievers, and those with reading disabilities.

Definition of reading disabilities. Thus far, reading disabilities (RD; i.e., dyslexia and SLI) have only been dealt with in very broad terms although much of the literature included in this review has specifically addressed reading disabilities. This is because the RD population has been difficult to define both for research and service purposes. The one point of agreement is that all learning disabilities (LD), including

reading disabilities, are characterized by an unexpected delay in achievement (Fletcher et al., 2007). This definition, however, has been difficult to operationalize because it is based on unobservable behaviours, and LD seems to be dimensional in nature. That is, LD subtypes exist on a continuum rather than representing discreet categories (Caine & Oakhill, 2006, Caine, Salomons, & Simmons, 2007). Commonly used diagnostic manuals (i.e., Diagnostic and Statistical Manual-IV and International Classification of Diseases-10) use a discrepancy definition of reading disability/disorder (American Psychiatric Association DSM-IV-TR, 2000; World Health Organization, 2007), typically based on a comparison between IQ and achievement standard scores on norm-referenced tests (Bishop & Snowling, 2004; Fletcher et al., 2007). However, neither of the diagnostic manuals refer to which tests or sub-tests should be used to determine a diagnosis, a factor which significantly alters the degree of discrepancy detected (Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996; Francis, Fletcher, Stuebing, & Lyon, 2005). Furthermore, all kinds of statistical problems arise in this discrepancy model, including: correlations between achievement and IQ tests (Catts & Kamhi, 2005c); measurement error in regression toward the mean models; and further error present in random cutpoints in a normal distribution (Catts & Kamhi, 2005c; D'Angiulli & Siegel, 2003; Fletcher et al., 2007; Francis et al., 2005). A more distressing problem is the fact that students who are low in both phonology and comprehension will not be identified by the IQ-discrepancy model (Catts & Kamhi, 2005b). This model is also not appropriate for young learners who do not yet display a discrepancy (Berninger, 2001b); in effect promoting a wait and fail approach whereby, learning differences may be increased rather than reduced (Kozey & Siegel, 2008). To remedy this situation, low achievement models have been proposed (Siegel, 1992). However, neither the IQ-

discrepancy nor low achievement definitions have resulted in stable groups over time (Francis et al., 2005). Another proposed model, an intra-individual achievement model (D'Angiulli & Siegel, 2003) looks at unexpected delays relative to other areas of achievement within the same individual; however, there is presently not enough research to support such a view (Fletcher et al., 2007). The model with the most promise is the Response to Intervention process (RTI).

RTI has gained national approval in the United States as a legitimate method of distinguishing students with disabilities from typically achieving peers (Yell, Shriener, & Katsiyannis, 2006). States are legally prohibited from requiring an IQ-Achievement discrepancy and are encouraged to use a system of identification based on student achievement in response to research-based interventions (Yell et al., 2006). Although specific design may vary, RTI basically involves the implementation of research-based instruction and the resulting achievement of students as measured by multiple assessments over time (Fuchs & Fuchs, 2006). Students who do not respond to this validated instruction qualify for progressively intensive tiers of service (Fuchs & Fuchs, 2006). Intensity can be increased by: raising the frequency, duration, or explicitness of the intervention; creating smaller groupings; or by utilizing instructors with additional expertise (Fuchs & Fuchs, 2006). For example, a school could screen students at the beginning of the year to identify those who may not respond to appropriate instruction (Fuchs & Fuchs, 2006). These students are monitored using assessment at specific intervals. If they do not respond to instruction, they may qualify for increased support in the form of targeted, systematic small group instruction (Richards, Pavri, Golez, Canges, & Murphy, 2007). If students are able to raise achievement levels they return to the regular curriculum. If they still do not respond, they may qualify for more intensive one

to one instruction with the division's reading specialist, for example (Fuchs & Fuchs, 2006; Richards et al., 2007). This is just one idea of how the RTI idea could be implemented; individual schools may have to decide how to best implement this process based on their particular resources, population or other factors (See Berninger, 2001a for an another approach to implementation; Fletcher et al., 2007).

RTI has several advantages over other models. Multiple assessments of learning based on response to classroom instruction can provide a more accurate picture of ability, as opposed to a single high-stakes assessment (Fletcher et al., 2007). Assessment measures need to be valid and reliable in multiple administrations; but the larger margin of error in this sort of testing would likely be negated by the considerable body of data that can be compiled on various occasions (Fletcher et al., 2007). RTI also requires high quality general instruction, so necessarily, instruction would need to be evaluated appropriately (Fletcher et al., 2007). Although instructional evaluation is not likely to be popular among teachers, a quality-controlled education could be a tremendous benefit to all students (Fletcher et al., 2007), and to the teaching profession. An increase in the quality of instruction can also reduce the effects of some reading disabilities (Torgesen, 2005), and may prevent reading delays from occurring altogether (Fuchs & Fuchs, 2006). RTI directs resources towards remediating struggling readers before they fail, no matter what the reason for the delay (Fuchs & Fuchs, 2006). In summary, RTI has the potential to provide a more valid system of assessment leading to a more responsive structure of intervention.

Although RTI sounds like a nearly idyllic model where teaching is based on research and all students have individual needs addressed, in reality its implementation is fraught with ambiguity. One problem lies with the psychometric validity of

assessment procedures that can be re-administered on a weekly basis (Fuchs & Fuchs, 2006). Criterion-referenced measures are being developed and tested, but few of these tools offer normative data, and many are still un-tested (Bell & McCallum, 2008). Furthermore, non-responsiveness needs to be defined and measurement tools developed for all targeted curriculum areas (Fuchs & Fuchs, 2006; Fuchs, Fuchs, Compton, & Bouton, 2007). Although much work is presently taking place in this area (e.g., the American-based Center on Instruction), researchers have yet to agree on valid criterion.

Another problem with RTI is that little agreement exists as to the best intervention methods. Few teachers have the time or patience to read tedious, scientific research articles to find one aspect of instruction that may (or may not) be useful in a specific situation (Reutebuch, 2006). School division problem-solving procedures for educational programming (as outlined in Fuchs & Fuchs, 2006) require the coordination of multiple school, division and home personnel in a wildly convoluted enterprise (although one which seems to match more traditional procedures). Another solution could be to implement a standard treatment protocol used by researchers in clinical trials (Fuchs & Fuchs, 2006). The use of this system could lead to a standardization of practice so that the same child would be identified at a similar tier among different schools (Fuchs & Fuchs, 2006). A standard curriculum of intervention could be developed to guide teachers in implementation (Fuchs & Fuchs, 2006). However, there is evidence to suggest that intervention in clinical settings bears little semblance to intervention in uncontrolled school settings (Reutebuch, 2006). Furthermore, this prescriptive curriculum allows little room for the individualized programming needed by many students with special needs. These ambiguities in the RTI process need to be clarified for sound validity to be established.

Given the difficulties with all assessment procedures, it seems that the best identification process for RD would incorporate valid aspects of the each method (Fletcher et al., 2007; Francis et al., 2005). This combination of methods would balance errors in any one measure with resulting increased reliability of final results. RTI provides a starting point in this approach. After students have shown a marked resistance to quality instruction and intervention, norm-referenced achievement testing could be used to determine which areas are specifically affected (Fletcher et al., 2007). This approach thus involves reliable testing, verification of school findings, significant attempts at remediation, and a broad assessment of achievement. At this point exclusionary factors may also be considered to ensure appropriate intervention (Fletcher et al., 2007).

Exclusionary factors are important to the conversation on reading disabilities because the best classification of student difficulties should lead to most specific (i.e., effective) intervention (Fletcher et al., 2007). Thus the interventions for low achievement due to severe intellectual impairments, sensory disorders, and linguistic diversity will be substantially different from those found to be effective for students with a reading disability or delay (Fletcher, Morris, & Lyon, 2003; Fletcher et al., 2007). Other exclusions typically include low achievement due to emotional or behavioural disorders, economic disadvantage, or inadequate instruction (Fletcher et al., 2007). From a diagnostic standpoint these factors may have a degree of relevancy. Emotional and behavioural disorders are commonly found to be co-morbid with LD (Willcutt & Pennington, 2000a), but should not diminish the substantial obstacles these children face in learning. Moreover, the latter three factors have not been proven to require different intervention methods to remediate problems in reading (Fletcher et al., 2003; National

Institute of Child Health and Human Development, 2000). So from an intervention standpoint, these factors should not preclude an individual from receiving appropriate intervention.

Low achievers. If students with a learning disability demonstrate an *unexpected* low achievement, low achievers may be classified as showing an *expected* low achievement (Fletcher et al., 2007). They are achieving below the average range across knowledge areas and lack a discrepancy between achievement and IQ (Aaron, 1997). These readers may have missed a lot of school, had inappropriate or poor instruction, or were not able to access instruction due to socio-economic stress, for example (Kavale & Forness, 2000). Thus, these students would not meet the same criteria for a mixed methods definition of reading disability.

At the same time, research suggests that the groups share many characteristics. Both have similar problems in learning to read and exhibit similar cognitive deficits (Francis et al., 1996). Distinct differences have not been found in terms of heritability and neurology either (Fletcher et al., 2007). Perhaps an equalizing force occurs in adolescents since both groups have equally lost the opportunity to access self-teaching benefits of proficient reading (O'Connor, 2007). More importantly, these similarities mean that both groups stand to benefit from the same intervention methods (Aaron, 1997). In meta-analysis, when comparing outcomes for comprehension interventions, no differences were found based on the LD status of participants (Scammacca et al., 2007). Aaron (1997) suggested that the underlying source of any reading deficit be identified and remediated without regard to IQ. Research evidence in this case converges with practical application to suggest that all students who struggle with reading should be able to access support at the point of weakness (Aaron, 1997).

Traditional reading intervention studies have typically occurred with younger students and/or have focused on basic skills, such as decoding (Berninger, Vermeulen, & Abbott, 2003; Bowyer-Crane et al., 2008; Brown, Pressley, Van Meter, & Schuder, 1996; National Institute of Child Health and Human Development, 2000). This orientation is valid based on recent brain research which illustrates the need to build requisite neural circuits for reading as accurately, strongly, and quickly as possible (Shaywitz, 2003). However, the applicability of this research to the unique biological, social, and environmental situation of adolescents may be debatable (Wigfield, Byrnes, & Eccles, 2006). Despite the importance of early intervention, it is hardly ethical to withhold appropriate remedial services from adolescents who may not have had sufficient opportunities to learn basic skills in the elementary grades. Within the population of struggling readers, individuals represent unique cognitive, social, and environmental profiles at different ages (Wigfield et al., 2006). To pin point the characteristics of the target population more precisely, some specific characteristics of adolescents will be discussed.

Adolescents. The adolescent population of struggling readers is of special interest. Adolescents are already at a point in their academic careers where there are few opportunities for improving their reading (Kamil et al., 2008). Furthermore, secondary teachers, while knowledgeable about their content areas, may lack the expertise to remediate skill deficits (Kamil et al., 2008; Raudenbush, Rowan, & Cheong, 1993; Reutebuch, 2006). Future opportunities for quality educational programming after high school may be limited if adolescents are unable to read and comprehend. If high schools do not teach students to read, it is difficult to imagine how individuals will ever develop this skill.

Adolescents are at a unique point in their development which works both for and against possible intervention gains. Adolescents demonstrate higher order abstract thinking abilities as well as a marked increase in metacognition; they can organize, coordinate, and reflect on their thoughts and abilities (Wigfield et al., 2006). Increased frontal lobe development in the adolescent years may facilitate intensive reading remediation, where earlier attempts met with limited success (Fine, 2008). Older students are also more likely to have developed splinter skills (Manset-Williamson & Nelson, 2005). These are specific skills or areas of knowledge where they have built some expertise. For example, a student who may be poor in reading may have found he is interested and capable in the area of welding. Older students tend to have more exposure to different topics and thus are able to find a niche area where they can be successful. This proficiency can also prove to be particularly useful in developing motivation for reading (Fink, 1998). For example, a student who is interested in welding may be highly motivated to read a welding instruction manual. Adolescents may also have a better developed store of background knowledge, including vocabulary, language, and academic routines and structures (O'Connor, 2007). These factors may result in a situation where older students are better able to use various cognitive strategies for reading (O'Connor, 2007).

Adolescent struggling readers are amenable to intervention, though in other ways they may be more resistant learners than younger children (Reutebuch, 2006; Wigfield et al., 2006). After grade two, students have missed so much additional learning from the practice of reading that intervention studies cease to produce effect sizes comparable to earlier years (Fletcher et al., 2007). Studies also indicate that students with RD tend to make progress until grade seven at which point they plateau (Schumaker, Deshler,

Woodruff, & Hock, 2006). However, recent theories in brain plasticity suggest that it should be possible to re-program inefficient reading strategies (Fine, 2008). Perhaps because of their inherent resistance to remediation, adolescents with RD are an under-analyzed population whose reading skills are not being addressed in content-driven classroom settings (Kamil et al., 2008). However, struggling adolescent readers may have a number of reading needs.

Research has identified a number of points that are commonly found to be areas of weakness in struggling readers, and which may be delayed in adolescent readers. Phonological processing is a key area of deficit in students with dyslexia (Bishop & Snowling, 2004; Fletcher et al., 2007; Leonard, Lombardino, Giess, & King, 2005; Shaywitz, 2003). Students may also be caught in a partial alphabet stage of reading development where they have learned many of the commonly occurring letters and sounds, but still cannot put them together to accurately decode words (O'Connor, 2007). Weaknesses in vocabulary and syntax could also be critical deficits (Catts, Hogan, & Adlof, 2005; Nation, Clarke, Marshall, & Durand, 2004) along with morphology (Nation et al., 2004). As initial stages in the Model for Meaningful Reading, an obstacle present in any of the decoding sub-skills would lead to major challenges in accessing any kind of text-based comprehension (Catts & Kamhi, 2005c).

On the other hand, students with SLI (i.e., good decoders and poor comprehenders), are able to decode (i.e., access the surface code) to arrive at a word by word semantic comprehension, but cannot put meanings together to obtain higher levels of comprehension (Barnes et al., 2007). This may be due to memory problems, a lack of metacognitive skills, difficulty with text integration or a low standard of coherence (Fletcher et al., 2007; Gajria, Jitendra, Sood, & Sacks, 2007; Perfetti et al., 2005;

Sencibaugh, 2007). Comprehension at any level cannot occur without the right kind of inferencing and metacognition at an appropriate point in the text where a gap actually exists and an inference is required (Cain & Oakhill, 1999; Gajria et al., 2007; Perfetti et al., 2005; Sencibaugh, 2007). Intervention studies indicate that an increase in appropriately timed inferences led to an improvement in reading comprehension levels (Cain & Oakhill, 1999). Inferencing problems may be due more to an inability to make an appropriate inference in the context of reading, as opposed to a deficit in ability (Cain & Oakhill, 1999). Students do not lack the fundamental ability to carry out cognitive processes, but may lack the strategies to effectively use the appropriate thinking processes at the right time (Sencibaugh, 2007). In this case, instruction in comprehension strategies could go far in remediating reading.

Instruction and Interventions

Literature about reading interventions for a population of struggling readers has been somewhat divided between decoding (e.g., Archer, Gleason, & Vachon, 2003; Bhattacharya & Ehri, 2004; McCandliss, Beck, Sandak, & Perfetti, 2003; O'Connor, 2007) and comprehension (e.g., Block, Rodgers, & Johnson, 2004; Brown et al., 1996; Gear, 2006; Gersten & Carnine, 1986; Keene & Zimmermann, 2007; Klingner, Vaughn, & Boardman, 2007; Mastropieri, Scruggs, & Graetz, 2003; Schmalhofer & Perfetti, 2007; Vaughn & Edmonds, 2006). Perhaps this is because decoding tends to be relatively transparent, easy to measure, and can be remediated using prescriptive step-by-step commercially available programs (Berninger, Abbott, Vermeulen, & Fulton, 2006; National Institute of Child Health and Human Development, 2000). Comprehension, on the other hand, is difficult to define, hard to measure, and requires more fluid, free-flowing and individualized instruction (Block & Johnson, 2002;

Gambrell, Block, & Pressley, 2002; Kamhi, 2005; Keenan et al., 2008). As the Model for Meaningful Reading aptly illustrates, when reading comprehension is the goal, both decoding and comprehension processes are vital to the final product. If decoding is problematic, all cognitive energy will be expended on figuring out the words, with little room for the cognitive processing required for comprehension (Pressley, 2002a; Sousa, 2007). If comprehension processes are problematic, students will never gain anything from reading. Therefore, intervention that aims to have any effect on overall reading comprehension must address both aspects (Berninger, 2001b; Berninger et al., 2003; Scamacca et al., 2007).

Ideally, each student who struggles with reading would undergo complete achievement testing to pinpoint specific areas of strength and weakness (Aaron, 1997). However, since most schools lack the resources to administer time-consuming individualized tests, it is best to embrace a balanced intervention strategy incorporating both decoding and comprehension instruction. This may be conceptualized as a standard treatment protocol for struggling adolescent readers within the RTI model of intervention (Fuchs & Fuchs, 2006; Graner, Faggella-Luby, & Fritschmann, 2005). Furthermore, focusing on multiple components of literacy has been shown to produce greater effect sizes in research (Scamacca et al., 2007; Swanson, 2001). Students who participate in a balanced intervention may enjoy unpredicted benefits from either intervention, or as a function of the interaction between decoding and comprehension interventions (Berninger et al., 2006; Swanson, 2001). However, more research in this area is needed to verify effect sizes with large confidence intervals found in many studies (Scamacca et al., 2007).

At the same time, it is absolutely imperative that intervention programming be highly effective and age appropriate. Students, especially in high school, need to participate in regular educational programming as much as possible to minimize the negative effects of pull-out programming (Aaron, 1997). Remedial instruction that requires any time out of the classroom needs to have significant research validity to justify missed content (Gajria et al., 2007). A survey of intervention literature suggests that explicit strategies instruction held the most promise for struggling readers (Biancarosa & Snow, 2004; Swanson, 2001). Students did not learn the skill when it was taught the first time, nor did they independently discover the thinking process behind reading (Biancarosa & Snow, 2004). Therefore, they need to explicitly see the cognitive processes behind understanding what is read (Swanson, 1999; Swanson, 2001).

Explicit strategy instruction can be used with both decoding and comprehension lessons (Swanson, 2001). It involves three main components. The first component involves strategy cues (Swanson, 2001). Cuing involves think alouds, teacher verbalization of thought processes involved in solving problems, and reminders to use the learned steps (Swanson, 2001). These steps are routinely used in intervention literature (e.g., Cunningham, 2005; Gear, 2006; Tovani, 2000). Elaboration is the second component of explicit strategy instruction (Swanson, 2001). Elaboration involves further information about the concept or repeated examples explained within text (e.g., Block & Johnson, 2002; Swanson, 2001). The final component of explicit strategy instruction is explicit practice (Swanson, 2001). Explicit practice involves structured practice and review that is usually scaffolded and faded to independent strategy use (e.g., Block & Johnson, 2002; Keene & Zimmermann, 2007; Swanson, 2001). Although explicit strategy instruction is typically associated with comprehension

(Block & Johnson, 2002; Brown, 2008; Gear, 2006; Keene & Zimmermann, 2007; Mason, Meadan, Hedin, & Corso, 2006; Pressley, 2002a; Tovani, 2000), it can be useful for remediating decoding weaknesses as well, especially in older readers (Bhattacharya & Ehri, 2004; Cunningham, 2005; Shefelbine, 1990).

Several other specific instructional features can be orchestrated to increase effects of reading intervention. Small group instruction is both pragmatic in the school setting and can improve results (Swanson, 1999). Graphic organizers can also be added for improved outcomes, without drastically altering the format of lessons (Kim, Vaughn, Wanzek, & Wei, 2004; National Institute of Child Health and Human Development, 2000). Interventions, in general, need to be implemented accurately, intensively, and consistently (Sencibaugh, 2007). Especially important in remediating adolescent readers is a lifespan perspective (Keene & Zimmermann, 2007; Shaywitz, 2003; Tovani, 2000). Individual knowledge, experience, and development of particular skills and abilities needs to be recognized, respected, and utilized appropriately in the instruction of struggling adolescent readers. If used in a comprehensive and coordinated fashion, these techniques and approaches could help to improve overall gains in reading comprehension (Fink, 1998).

A plethora of intervention programs or paradigms are apparent in the research literature and in pre-packaged programming. Since the effectiveness of programming is of crucial importance, especially in high school, great care must be taken in selecting appropriate interventions (Aaron, 1997). Furthermore, the unique cognitive, social, and environmental situation of adolescents must be used to provide developmentally appropriate intervention (Shaywitz, 2003). Several specific programs will be considered in the following sections.

Decoding. In the area of decoding, various programs have been found to be useful and effective as long as the programs include an element of phonemic awareness and an explicit, systematic connection of sounds to letters (National Institute of Child Health and Human Development, 2000). Decoding interventions do not need to be long; 12 hours was found to be optimal in one study (Torgesen, 2005). The National Reading Panel corroborated this evidence by suggesting after 20 hours intervention no longer produced significant improvement (National Institute of Child Health and Human Development, 2000). Decoding interventions have been found to be equally effective among young and old students with RD (Catts et al., 2005; Zevin, 2003). These guidelines represent a general approach that can be used in the evaluation of particular programs.

Decoding is a particularly sensitive topic for older readers who may feel that they should have already acquired basic reading abilities (Shefelbine, 1990). Many commercially available programs aimed at younger students may exacerbate the problem when used with older students because materials may contain large lettering or cartoon figures, which the students perceive as babyish (Shefelbine, 1990). Furthermore, students in the older grades encounter a large amount of polysyllabic words across content areas which require a specific decoding strategy (Carlisle, 2004; Cunningham, 2005; Shefelbine, 1990). Studying polysyllabic words still affords the opportunity to learn and practice more basic decoding skills within individual syllables (Shefelbine, 1990). However, students are learning age appropriate words and they are able to learn strategies for decoding longer words (Shefelbine, 1990).

Several methods for decoding polysyllabic words are available. Cunningham's (2005) approach is the most strategic, involving analysis and comparisons among

syllabic units. This program also makes use of multiple modalities including visual, auditory, and kinaesthetic (Cunningham, 2005). However, the use of manipulatives and word cards also makes teacher preparation and instruction somewhat chaotic, where much time could be wasted in organization of materials. In addition, the coordination of multiple rules and strategies may be too onerous for students with reading disabilities who may be struggling with metacognitive or strategic thinking (Sencibaugh, 2007). Although this program holds a lot of promise, it may be better suited for whole class instruction in the upper elementary grades, rather than pull out intervention in high school.

Other literature focuses almost entirely on morphology (Carlisle, 2004; O'Connor, 2007). O'Connor (2007) describes the BEST (Break apart the word; Examine each part; Say the word; Try the whole thing in context) strategy for instruction in multi-syllabic words. This program teaches high frequency affixes and recognition of root words (O'Connor, 2007). Word webs are graphic organizers that help kids see how words with different affixes are related (O'Connor, 2007). Morphological awareness makes key contributions to lexical, semantic, and syntactic understanding (Carlisle, 2004). The implementation of this program involves just 10 minutes per day over a course of three weeks to obtain generalization effects (O'Connor, 2007). The BEST strategy is a good strategy for students who may not need instruction in phonology/phonics and have a good oral vocabulary. In a balanced literacy program, where time is of the essence, key features of BEST might be best incorporated into a program that is better suited to more basic decoding skills as well.

The most desirable approach in a balanced, intensive intervention situation is a grapho-syllabic approach (Beck, 2006; Bhattacharya & Ehri, 2004; Shefelbine, 1990).

This approach is not as concerned with specific rules or constructs as it is with attending to internal structures and sounds of words (Bhattacharya & Ehri, 2004). Frequently occurring affixes can also be easily incorporated into the program. Beck (2006) sets out the most detailed program. In this program, a predetermined set of syllables are used to create words. Cards are made for each syllable and they are arranged in a matrix according to the lesson description (Beck, 2006). The words are very briefly introduced and meanings are touched upon. Students are then asked to make sound-symbol correlations (i.e., which syllable makes the /um/ sound? What sound does u-m make?). Syllables are then put together to form words, which students write down. After students have explored the phonetic relationship, there are a number of games that may be played using the syllables. One version involves having the students build a given word, the second version involves having the students choose a word to build, and the third version involves building made up words (Beck, 2006). Each method asks the students to read, pronounce, and write the word (Beck, 2006). Easy, medium, and difficult word lists and syllable matrixes are included in this program (Beck, 2006). It is important to include grade-appropriate words that students may not be familiar with, so that lessons have immediate practical application (Bhattacharya & Ehri, 2004). The teacher may also want to model appropriate thought processes (e.g., looking for affixes) in attempting to figure out words (Shefelbine, 1990). In this way students begin to identify syllable patterns using different strategies (Shefelbine, 1990). The grapho-syllabic approach incorporates core components of syllabic division and attention to internal phonemes and graphemes within the context of real and relevant words (Beck, 2006; Shefelbine, 1990). The approach can be easily adapted to various stages of

literacy development for adolescent struggling readers and can be taught in a short period of time (e.g., just 2 hours of intervention in Bhattacharya & Ehri, 2004).

The grapho-syllabic approach has been found to be most appropriate for the decoding portion of a balanced literacy intervention for struggling adolescent readers (O'Connor, 2007; Shefelbine, 1990). The comprehension portion of the intervention may be a little more difficult to pin down. It is important to note, that struggling readers represent a highly diverse group and no one strategy is going to be a panacea for every student. The goal of intervention is to provide varied access tools and processes that allow a reader to make meaning that is self-initiated, ever-changing, and adaptable to different texts and purposes (Block & Johnson, 2002). Once decoding has been suitably addressed, comprehension strategy instruction can support a transformative understanding of text.

Comprehension. Despite increasing attention to literacy in recent years, many teachers have expressed frustration in a lack of resources for teaching reading and comprehension in particular (Gill, 2008). Several studies indicate that explicit instruction in comprehension strategies are not commonplace in general education classrooms, despite the fact that a great deal of testing in comprehension occurs (Block & Pressley, 2002). Researchers tend to shy away from studying comprehension because it involves so many unknowns or theoretical constructs about cognitive processing (Kamhi, 2005). In the United States, a number of research groups have been commissioned by the government to study reading. Reading comprehension has been identified as one area of research that is most urgently required (Gambrell et al., 2002). Inferencing and metacognition are areas of particular importance (Cain & Oakhill, 1999), and are coincidentally areas where little research illuminating effective teaching

strategies has been conducted (Pressley, 2002a). Furthermore, the need for critical independent reading skills becomes even more urgent as the present technological age increases the availability of unregulated information via the internet (Gambrell et al., 2002). Therefore, more research is critical to definitively assess whether or not comprehension intervention is even useful. Further research is especially important for struggling adolescent readers who are developmentally unique from their younger counterparts, and may be missing vital curricular content during pull-out interventions. Researchers and educators need to determine the best way of intervening for those students who struggle with reading comprehension.

Although there are many questions about the specifics of reading comprehension strategy instruction (Pressley, 2002a), researchers seem to be in agreement on a basic model of instruction (Block & Pressley, 2002; Gambrell et al., 2002; Schumaker et al., 2006; Sousa, 2007; Swanson, 2001). Regardless of individual strategies or divergences in specific practice activities, most models include the following procedures:

1. the teacher describes the strategy and discusses when a good reader should use it;
2. the teacher demonstrates the strategy using at least one think-aloud;
3. students are given multiple opportunities to practice the strategy with support from the teacher;
4. the teacher gives feedback and guidance while students refine their use of the strategy;
5. students apply the strategy to material of increasing difficulty with teacher support;

6. students use the strategy independently in different contexts (Block & Johnson, 2002; Block & Pressley, 2002; Gambrell et al., 2002; Gear, 2006; Schumaker et al., 2006; Sousa, 2007; Swanson, 2001).

This basic instructional model has emerged from the literature as having scientific, theoretical, and practical value (Block & Johnson, 2002; Gambrell et al., 2002; Keene & Zimmermann, 2007; Schumaker et al., 2006; Swanson, 1999; Swanson, 2001; Tovani, 2000). Models may differ slightly, primarily in the student practice aspect. Sometimes peer mediated learning is incorporated, where students work together and discuss the implementation of the strategy as they read (Block & Johnson, 2002; Mastropieri et al., 2003). Peer mediated learning has been established as an efficacious method of teaching any content area (Mastropieri et al., 2003). Other strategies suggest that students say the steps of the strategy to themselves as a method of self-instruction (Schumaker et al., 2006). These differences are minor in nature as compared to the basic structure of the method.

This basic instructional model appears most frequently in literature describing instructional methods for regular classroom instruction of comprehension strategies (Block & Johnson, 2002; Brown, 2008; Gear, 2006). However, the model could be equally useful in small group settings as well (Swanson, 2001). Specific comprehension programs (e.g., transactional strategies instruction, collaborative strategic reading, reciprocal reading, etc.) will not be discussed in detail here because they are essentially variations on the same basic model (See Fletcher et al., 2007; Klingner et al., 2007 for a summary of different approaches). Only the most developmentally appropriate programs for use in small-group interventions with adolescent struggling readers will be discussed in depth.

Reading comprehension programs such as those described in Gear (2006) and Tovani (2000) can be used in conjunction with the basic instructional model to provide appropriate intervention to adolescent struggling readers. Gear's (2006) program has the advantage of being highly structured – a rare animal in the field of reading comprehension. Gear provides reproducible worksheets, book lists, and lesson by lesson guidance for whole class instruction (Gear, 2006). These features are highly appealing to teachers eager to implement comprehension instruction in their classrooms (Sergeew, personal communication, 2009). This program is being widely used in at least part of Canada and has some degree of validity based on consistency with research literature (Gear, 2006). However, no scientific research currently exists to explicitly support the implementation of this particular program. Furthermore, this program is aimed at upper elementary students, and is not developmentally appropriate for high school readers without some kind of modification.

Tovani's (2000) work focuses on several comprehension strategies specifically for struggling adolescent readers in the context of a high school reading remediation setting. Her suggestions lack the precision of Gear's (2006) program, but are explicit about how to tap into the life experiences of struggling adolescent readers (Tovani, 2000). Tovani (2000) uses many of the same ideas as Gear (2006), but frames them in a more developmentally appropriate way. For example, Gear (2006) offers reproducibles with cartoon pictures that ask children to draw pictures to make connections with text. Tovani (2000), on the other hand, uses highlighters and sticky notes as a staple activity; much as a mature reader would do. Tovani (2000) also focuses on asking questions and having her students share experiences and thoughts about reading. This kind of strategy is not as useful for younger children who do yet have the wealth of academic or life

experience from which to draw. Thus, the best comprehension strategies intervention would combine the structured lessons of Gear's (2006) work, with Tovani's (2000) developmentally appropriate considerations, keeping in mind the basic instructional model that research has found to be efficacious.

Diverging views. A more significant divergence in the literature exists when it comes to the number of strategies taught. Some researchers suggest teaching a small repertoire of strategies to mastery (Berninger, 2001b; Keene, 2002; Swanson, Cooney, & McNamara, 2004). In this view, the in-depth consideration and subsequent mastery of selected strategies will be more useful to a struggling reader than a superficial treatment of many strategies (Keene, 2002). It may be further argued that in a typical educational setting, where time is limited, educators are not able to practically devote intensive long term resources to grade level reading remediation. Teachers need to know which specific comprehension strategies will lead to the biggest gains in overall comprehension. Inferences feature prominently in the comprehension process, therefore it may be possible to obtain substantial gains in reading comprehension through the in-depth teaching of this one skill (Cain & Oakhill, 1999). Optimum gains could also occur if inferencing is taught in combination with one or two complementary skills such as questioning and self-monitoring (Johnston et al., 2008; Pressley, 2002b). By focusing on just a few core strategies, it could be possible to dramatically improve overall comprehension in a limited time.

Other views suggest that teaching multiple strategies as part of the authentic and coordinated reading comprehension process is more effective, although the number of strategies suggested is not consistent (Block & Johnson, 2002; Brown, 2008; Gear, 2006; Manset-Williamson & Nelson, 2005; Vaughn, Klingner, & Bryant, 2001). Results of

one meta-analysis produced higher effect sizes for instruction involving multiple comprehension strategies. The authors suggested that authentic content area comprehension would be better improved through the coordination of different reading strategies. Other researchers suggested that improvement on standardized measures of reading comprehension (presumably those with high validity) also require instruction in multiple reading strategies (Perfetti et al., 2005). Thus, it would appear that the multiple strategy approach has a greater amount of quantitative scientific weight behind it. The comprehension process in good readers requires the coordination of a large number of strategies and cognitive thought processes (Pressley & Afflerbach, 1995). If students, and adolescents in particular, are able to achieve grade appropriate reading they must understand the thinking associated with comprehension and how to manage and coordinate its multiple components (Leonard et al., 2005).

Educators may favour a focused intervention with one or two primary comprehension strategies due to practical considerations. Students who are pulled out of class for remediation may miss important content or may require time-consuming adaptations or accommodations. Furthermore, multiple strategy coordination may be an advanced skill that is cumbersome for a novice to handle and difficult to remember. In a pull-out intervention program it is plausible to assume that some comprehension strategies (e.g., summarization) may be taught in content area classes. Therefore, it is vital to know whether or not students require an in-depth balanced literacy intervention focusing on multiple strategy instruction in order to achieve significant gains. To definitively determine the more effective instructional approach, research parameters from published intervention studies may be used as a guide.

In order to distinguish statistically significant different outcomes between a focused-strategy versus a multiple-strategy approach, every effort must be made to use research-validated approaches in decoding and comprehension instruction. The adoption of previously validated methods helps to effectively isolate the specific variable that may lead to a difference in results. Thus, research design could include intensity that resembles what is found in typical intervention studies. Scammacca, et al. (2007) compiled data from 31 intervention studies. Studies included from 25 to 4500 minutes of instruction ($M = 620.4$, $N = 26$), over the course of one to 90 sessions ($M = 14$, $N = 27$; Scammacca et al., 2007). Small group setting has also been found to be highly effective (Swanson, 2001). Grapho-syllabic decoding methods are validated in the research (Bhattacharya & Ehri, 2004) and are consistent with guidelines for decoding suggested by the National Reading Panel (National Institute of Child Health and Human Development, 2000). Explicit strategy instruction has been found to be the most effective approach in teaching comprehension (Swanson, 2001). Therefore, by using these conditions, a researcher may have reasonable confidence that the number of strategies taught in interventions of different frequency is effectively isolated as the variable under consideration.

Summary

Past research into the theory of reading can be brought together to form a Model of Meaningful Reading which can be divided into three levels: decoding; functional understanding; and transformative understanding. This theoretically based model can give some indications as to where students are struggling and where instruction might be useful. Within this context of reading, struggling adolescent readers have a unique set of strengths and challenges. Struggling adolescent readers can be described as those who

exhibit low achievement, a lack of response to intervention, and do not have problems with sensory or cognitive impairments or English as a second language. In order to help this population, a basic methodological approach can be adapted involving: (1) strategy introduction; (2) demonstrations and/or think alouds; (3) scaffolded practice which is gradually faded; (4) small group instruction; and (5) independent practice. Research suggests a balanced literacy approach can be effective, involving instruction in decoding and either the coordination of many comprehension strategies (e.g., visualization, predicting, summarizing, activating prior knowledge, making connections, etc.) or a smaller repertoire of targeted skills (e.g., questioning and inferencing). Due to limited resources in the education sector, future research is needed to determine which approach could yield the greatest results. Reviewing past research relating to students with reading difficulties may give some indication as to how this research should be conducted.

CHAPTER THREE

Overview of the Nature of the Study

Purpose of Research

This study endeavours to fill the need for information about the most effective approach to reading comprehension intervention with struggling adolescent readers. The main area of exploration involved a comparison among three approaches to teaching reading: (1) a multiple strategy intervention (MSI); (2) a focused strategy intervention (FSI); and (3) a comparison group who received the typical English language arts program. Both interventions involved grapho-syllabic instruction and practice; and instruction in reading comprehension strategies. The FSI group were taught just two reading comprehension strategies (questioning and inferencing), whereas the MSI group were taught six reading comprehension strategies (setting a purpose, making connections, visualization, questioning, inferencing, fix up strategies). Individuals in the comparison groups were drawn from a variety of classes (i.e., varied by teacher and section), and programs (i.e., Regular, Modified, Alternate Education English programs). These three groups were then analyzed in two ways to determine the success of the interventions.

Thus the guiding questions of this research study are as follows:

- 1a. What effect does small-group pull-out intervention have on reading comprehension, as opposed to reading instruction in the typical educational setting?

- 1b. What type of instruction (Multiple Strategy Instruction, Focused Strategy Instruction, or typical educational setting) leads to the greatest gains in reading comprehension and decoding?
2. How much unique variance does the type of comprehension instruction and decoding instruction contribute to reading comprehension?

Participants

Sample. Participants were drawn from a high school in Northern Saskatchewan, across multiple English class groupings (i.e., teachers and periods throughout the day), programs (i.e., Regular, Modified, and Alternate Education programs), and grade placements (i.e., 10-12). This particular school's population of over 400 included students from various socio-economic backgrounds that came from small city, rural and reserve residential settings. The elevated level of diversity encompassed in the student body makes this study more generalizable to other schools in a similar small city setting. The Regular English class encompasses all curricular expectations as set out by the government of Saskatchewan. A Modified credit is given when significant changes have been made to curricular objectives, but the core program remains similar to the Regular English class. Alternate Education classes are better suited to students who may require more basic, functional literacy skills, and who are not capable of success in either the Modified or Regular English classrooms. No one program was given preference, because intervention in all cases should be equally effective (Fletcher et al., 2007). However, stratified sampling across multiple variables (gender, teacher, class, etc.) was used to ensure groups were balanced.

Teachers were asked to generate a pool of candidates they judged to fit the following criteria for inclusion in this study: demonstrated lack of response to

instruction (ELA marks of 60% or less OR inclusion in modified/alternate programming); standard scores <25th percentile on GORT-4; absence of sensory or cognitive impairment, or language difficulties associated with ESL. Norm-referenced testing using Gray's Oral Reading Test-4 (GORT-4), and the Woodcock-Johnson III (WJ-III) Word Attack sub-test was conducted to verify the teacher election process (Hagaman & Reid, 2008). Criteria for inclusion in the study fell in line with the definition of students with reading disabilities being employed in this study (Fletcher et al., 2007).

In this case, cut-off scores for inclusion in the study were determined in consideration of research literature in the field and the practical context of the study. Responsiveness to intervention can be measured by rate of growth and overall achievement assessments (Graner et al., 2005). Curriculum-based measurement (CBM) is considered a valid method of evaluating progress and growth in the RTI model (Fuchs & Fuchs, 2006; Speece & Case, 2001). Therefore, past performance in English courses was used as a representation of curriculum based achievement in reading. The cut-off point of 60% was chosen to allow for a margin of assessment error. This mark may indicate that these students were not excelling in the general education classroom as compared to their peers. In this situation, there was no evidence to confirm that research-based instructional practices were faithfully and consistently implemented; however, a history of poor performance across time clearly indicated that students were struggling with content.

Different research studies utilize different cut-off points for inclusion in studies of readers who are struggling, or at-risk. Scores falling within one standard deviation below (16th percentile) and above (84th percentile) the population mean are generally

regarded as falling within the typically developing range (Sattler & Hoge, 2006). However, research studies on struggling readers use scores from the 25th to the 40th percentile (Hagaman & Reid, 2008; Hock et al., 2009; Torgesen, 2000). At the high school level, if students are not reading at grade level, they are likely to be struggling with content (Hock et al., 2009). These readers can become doubly deficient both in terms of how well they can read, and in terms of how well they can access the curriculum, since reading is a primary mode of instruction in the higher grades (Hock et al., 2009). Standard scores at or below the 25th percentile (Hagaman & Reid, 2008), in combination with low performance on CBMs would appear to conservatively identify students who are struggling with reading (Hagaman & Reid, 2008).

The random stratified selection process saw participants divided into groups that were comparable in terms of: maternal occupation categories; English class placement; gender; and pre-test achievement scores. Participants were placed into one of three intervention groups: the MSI group (which received 360 minutes of intervention), the FSI group (which received 150 minutes of intervention) and a contrast group, which received regular educational programming. Generally, this method helps to reduce sampling bias and to isolate the effects of the interventions (Morris, 2004). However the randomization process in this case was modified by several additional considerations. Participating students who were in the same class were usually put together in order to minimize the disruption to the regular classes and reduce contamination between intervention groups. At the same time, every group included participants from more than one class. Careful consideration of social and self-esteem issues also informed student groupings. Siblings were placed in the same intervention, but different groups to minimize contamination. Intervention groups were further sub-divided to produce work

groups of two to six participants. Meta-analysis of research literature on interventions for struggling adolescent readers indicated the proposed total minutes of intervention and the number of participants in each group fell well within the range suggested by typical practice in published literature (Scammacca et al., 2007).

Ideally, 10 to 15 participants were to be recruited for each intervention group. In order to participate, students needed to be motivated and willing both to attend school, and to attend the intervention as part of their school day. Furthermore, teachers needed to be willing to release students from some class time. These students then needed to take consent forms home (if they were under the age of 18), have forms signed and returned to the researcher. The study was not able to commence until the end of the school year (May - June). This time frame was problematic, as some teachers and parents did not wish for students to miss curricular content at this critical time of year. Five students were elected for involvement, but their pre-test scores were above the pre-set cut-off points, and they did not qualify for participation in this study. One student did not complete the study because school time was required to work on incomplete assignments. Two other students did not complete the study, but offered no explanation. Final numbers for the intervention groups were: MSI, 10 participants; FSI, 12 participants; control, 10 participants.

Instruments

In order to measure progress in reading comprehension and decoding, three standardized tests were administered: the GORT-4, the Woodcock-Johnson III (WJ-III) Word Attack subtest, and Wechsler's Individual Achievement Test-II (WIAT-II) Pseudo-Word subtest. All tests (in present or earlier versions) have been used quite extensively in research literature testing reading interventions (e.g., Berninger et al.,

2003; Bhattacharya & Ehri, 2004; Bowyer-Crane et al., 2008; Calhoun, 2005; Hagaman & Reid, 2008; Therrien, Wickstrom, & Jones, 2006). Standardized tests of decoding ability have fairly high reliability and validity (Keenan et al., 2008). Both the WJ-III Word Attack and the WIAT-II Pseudo-Words test a student's ability to sound out words using the phonological structure of the English language (Mather & Woodcock, 2001; Wechsler, 2002). The two sub-tests served as a pre- and post-test, to eliminate a practice effect that could have occurred with the re-administration of either test within a short period of time. The Basic Reading clusters of the WJ-III and the WIAT-II, which include the pseudo-words tests, have a correlation of .82 (Mather & Woodcock, 2001). The correlation is high enough to identify trends over time among groups. It falls well within the acceptable range used by standardized tests for alternate forms reliability (Wiederholt & Bryant, 2001) and for test-re-test reliability coefficients as well (Mather & Woodcock, 2001; Wechsler, 2002). Although standardized measures of decoding have an established validity within the academic community, the area of comprehension is not as well defined, making comprehension tests more controversial (Keenan et al., 2008).

Gray's Oral Reading Test-4 (GORT-4) was chosen as the norm-referenced comprehension measure for several reasons. The GORT-4 has been used in several research studies involving reading comprehension (e.g., Hagaman & Reid, 2008; Hock et al., 2009; Keenan, Betjemann, Wadsworth, DeFries, & Olson, 2006; Keenan et al., 2008; O'Connor, White, & Swanson, 2007; Torgesen, Alexander, Wagner, & Rashotte, 2001). The longer passages in GORT-4 more accurately reflect an authentic reading experience as opposed to other norm-referenced tests which use short passages (i.e., Woodcock-Johnson Passage Comprehension subtest or Peabody Individual

Achievement Test; Keenan et al., 2008). Low scores on tests involving shorter passages may be more indicative of poor decoding skills than comprehension abilities (Keenan et al., 2008). The GORT-4 correlates more strongly with oral language comprehension than decoding, and in this way isolates the comprehension variable more so than other tests (Keenan et al., 2008). It has been argued that some of the items on the GORT-4 can be answered without reading the passages, accessing background knowledge instead (Keenan et al., 2008). Assuming this criticism is consistent across both forms of the GORT-4, this variable can be adequately controlled for since each group took the same tests pre- and post-intervention. Furthermore, the ability to access background information to answer items is indicative of cognitive skills required for reading comprehension. Students who can make appropriate inferences are better readers (Cain & Oakhill, 1999). The ability to read the questions and access background knowledge relevant to answering the question is, in fact, one of the reading comprehension strategies being taught in the MSI. Thus it may be argued that the GORT-4 will still provide a valid assessment of cognitive abilities needed for reading comprehension. Finally, although the GORT-4 may have some flaws, it is still one of the better normed tests of reading comprehension currently available (Bell & McCallum, 2008). Considering the validity of the GORT-4, WJ-III and WIAT-II, as demonstrated both statistically and through application in published research, these tests are judged to be a suitable measure of skills to be examined in this study.

Procedures

Focused strategy intervention (FSI). The FSI group received 30 minutes of intervention each week. Sessions began with ten minutes of decoding instruction. The decoding piece was based upon the grapho-syllabic portion of Isabel Beck's (2006)

phonics program, with significant considerations from Shefelbine (1990), Bhattacharya and Ehri (2004) and some thought to Cunningham (2005). Beck (2006) provides a word/syllable matrix that explicitly sets out the words and constituent syllables to be studied during each lesson. The words and syllables are to be written on cards in advance and physically arranged on the table in a particular pattern (Beck, 2006). Although Beck (2006) offers no rationale for the selection or arrangement of words and syllables, it seems that syllables are arranged in columns according to their position in the word (i.e., first syllables in the first column, second syllables in the next, and so on). However, syllables are scattered throughout the rows in the matrix so that, for example, the student must find the right first syllable for the target word.

Presumably, the precision matrix and vocabulary list control for appropriate concept development, and thus they were both initially used. However, it was quickly ascertained that the lists were not completely appropriate or relevant for the targeted group. So in the first session students were asked to bring two multi-syllabic or unfamiliar words they came across in their reading to the next session. This method made the card system too cumbersome and time consuming, since the cards could not be prepared in advance. However, a whiteboard was available and this proved to be a more effective and efficient option. Students provided their own words, which the group divided into syllables, and wrote in the appropriate columns on the white board. Like Beck's (2006) matrix, syllables were scattered in the rows throughout the matrix. If students forgot to find words during their independent reading, they were asked to find words in their books upon arriving for the session. If, for some reason, they did not bring a book to the session, the instructor had on hand a collection of books she was

reading, some of which were recommended by the school librarian as being popular among the students. Students could use these books to find words.

Thus the session would begin with students looking through their reading books for unfamiliar words while the group waited for all the participants to arrive. As the instructor and each student provided one or two multi-syllabic or unfamiliar words, these words were written on the board and meanings and context were briefly discussed. Sometimes students could supply meanings or sentences to the group. Other times the instructor provided a quick meaning or the dictionary was consulted. The instructor made a point of saying the words a few times so students could hear the pronunciation and the word used in context. Cunninghams's (2005) suggestion of analogies was occasionally brought into the intervention when syllables were irregular or rarely occurring in the English language. So the first syllable in the word *poultice*, for example, was compared to that in the word *poultry* to figure out the pronunciation and spelling. Real life context, root words, word origins and affixes were also touched upon where appropriate, or where a member of the group voiced some prior knowledge. This entire discourse would take place within the space of about 3 minutes.

Four to five words (depending on the time) were then chosen to be broken into syllables. Following a matrix, similar to Beck's (2006), initial syllables were put in the first column in a jumbled up order, second syllables in the second column, etc. Unlike Beck (2006), syllables that were repeated in different words were listed twice. This practice seemed to reinforce the prevalence of high frequency syllables. The instructor asked students to identify first, second, etc. syllables, providing syllabification rules as part of corrective feedback. In the next step, a few of the words were chosen to practice sound-symbol correlations. The instructor would direct the students' attention to one

word in particular. Then each syllable would be identified and students would be asked to convert the sound of the syllables to the letters and vice versa. Thus the exchange would proceed along the following pattern:

I: Look at the word *surreptitiously*. What letters are making the /sur/ sound in surreptitiously, S1?

S1: s,u,r

I: And s,u,r makes what sound?

S1: /sur/

I: What letters are making the /rep/ sound in surreptitiously, S2?

S2: r,e,p

I: And r,e,p makes what sound?

S2: /rep/

(and so on, until all the syllables for that word have been completed)

After syllables were orally manipulated, the complete words were erased from the board and individual students were asked to choose a word and write it on the board while the other students wrote the complete word on their handout. This section of the intervention required a public performance in front of the small group. Therefore, students who were weak or had a lower social status (perhaps due to age or placement) were usually asked to go first so that they could choose a word they could probably spell, if they so desired. Corrective feedback was given orally by the instructor where needed. If students were seen to be writing an incorrect letter, the sound of the syllable was repeated, after which time the spelling for that syllable would be provided. After spelling the word, the student was asked to say the word. In this manner, the entire list of words that had been broken into syllables was completed. The entire decoding intervention occurred in the space of 10 to 15 minutes.

The remaining 15 to 20 minutes was spent teaching comprehension strategies using a combination of the basic instructional model discussed previously (Block & Johnson, 2002; Block & Pressley, 2002; Gambrell et al., 2002; Gear, 2006; Schumaker

et al., 2006; Sousa, 2007; Swanson, 2001), Gear's (2006) guidelines, and Tovani's (2000) approach. Specific methods from Keene and Zimmerman (2007) and Harvey and Goudvis (2007) were also used to develop the comprehension portion of the intervention. Instruction in questioning and inferencing followed the format suggested by Swanson (2001). The strategy was introduced, after which the instructor performed one or two think-alouds to model how thinking occurs during the use of this strategy. Then students had an opportunity to practice the strategy, with support. Questions were incorporated as much as possible to make the lessons more interactive. Students were given different activities, outlined on a worksheet, to facilitate the comprehension process. After a few minutes of individual practice in their self-selected independent reading books, the group briefly summarized the strategy. At times the students did not have or did not bring independent reading materials, thereby limiting their ability to practice the strategy within an authentic context. During these times, the classroom teacher was sometimes consulted to provide reading materials for use in the intervention program, and sometimes the instructor provided a book for the student to use. In the FSI group, students were given an additional assignment to complete over the course of the week to encourage generalization and transference. Students were given as much time as possible to complete assignments during the programming period. However, this practice may have reduced transference.

The aforementioned instructional process was repeated with questioning and inferencing strategies. Inferencing was chosen because of its importance in the model of meaningful reading (see Figure 3). Inferencing occurs at multiple phases in reading comprehension and is important for both a functional and transformative understanding of text. Asking questions appears to be a necessary precursor to inferencing. It stands to

reason that gaps in the text cannot be filled unless they have been identified through a process of question generation.

Multiple strategy intervention (MSI). The MSI group received a total of 360 minutes of intervention. The intervention period began and ended mid-week (according to the school calendar for those particular weeks). That is, although the intervention was spread over the course of a five week period, students received only four full weeks of intervention. The MSI group began with the same ten minutes of decoding instruction. This group had the opportunity to discuss many more words and was much better versed in the decoding method of instruction likely because they had many more exposures to this intervention procedure.

Twenty minutes of comprehension instruction followed the decoding segment, with the same process being employed. Similar weaknesses were noted and amendments made. A total of six comprehension strategies were discussed, modeled and practiced with varying levels of support. The MSI group studied the following six comprehension strategies: setting a purpose (1 session); sensory representations (3 sessions); making connections (3 sessions); asking questions (2 sessions); inferencing (2 sessions); and fix-up strategies (1 session; Gear, 2006; Tovani, 2000). These strategies were chosen because they frequently appear in professional development literature on comprehension strategies targeted at teachers (Brown, 2008; Gear, 2006; Gill, 2008; Keene & Zimmermann, 2007; Tovani, 2000). Thus far, no one strategy can claim superior scientific validity, but each plays a theoretical role in integrated reading theory. As each strategy was introduced, students were encouraged to coordinate its use with the strategies that had already been studied.

Control group. Reading comprehension strategies did not appear to have any special status or acknowledgement among the staff or administration in the participating school. During the time of this study, no pull-out reading intervention services were available. Although decoding and reading comprehension strategies are not explicitly included as part of the content of the Saskatchewan English Language Arts Curriculum for secondary students, every teacher has some discretion about how they teach the content contained in the curriculum guide (Saskatchewan Education, 1999). Teachers of Modified or Alternate Education programs have even more discretion about what type of instruction would be appropriate for their students. Students referred to the study were all identified as having some difficulty with reading or reading comprehension. As such, in some cases, test scores and commonly employed reading comprehension strategies were superficially mentioned with some teachers and students, when this information was requested. At this critical juncture, students must be given every opportunity for success. Since the semester was drawing to an end, it was impossible to offer intervention after the study had been completed; students would have already failed their course. Thus to refuse this information to students and teachers for the benefit of this study would seem to be highly unethical. It is possible that this information and/or the execution of this study within the school influenced teachers to spend some extra class time on reading strategies within the context of their course instruction. This practice was not discouraged, since extra instruction in reading can only serve to help those students who are struggling.

Data Collection

During the preparation stages of this study, consultation was conducted and approval secured from the Principal of the participating school, and the Director of

Education for this school division. Student application for Approval of Research Protocol was submitted to the University of Saskatchewan, Office of Research Services, on March 24, 2009, and approval was granted on May 7, 2009. Some meetings were initially held with English and Special Education Teachers so that they could begin thinking about potential candidates. After approval was granted, consent forms were distributed to English teachers to form a pool of candidates. Teachers handed out consent forms to those students whom they thought would meet the first (RTI) and third (exclusionary) criteria for inclusion in this study. Some teachers elected to distribute consent forms to their entire class, so as not to single out any one student, minimizing social risk. Other teachers spoke to students individually. All participating teachers were concerned professionals, well-acquainted with their students, so each teacher was trusted to exercise appropriate discretion according to the individual characteristics and dynamics of their classrooms. All administrators, and English and Special Education Teachers were found to be very positive and supportive of the study. However, some teachers felt that they could not accommodate pull-out interventions, especially at the end of the school semester. These teachers participated in a more limited way by referring fewer students.

Once potential participants were located, and consent obtained, pre-testing using the GORT-4 and WJ-III Word Attack was conducted so as to establish fulfillment of the second criteria. Participants were assigned an identification number to ensure confidentiality. This number was used on all testing materials. Administration of pre-tests took approximately 30 minutes per participant. Some additional time was required at this point to establish rapport with students. A total of 40 pre-tests were conducted. Five students did not meet the criteria for inclusion because test scores fell above the

cut-off range determined for this study. If students did not meet criteria, a report was sent home and students were struck from the participant list. In one case, a meeting was held between the researcher, classroom teacher, student and the student's mother to discuss testing results. In this case classroom performance was considerably lower than standardized test results, and it was thought that a meeting might motivate greater achievement within the classroom. Interventions needed to begin as quickly as possible because the academic year was drawing to a close. This time constraint meant that some pre-testing for the control group had to occur after interventions had begun.

Despite a shortened school week due to the May Long Weekend, interventions began on May 18, 2009, and lasted until June 15, 2009. Lesson plans for each day were carefully constructed (see Appendix A for a sample). Professional development revolving around these lesson plans was made available to teachers within the participating school division in the fall of 2009. This intervention period gave the FSI group 150 minutes of intervention (30 minutes, once a week for five weeks), and the MSI group 360 minutes of intervention (30 minutes, three times a week for three complete weeks and two partial weeks). The control group received no additional intervention, other than what may have occurred in the general classroom setting. Intervention time needed to be shortened from that originally proposed (six complete weeks) due to the lateness of ethics approval in the context of the school year. With the end of the school year quickly drawing to a close, post-testing began as soon as possible and was completed on June 21, 2009. At this point, all of the raw data had been collected and several steps were employed for its analysis.

Data Analysis

Control variables. Information about participants was gathered for the purpose of stratifying groups and increasing generalization as much as possible. Demographic data, including age, teacher, educational placement, mother's occupation, and gender, was coded and entered as numeric values. Parametric tests were then used to test for differences between groups. The desired result of these tests is *no* statistical significance, so multiple ANOVAs using a Bonferroni correction were a conservative option to analyze results, since it is the Type I error that is increased. Other methods were then employed for analyzing test data.

Research data. Pre-test and post-test scores were gathered using Form A (pre-test) and Form B (post-test) of the GORT-4 to measure reading fluency and comprehension; and the WJ-III (pre-test) and the WIAT-II (post-test) to measure decoding. Standard scores were used for analysis of all data. Standard scores were chosen because they give an indication of a student's performance in relation to her or his age or grade equivalent peers (Sattler & Hoge, 2006). Unlike percentile ranks, standard scores can be manipulated without distortion, making them most appropriate for statistical analysis (Sattler & Hoge, 2006). In this case, age norms were chosen because in high school it is possible for some students to be taking classes at different grade levels. In addition, students may attend school until the age of 22 in Saskatchewan. Therefore, age norms were deemed as a more accurate measure of student performance in relation to her/his peers. The GORT-4 only provides normative data for individuals up to the age of 19. However, these norms were deemed appropriate for struggling readers who may have been over the age of 19 (Wiederholt & Bryant, 2001). Data was cleaned and checked against the required assumptions for the

appropriate parametric test, according to those outlined by Tabachnick and Fidell (2007). Data entry was checked numerous times for accuracy before proceeding to statistical testing as dictated by the research questions.

When looking for significant differences between and within groups, two statistics will be reported and used for interpretation: the significance level (p) and the effect size, in the form of partial eta squared (η_p^2). Effect size is important to report with results because important pieces of information may be by-passed using significance testing alone (Levine & Hullett, 2002; Sink & Stroh, 2006). In addition, numerous important meta-analyses (e.g., National Institute of Child Health and Human Development, 2000; Swanson, 2001) rely on effect sizes to consolidate research results. Partial eta squared is the standard measure of effect size in multivariate and repeated measures ANOVAs (Sink & Stroh, 2006). Generally accepted guidelines suggest that a partial eta squared value of .01 may be interpreted as a small effect, .06 as medium, and .14 as large (Cohen, 1988). However, the partial eta squared may tend to overestimate effect sizes to some degree and must be treated with caution (Sink & Stroh, 2006).

Research question number one. Analyses were tied specifically to research questions. Question number one compared the effect of pull-out intervention to that of the typical educational setting on comprehension gains. This question was answered by collapsing the two intervention groups into one to form a pull-out group. This group's mean on pre- and post-testing measures could then be compared with those of the control group using a repeated measures ANOVA ($p = .025$).

Research question number two. Question number two asked more specifically about which intervention led to gains in either decoding or reading comprehension. In order to focus the analysis, one must first test to see if, as the literature and logic

suggest, decoding is correlated to reading comprehension within this population. In the area of reading disabilities it is possible to have decoding without comprehension, so the relationship between variables may not be as strong as one may suspect. If a strong relationship was found ($R > .90$ as suggested by Tabachnick & Fidell, 2007), reading comprehension would be used as the only dependent variable in a one-way ANOVA with repeated measures. The type of reading intervention, or group variable, was a three level (FSI, MSI or control) independent variable. The variable group was tested between subjects for its statistically significant ($p = .05$) influence on the dependent variable (DV), reading comprehension (and possibly decoding). Time was the within-subject independent variable. The repeated measures ANOVA tests for statistical significance over time, as determined by scores on pre- and post-tests. If reading comprehension and decoding were not found to have a strong relationship in this case, a similar procedure would be used with a one-way repeated measures MANOVA instead, where two dependent variables (i.e., reading comprehension and decoding) would be tested individually.

The two-way ANOVA (or MANOVA) with repeated measures is the most appropriate design because it is the only analysis which allows for consideration of the decoding and reading comprehension interventions, and some interaction between the two. Learning to read is not necessarily a straight-forward process. A more complex analysis has the potential to give more definitive answers about which processes are at work, and under what conditions. If, for example, statistical significance could only be found with one DV, educators may wish to approach the other skill area in a different manner. This information is absolutely essential in a very real and practical setting. It

can help educators better streamline practices for more efficient interventions and more effective use of resources.

Research question number three. The final research question asks about the amount of unique variance comprehension instruction and decoding contribute to reading comprehension scores. This question was answered using a sequential multiple regression. Variance in the dependent variable, post-test reading comprehension scores on the GORT-4, was analyzed by first entering the scores on the WIAT-II. Entering the decoding variable first offered a view of how much decoding could contribute to comprehension in this sample of adolescent struggling readers. More importantly, the early entry of decoding effectively controlled for decoding by removing this variance first. After this point, the group variable could be entered, which showed how much unique variance the type of instruction contributed towards the post-test scores. This analysis could reveal how much and what type of instruction could realistically help struggling adolescent readers. Information could be used to better streamline programs and effectively target interventions and resources. The following chapter outlines the results of this study which begins to illuminate some patterns in the impact of reading interventions with secondary students who struggle to read.

CHAPTER FOUR

Results

Overview

The purpose of this study was to scientifically validate methods of improving reading comprehension in adolescent struggling readers. Data on pre- and post-tests were analyzed to uncover optimum intervention conditions for the improvement of reading comprehension. In particular, conditions examined included: the kind of intervention (pull-out versus typical educational setting); the number of comprehension skills taught (two versus six); and the contribution of the intervention to post-test reading comprehension scores. In order to answer these questions, a random stratified sample of students from a high school in Northern Saskatchewan was placed into one of three research conditions: MSI ($N = 10$), FSI ($N = 10$), or a control group ($N = 9$). Students in the intervention groups received half-hour sessions of intervention which included a grapho-syllabic decoding strategy and reading comprehension strategies. The control group received the typical curricular programming, as prioritized by the classroom teacher, within the context of the English Language Arts course. Comparisons between pre- and post- test standard scores within and between the groups serve as the foundation for this analysis. This data was compiled and analyzed with the use of the Statistical Package for the Social Sciences (SPSS 16.0). Before statistical analysis occurred, data was first checked for outliers and normality.

Data cleaning. Thirty-two students completed the study. Students who informed the researcher of their discontinuation in the study were taken out of the analysis.

Students who may have been absent for a portion of the intervention were still included in the analysis because this situation may reflect an authentic intervention experience when struggling readers, at the end of the school term, may occasionally be absent. Of the 32 who completed post-testing, 29 remained after outliers were removed.

Three outliers were removed from the analysis. Although their data is valuable, the statistical analysis performed here (i.e., a MANOVA and multiple regression) is very sensitive to outliers and requires clean data and groups that are close in number (Tabachnick & Fidell, 2007). Theorists do not seem to agree on the appropriate course of action for cleaning data using transformations (see Field, 2009 for a brief overview; Tabachnick & Fidell, 2007). After weighing the options, it was determined that the simple removal of the outliers, an acceptable practice for cleaning data (Tabachnick & Fidell, 2007), would limit changes to the actual data (as occur in transformations), and result in the most accurate representative sample.

Cases were removed from the control group and from the FSI group. One of the outliers occurred in the control group. This individual's Oral Reading Quotient improved by 27 standard score points in about a month. Large increases were noted in all areas of testing (i.e., decoding, fluency, reading comprehension and overall reading). The particulars of this case are not known. Perhaps there was some reason that the data from either test was not representative of true reading ability, however, no reason was communicated to the examiner. In fact, this student expressed some exasperation during the post-test, asking "when will we be finished?". Neither of the student's teachers, with which the researcher regularly communicated, indicated that any major changes in reading had occurred. Multiple basals were established in the post-testing, with the highest one counted as the true basal, as per testing instructions (Wiederholt & Bryant,

2001). This degree of change is unlikely to have occurred within such a short expanse of time and without notice by classroom teachers. Therefore, it is assumed that internal changes in attention or motivation significantly impacted test scores. Further testing for this individual would be required to verify results (Wiederholt & Bryant, 2001), however this option was not available at the time. Thus this case was withdrawn from the analysis.

Two other outliers were removed from the FSI group. This was done, in part to produce groups that were closer in number, as per MANOVA requirements (Tabachnick & Fidell, 2007). The first individual, who had been noted by one teacher as inconsistent in achievement, experienced a 21 point gain in the Oral Reading Quotient. Large gains were noted across the subtests. This student missed several days of school at the end of the school year, and did not offer any explanation that might account for the extreme discrepancy. The second individual experienced a 9 point drop in the Oral Reading Quotient, explained entirely by a decrease in the comprehension subtest. This situation may be expected given the time of the school year and other confounding factors, described below. A lack of careful attention and focus, brought on by the distraction of warm weather and impending holidays, may have affected the post-test score (Wiederholt & Bryant, 2001). By removing outliers on both ends of the extremes, it is thought that the data may give a more balanced and accurate picture of actual benefits accrued. Once outliers were thus removed, data was examined for normality, a requirement of nearly every parametric test.

Table 1. *Measures of Central Tendency Across Sub-tests.*

	WJIII							
	Word Attack Pre-test	GORT Fluency Pre- test	GORT Comp. Pre- test	GORT ORQ Pre- test	WIAT Pseudo-Words post-test	GORT Fluency Post-test	GORT Comp. Post-test	GORT ORQ Post- test
N Valid	29	29	29	29	29	29	29	29
Missing	0	0	0	0	0	0	0	0
Mean	85.86	5.48	6.69	76.52	89.38	6.41	7.14	80.55
Median	87.00	4.00	7.00	76.00	90.00	6.00	7.00	82.00
Mode	67 ^a	3 ^a	7	73 ^a	99	7 ^a	8	85
Std. Deviation	9.815	3.622	1.854	13.225	12.049	3.386	2.133	15.013
Variance	96.337	13.116	3.436	174.901	145.172	11.466	4.552	225.399

Note: a. Multiple modes exist. The smallest mode is shown.

Normality. Although the statistical tests used in this study are more sensitive to outliers than to violations of normality (Tabachnick & Fidell, 2007), the assumption of normally distributed data still underlies each of the parametric tests (Tabachnick & Fidell, 2007). Therefore, descriptive statistics were run to compare measures of central tendency (See Table 1) and to visually examine histograms. On the whole, graphs looked fairly normal for the entire group on each pre- and post-test measure. Some possible skewness was observed. The greatest difference in the measures of central tendency occurred on the GORT-4 Frequency Pre-test, where scores were measured from 0 to 10. The mean score was 5.48, whereas the median was 4.00. This difference may indicate a possibility of non-normality.

To further explore normality, the non-parametric Kolmogorov-Smirnov test was run to check for significant differences between the sample distribution and a normal distribution (Field, 2009). This test is a good check for the data because the sample size

was relatively small (Field, 2009). Analysis of data on each pre- and post-test measure was tested in separate groups to provide a more detailed look at normality. Group scores are compared in the MANOVA, and thus normality within each group is also more relevant (Field, 2009). On the whole, this analysis revealed no significant differences between each groups' distribution of scores and the normal distribution on each measure, with one exception. The distribution of scores for the MSI group on the post-test GORT-4 Fluency sub-test was found to be significantly different from a normal distribution, $D(10) = .04, p < .05$. This difference is not of major concern because the fluency subtest does not figure prominently in these analyses. The decoding measures (i.e., WJ-III and the WIAT-II) and the reading comprehension measures are more important to the research questions at hand, and these distributions were found to be normal. Having established these basic requirements, the data was then checked for appropriate stratification.

Pre-intervention differences between groups. Information was gathered from participants about their educational placement, gender, age, mother's occupation (or father's occupation if the participant lived with a single father), and teacher. Most of these variables are categorical and thus require analysis using the chi-square test. However, due to the various categories within each variable, most cells lacked the requisite minimum of five cases per cell. Therefore, results were analysed using Fisher's exact test and the Likelihood ratio (Field, 2009). Chi-square results suggest that no significant correlations occurred between the group placement and English class placement ($p = .11$); group placement and teacher ($p = .67$); group placement and gender ($p = .67$); and group placement and SES, as inferred by the mother's occupation ($p = .87$). A straightforward ANOVA conducted on the continuous variable, age, found a

significant difference between groups ($p = .02$). In particular, the mean age for the MSI group ($M = 17.91$) was significantly higher than that for the FSI group ($M = 16.48$). This difference occurred, in part, because there was not an even dispersion of students available throughout the day and decisions about groupings needed to be made in light of social considerations and practical time constraints. The researcher also attempted to form groups so as to minimize contamination between research groups. This meant that students in the same family or peer group needed to be in the same intervention group, as much as possible. Developmental differences over one and a half years in adolescents may not be as extreme as those found in young children, and thus may not be considered as important as stratifying according to other variables, including pre-test scores.

Pre-test scores were analyzed for major differences between groups using multiple ANOVAs. In this instance, a Bonferroni correction was applied to control Type I error ($p < .01$ for 4 two-tailed ANOVAs; Tabachnick & Fidell, 2007). The multiple ANOVAs are still considered an appropriate test, despite elevated risk of Type I error because in this case the desired result is a *lack* of statistical significance. ANOVAs testing differences between groups failed to achieve significance in pre-testing measures of decoding ($p = .24$), fluency ($p = .43$), comprehension ($p = .42$) and the Oral Reading Quotient ($p = .80$). Results are listed in Table 2. The null hypothesis that the groups are the same cannot be rejected. Groups thus started out as approximately equal in terms of educational placement, teacher, SES, gender and reading ability before the interventions occurred.

Table 2. *Comparisons Between Groups on Pre-test Scores.*

	<i>MSI</i> <i>N = 10</i>		<i>FSI</i> <i>N = 10</i>		<i>Control</i> <i>N = 9</i>		<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
WJ-III	83.30	9.79	84.30	10.71	90.44	8.10	.24
Comp.	6.90	1.91	7.10	1.97	6.00	1.66	.42
Fluency	5.80	4.69	4.30	2.50	6.44	3.36	.41
ORQ	78.10	16.68	74.20	10.60	77.33	12.74	.80

Note: *M* = Mean; *SD* = Standard Deviation; *p* = significance

Efficacy of Pull-out Interventions

The first research question looks at whether or not pull-out intervention is a good option for adolescent struggling readers from the perspective of academic gains.

Specifically, the question asks: what effect does small-group pull-out intervention have on reading comprehension, as opposed to the typical educational setting? To answer this question, the two intervention groups were collapsed into one group ($N = 20$). The mean from this group was then compared to the mean from the control group ($N = 9$) using a repeated measures ANOVA. The statistical analysis revealed a surprising interaction between groups over time that approached significance ($p = .08$), with a medium effect size ($\eta_p^2 = .11$). This analysis failed to find significant differences between groups, although these results also approached significance ($p = .06$), with a medium to large effect size ($\eta_p^2 = .13$). Although both groups improved on measures of comprehension, the control group appeared to make greater gains than intervention group. Mean scores for the control group started out lower ($M = 6.00$) than the intervention group ($M = 7.00$). However after about a month, the scores for the control group ($M = 7.33$) were

higher than those for the intervention group ($M = 7.05$). Post hoc testing was required to find out whether or not the improvements seen by the control group alone could be considered significant. These tests were performed as part of the post hoc analysis in the next subsection. The estimated marginal means for reading comprehension between the two groups are depicted in Figure 4.

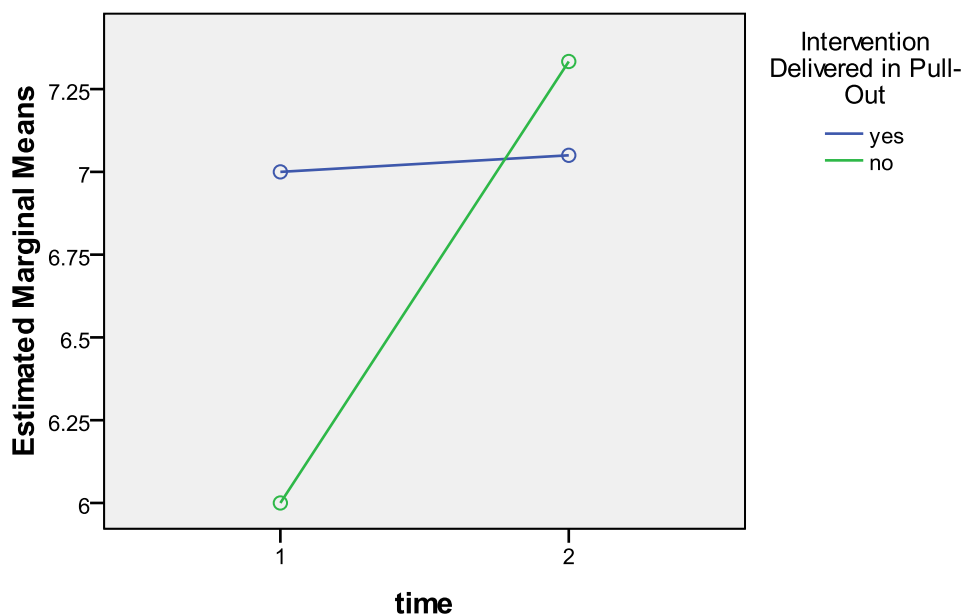


Figure 4. Estimated marginal means of GORT-4 Reading Comprehension Subtest comparing pull-out/typical setting groups.

Although a significant difference was not found, the actual differences between groups may point to some important considerations for classroom/school practice to optimize instruction for adolescent struggling readers. The implications of this finding will be discussed further in Chapter 5. Additional division of the individual groups may shed some light on possible differences.

Efficacy of Specific Interventions

The second research question asks about the ability of the different instructional methods to help adolescent struggling readers improve their reading skills. Specifically,

the question asks: what type of instruction (Multiple Strategy Instruction, Focused Strategy Instruction, or typical educational setting) leads to the greatest gains in reading comprehension and decoding? This question further probes any changes that occurred between and within the groups using the standard scores from norm-referenced tests before and after an intervention period. In this case, reading may be divided into two dependent variables: reading comprehension and decoding.

To answer this question an analysis of variance was required; however, correlations were tested first to determine whether an ANOVA or MANOVA was the most appropriate test and to see which variables would be useful dependent variables (Tabachnick & Fidell, 2007). If a very high correlation existed between decoding and comprehension, only one variable could be used as a dependent variable and the more straight forward ANOVA could be performed. A correlation of .90 or higher is a suggested standard that may indicate a high correlation as per the MANOVA assumption of multicollinearity and singularity (Tabachnick & Fidell, 2007). Any variables that are this highly correlated can be collapsed into one DV (Tabachnick & Fidell, 2007). Correlations were tested using the Pearson Correlation Coefficient (Tabachnick & Fidell, 2007). Table 3 illustrates correlations between each of the measures. In the field of education, anything below .30 is considered low or very low; .30 to .49, moderately low; .50 to .69, moderate; .70 to .79 moderately high; and .80 to .99, high (Sattler & Hoge, 2006). Interestingly, correlations between all norm-referenced measures indicated that reading comprehension scores (pre-test and post-test) are not highly correlated with any measures of decoding or fluency. Comprehension pre-test scores were moderately correlated to comprehension post-test scores ($r = .60$), as could be expected. Comprehension scores were also predictably correlated to the

Oral Reading Quotient (pre-test $r = .60$; post-test $r = .45$) which is derived from a sum of the comprehension and fluency sub-tests scores (Wiederholt & Bryant, 2001).

Table 3. *Correlations Between Norm-Referenced Measures of Reading*

	WJ-III	Pre-test Fluency	Pre-test Comp	Pre-test ORQ	WIAT	Post-test Fluency	Post-test Comp	Post-test ORQ
WJ-III	1.00	.775	.288	.757	.841*	.826*	.514	.778
Pre-test Fluency		1.00	.215	.912*	.703	.950*	.587	.896*
Pre-test Comp			1.00	.597	.273	.243	.598	.449
Pre-test ORQ				1.00	.692	.883*	.734	.925*
WIAT					1.00	.776	.387	.688
Post-test Fluency						1.00	.595	.931*
Post-test Comp							1.00	.839*
Post-test ORQ								1.00

Note: *indicates a high correlation.

Low to moderate correlations mean that comprehension and decoding were both used as dependent variables in a repeated measures MANOVA. Although there are several arguments for and against the use of multivariate over univariate analysis of variance (Harwell, 1988; Keselman et al., 1998; Tabachnick & Fidell, 2007), in this case the multivariate analysis was chosen because reading and reading comprehension are complicated processes that researchers should refrain from simplifying. A MANOVA has the advantage of being able to detect a more complicated interaction among variables (Tabachnick & Fidell, 2007). The MANOVA is also more resistant to Type I

error, and thus provides a more reliable overall view of experimental outcomes (Tabachnick & Fidell, 2007). In addition, a more detailed look at individual group scores on dependent variables is gained through the use of multiple ANOVAs run as post hoc tests (Tabachnick & Fidell, 2007). Thus in this instance, the use of multivariate analysis, in conjunction with univariate post hoc tests seems to offer a broader picture than either method alone.

A repeated measures MANOVA was run, using the decoding measures (i.e., WJ-III and WIAT-II) and the GORT-4 Reading Comprehension subtest as dependent variables and groups assigned as the independent variable for the between groups analysis. Within-subject factors were measured using pre- and post-test scores as a comparison. Data was found to meet the assumptions of MANOVA, including requirements for normality, homogeneity of variance-covariance, linearity and an absence of outliers (Tabachnick & Fidell, 2007). Between subjects multivariate tests were not found to be significant. Overall, no statistically significant differences in achievement could be directly attributable to a participant's inclusion in one group over another ($p = .81$), and the small effect size suggests that little practical difference could be found either ($\eta_p^2 = .02$). Within-subjects significance testing indicated a non-significant result for the interaction between time and group ($p = .19$), however this interaction produced a medium to large effect size ($\eta_p^2 = .12$). A significant difference was found over time ($p = .006$), with a large effect size ($\eta_p^2 = .34$). Participants thus experienced a significant change from the pre- to the post-test condition, which may have interacted in some way with the group to which participants were assigned, despite the fact the groups themselves did not produce a significant difference on the combined DV. Examination of post hoc univariate tests helped to explain this result.

Univariate ANOVAs were run to take a closer look at areas of significance. The time x group interaction was found to be approaching significance, with a medium to large effect size, ($p = .07$; $\eta_p^2 = .12$) in the decoding variable, but not for comprehension ($p = .90$; $\eta_p^2 = .00$). Similarly, time was found to be a statistically significant variable for decoding ($p = .007$; $\eta_p^2 = .25$), but not for comprehension ($p = .10$; $\eta_p^2 = .10$), although the effect size was medium for this variable. These results imply that further investigation may be focused in the area of decoding and in gains made over time. More information about the precise areas of significance may also be suggested by examining the estimated marginal means line graphs for each DV.

Visual examination of profile plots depicting the estimated marginal means for each DV gave more information about where the significance may have occurred, and thus provided a starting point for further investigation. The profile plot for reading comprehension (Figure 5) shows that while the intervention groups improved very little, or not at all, the control group experienced a dramatic improvement. The line for the control group crossed that of the intervention groups, suggesting where an interaction may be occurring. This finding supported the earlier result from the repeated measures ANOVA conducted in response to question 1, but further divided the groups for more in-depth analysis. Descriptive statistics for these groups indicated that the MSI group's mean stayed the same ($M = 6.90$), the FSI group's mean increased a small amount (Pre-test $M = 7.10$; Post-test $M = 7.20$); and the control group's mean increased by a large amount (Pre-test $M = 6.00$; Post-test $M = 7.33$).

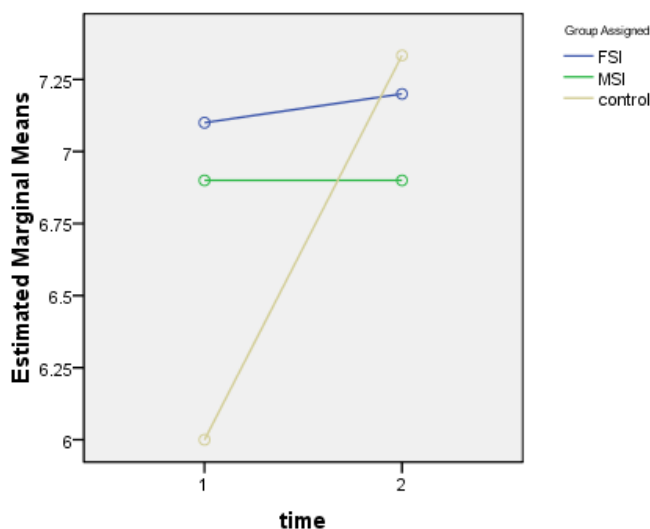


Figure 5. Estimated marginal means for GORT-4 Reading Comprehension Subtest comparing all groups.

The profile plot for the decoding measures (Figure 6) was also visually examined for more precise information about where significant results were occurring. In this graph, marked improvements were seen in the control group and in the MSI group, while the FSI group improved just slightly from pre- to post-testing conditions. An interaction, marked by the crossing of lines, occurred between the MSI and the FSI groups. The MSI group started out with a lower pre-test mean score ($M = 83.30$) than the FSI group ($M = 84.30$); however, the MSI group finished with a higher post-test mean ($M = 89.50$) than the FSI group ($M = 85.10$). Univariate tests, conducted as part of the MANOVA suggested that changes in decoding as a function of time and group were approaching statistical significance ($p = .07$), with a medium to large effect size ($\eta_p^2 = .12$). Overall word reading experienced a statistically significant change over time ($p = .007$), with a large effect size ($\eta_p^2 = .25$).

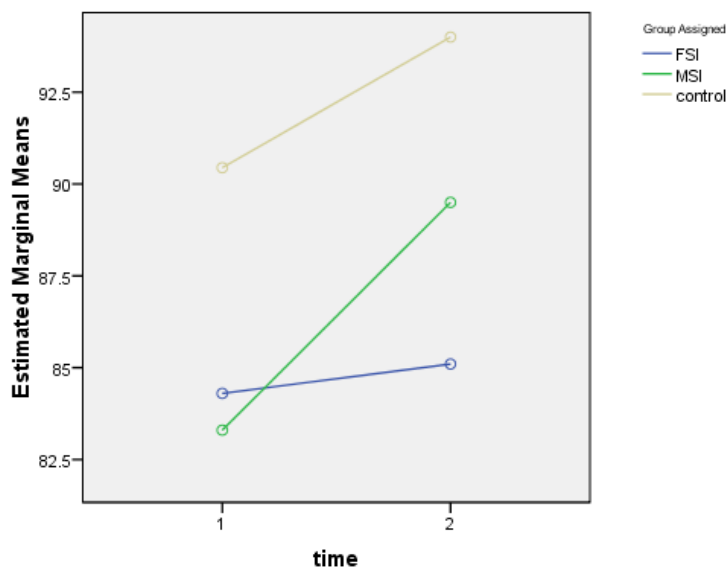


Figure 6. Estimated marginal means for decoding measures comparing all groups.

At this point it was clear that some statistically and practically significant results were occurring over time and as an interaction with time and group, although no statistically significant results were found between groups on the repeated measures of decoding and reading comprehension. Since these results were found through the use of the omnibus MANOVA, with its protection from Type I error, there may be some reasonable confidence that the results are an accurate reflection of reality, rather than error. However, the MANOVA is noted for its difficulty of interpretation (Tabachnick & Fidell, 2007), and the results seemed to be contradictory. The multivariate analysis between groups resolutely found no statistical or practical significance; however multivariate analysis on within-group variables indicated that there could be some interaction occurring within the group x time variable. Although the test failed to provide statistical significance, levels in fact approached significance, and practical significance may be implied by the moderate to large effect size (Sink & Stroh, 2006). Furthermore, the profile plots illustrated that some of the groups did, in fact improve on

one or both measures. This fact may lead one to wonder whether or not the improvements experienced by individual groups were statistically significant, and whether or not a pattern of improvement may be seen across groups, to more precisely inform reading intervention practices.

Further testing served to clarify seemingly contradictory results. The research question asked specifically about changes experienced in decoding and comprehension over time and between groups. Results of the repeated measures MANOVA suggested that some change may have occurred, but at this point it was impossible to get a complete answer to this question. To get an idea about what was occurring within the groups, the file was split according to group membership. Splitting the file resulted in a more isolated data set that could be analyzed with greater scrutiny. A more detailed picture of trends in specific reading achievement gains was obtained by introducing all sub-test scores as dependent variables. Therefore, separate repeated measures ANOVAs were run for each subtest, within each group as a follow up test, using time as the only independent variable. A Bonferroni correction was used to control for Type I error. A one-tailed significance value, divided over 12 tests led to a significance value of .004. Variables could then be more effectively isolated in a manner that held some promise of clarity, while maintaining integrity in the form of protection from error.

Results from the repeated measures ANOVAs showed some interesting trends. Table 4 illustrates the results of these analyses. Note that results from the fluency sub-test must be interpreted with caution due to possible violations of normality, as mentioned earlier. The MSI group, who received the most intensive intervention, experienced the only statistically significant increase in the entire set of results, in the area of decoding ($p = .001$). However, large effect sizes were noted both for decoding

($\eta_p^2 = .75$), and fluency ($\eta_p^2 = .39$). The FSI group, who received less intensive intervention, did not experience any statistically significant increases, but large effect sizes were noted for increases in fluency ($\eta_p^2 = .53$), and the Oral Reading Quotient ($\eta_p^2 = .37$). The control group had a more even pattern of improvement, with no statistically significant gains, but large effect sizes for improvements in decoding ($\eta_p^2 = .21$), comprehension ($\eta_p^2 = .38$), fluency ($\eta_p^2 = .32$), and the Oral Reading Quotient ($\eta_p^2 = .50$). These results suggest a hierarchy of skills that may be required before deficits in reading comprehension may be addressed. This possibility will be discussed in the context of research literature in Chapter 5.

Table 4. *Results of Multiple Repeated Measures ANOVAs for Split Groups.*

	<i>MSI</i>			<i>FSI</i>			<i>Control</i>		
	<i>N = 10</i>			<i>N = 10</i>			<i>N = 9</i>		
	<i>F</i>	<i>p</i>	η_p^2	<i>F</i>	<i>p</i>	η_p^2	<i>F</i>	<i>p</i>	η_p^2
Comp.	0.00	1.00	0.00	.053	.82	.01	4.92	.06	.38
Decoding	27.55	.001	.75	.11	.74	.01	2.18	.18	.21
Fluency	5.65	.04	.39	10	.01	.53	3.77	.09	.32
ORQ	2.22	.17	.20	5.21	.05	.37	7.85	.02	.50

Note: *p* = significance level; η_p^2 = partial eta squared

Non-parametric tests were run on a portion of the data as well to ensure the validity of results. Results using Friedman's ANOVA were virtually the same as those found with parametric tests. The same measures were found to be significant for the same groups, and additional areas of significance were not revealed. Therefore, the parametric tests were deemed as accurate and further testing unnecessary.

Contributions of Interventions and Decoding to Reading Comprehension

The last research question asked about the contributions of decoding and the type of comprehension intervention to post-test comprehension scores. This question was answered by using a sequential multiple regression. An absence of outliers had already been confirmed, since the data was cleaned. The data contained more data fields than IVs, and thus met the minimum number of cases required to conduct the multiple regression (Tabachnick & Fidell, 2007). Calculation of correlations indicated moderate correlations between post-test comprehension scores and WIAT-II scores ($r = .39$), but low correlations between post-test comprehension scores and group membership ($r = .06$). The correlation between IVs was also moderate ($r = .31$). These correlations met the requirements for an absence of multicollinearity and singularity (Tabachnick & Fidell, 2007). Normality, linearity, and homoscedasticity of residuals had been met, as determined by a visual examination of the residuals scatterplot (Tabachnick & Fidell, 2007). Thus the data was appropriate for analysis using the sequential multiple regression.

Having met the assumptions for the multiple regression, the analysis was conducted using post-test comprehension scores as the DV and (1) WIAT-II scores, and then (2) group membership as IVs. Interestingly, the entrance of decoding produced statistically significant results ($p = .03$), accounting for 15.4% of the variance in post-test comprehension scores. The addition of the group variable failed to produce a statistically significant result ($p = .1$), and added almost nothing to the amount of variance accounted for by the model ($R^2 \text{ change} = .004$). Thus, the multiple regression yielded some remarkable results about different aspects of the intervention study.

This study was undertaken to test different approaches to reading intervention for struggling adolescent readers. Data on pre- and post-test scores of decoding and comprehension were analyzed to determine which aspects of the intervention could be considered as effective. With the statistical analysis complete, the implications for classroom teaching and school programming can now be discussed.

CHAPTER FIVE

Discussion

Summary

The purpose of this study was to investigate methods for improving reading comprehension among struggling adolescent readers. More specifically, this study was concerned with: the effectiveness of pull-out intervention for reading outcomes in this population; the most effective type of intervention; and the contributions of instructional method to reading comprehension after decoding has been removed. These questions were answered with the help of 29 students from a rural school division in Saskatchewan who volunteered to participate in testing and various forms of reading intervention for a period of five weeks. Students were placed into one of three groups: the MSI group practiced decoding and learned six comprehension strategies; the FSI group practiced decoding and learned just two comprehension strategies; and the control group who participated in their typical education program.

The effectiveness of pull-out as a method of intervention was determined by collapsing the MSI and FSI groups into one and then comparing these scores with that of the control group using a repeated measures ANOVA. The groups' improvements in reading were analyzed by comparing pre- and post-test standard scores on the GORT-4 reading comprehension subtest, and on a decoding measure (i.e., WJ-III and WIAT-II) in a repeated measures MANOVA. These results led to supplementary post hoc testing using repeated measures ANOVAs to determine the exact nature of improvements made by each of the groups. Further contributions of decoding and instructional method were

determined through the use of a multiple regression. This set of analyses produced some interesting, and at times surprising, results.

Student Reactions to Intervention

Some general and specific modifications had to be made in response to student reactions to the intervention process. As in all cases of authentic teaching, lesson plans had to be modified mid-course if it was found that students were not responding as expected. Furthermore, instruction needed to be adapted according to the individual students and the group dynamics. For example, in one intervention group there were just two, soft-spoken students. In this case the instructor needed to ask more questions and exhibit more enthusiasm in order for students to display engagement. In another intervention group there were six outgoing and confident boys. In this case, the instructor needed to help the boys direct their energy into a meaningful learning task, but did not have to encourage enthusiasm or discussion.

Specific modifications were made to the lesson plans for all students. Most notably in the decoding intervention, the vocabulary lists provided by Beck (2006) were found to be inappropriate. It became quickly apparent that although some words may have been unfamiliar, others were viewed as easy, and all words had questionable relevance. If students found that the words were too easy, they may have dismissed the intervention as childish. Having students bring their own words was key to ensuring that the intervention was viewed as relevant, challenging, and developmentally appropriate. In fact, it was found that students in some cases took this task to be a challenge where they could show off their level of reading difficulty among their peers. Students sometimes ridiculed others if words were too short or well-known. In this case, the instructor took care to exemplify words that were short, but unfamiliar, or words that

were common, but unknown to herself. During the course of the decoding intervention a fast-paced questioning style was adopted to practice sound-symbol correlations. This part of the decoding program needed to be fast to encourage automaticity and because students tended to become disengaged due to the individual nature of instruction and the ease with which most students could respond. The questioning method was especially useful with adolescents who had a good knowledge of where syllable breaks might occur, and made the syllabification rules relevant where prior knowledge was lacking. Furthermore, students maintained engagement and were able to hook into prior knowledge for an authentic purpose.

In the case of the reading comprehension aspect of the intervention, it was found that students may have viewed the work as childish and irrelevant. Perhaps the individual lessons need to be re-visited to make the activities more sophisticated for an adolescent population. It was more difficult for the instructor to establish relevance because the students were taken out of the classroom context. The instructor, and sometimes the students, had little knowledge of what the students were expected to comprehend from their reading, or the learning objectives of the unit. Therefore, attempting to implement a de-contextualized reading comprehension intervention may require closer collaboration and planning between the classroom teacher and the instructor providing intervention. In addition to the student observations on the format of the interventions, several interpretations may also be made from the statistical results.

Findings

The original hypothesis of this study was that improvements would roughly correlate with the intensity of intervention on all reading measures; MSI would improve the most, followed by the FSI group and the control group least of all. This hypothesis

was based on general practices and beliefs in the field of reading remediation, and on intervention studies in decoding (National Institute of Child Health and Human Development, 2000), one small part of reading. However, there are two important distinctions that set this study apart from that body of research. First, most intervention studies have occurred with younger children who may be more cognitively pliable, with fewer emotional and motivational obstacles. Second, research in reading comprehension is mainly theoretical, and yet to be substantiated (National Institute of Child Health and Human Development, 2000). Little is known about how to remediate comprehension: the end product of a somewhat mysterious process. Thus, it should not be surprising to find results that are inconsistent with traditional expectations. Results such as these provide an important starting point for designing more appropriate educational programming for adolescent struggling readers. In sum, the analysis produced the following results:

1. Pull-out intervention did not appear to hold any advantage over the typical classroom setting when attempting to remediate reading comprehension, with the control group showing greater gains (pre-test $M = 6.00$; post-test $M = 7.33$) than the intervention group (pre-test $M = 7.00$; post-test $M = 7.05$);
2. Participants in the MSI group demonstrated significant improvement on post-test measures of decoding ($p = .001$; $\eta_p^2 = .75$);
3. Although statistical testing did not reveal significant results, effect sizes were large for: participants in the MSI group on measures of fluency ($\eta_p^2 = .39$); participants in the FSI group on measures of fluency ($\eta_p^2 = .53$) and the Oral Reading Quotient ($\eta_p^2 = .37$); participants in the control group on

measures of decoding ($\eta_p^2 = .21$), comprehension ($\eta_p^2 = .38$), fluency ($\eta_p^2 = .32$), and the Oral Reading Quotient ($\eta_p^2 = .50$); and

4. Decoding accounted for a statistically significant 15.4% of the unique variance in post-test comprehension scores ($p = .03$), but differences in grouping contributed a negligible amount ($p = .1$; R^2 change = .004).

Effectiveness of pull-out intervention. The results of this study did not indicate any advantage for pull-out intervention services in reading comprehension. However, it is important to keep in mind that the control group tested much lower on the pre-test ($M = 6.00$) than the intervention group (pre-test $M = 7.00$). Although no statistical significance was found between pre-test scores of decoding between the three groups ($p = .42$), a definite pattern exists. It is difficult to explain this difference in pre-test scores. Perhaps it is a result of internal motivation or attention. The small numbers in the control group ($N = 9$), versus the intervention group ($N = 20$) may make the control group more vulnerable to chance fluctuations. It could be that the post-test scores for the control group ($M = 7.33$), which are closer to those of the intervention group ($M = 7.05$), are a better representation of actual ability. If pre-test scores are not an accurate demonstration of ability in the control group, no firm conclusions can be drawn about the relative effectiveness of pull-out interventions.

Assuming that pre-test and post-test scores are an accurate representation of ability in reading comprehension, this study could not support the practice of pull-out services for remediation of reading comprehension. In this analysis the control group improved more than the other two groups, who essentially stayed the same. This difference cannot be explained by a pre-intervention condition, such as age, since the significant difference in age was found to exist between the MSI and FSI groups. The control group did not

differ significantly from either of the other groups in any of the stratification variables, and all participants met the requirements for inclusion in this study. This leaves two possible alternative explanations for this difference.

The first possibility is that differences in internal motivation and attention may have existed between groups. Students who participated in the intervention conditions may not have taken the intervention seriously, since it was not a part of their regular academic programming. Students, especially those in the FSI group, frequently did not complete the comprehension component of the home work and sometimes asked for clarification or reminders about what to do. If comprehension homework was not completed, there was not enough time during the intervention for students to do the work. If work time was provided, it was found that students tended to rush through the work just to get finished, without giving the cognitive processes enough time to establish effective neural pathways. Sometimes students did not bring a text they were currently reading to intervention sessions. This meant intervention became less relevant and de-contextualized. These observations may be interpreted as a sign of low internal motivation for really working towards the improvement of reading comprehension skills, or that internal motivation was not sufficient to overcome possible distractions.

It is difficult to assess the attention and engagement of students in any of the groups. The comprehension aspect of the intervention involved a lot of internal cognitive processes, such as discourse processing, synthesized cognition and metacognition, which are not easy to monitor. Thus it is more difficult to provide corrective feedback and redirect students to the task at hand, especially in terms of reading comprehension. The instructional protocol was less structured and less tangible than what could be seen and heard in the decoding section. Reading comprehension

instruction also included much more elaborate explanations by the instructor, which resulted in less participation by the students, lessening engagement. For example, many of the students were unfamiliar with the term *inferences*. Therefore, explanations and examples were required just to introduce the concept and to persuade the students that making inferences really would help improve their reading. Further explanation was required to take students through the explicit thought process required for making inferences during reading. At times it was found that all of this *teacher talk* left very little time for student practice. During the interventions, an effort was made to increase student engagement in the comprehension section by asking questions and encouraging discussion. However, time constraints did not always make this possible. It may be that the instructional model suggested by Swanson (1999), which emphasizes explicit instruction in thought processes and multiple teacher-led examples, is more appropriate for longer time slots or younger children who may be more tolerant of directive skill practice in reading. For students who are, or are nearly adults, there needs to be greater recognition of student knowledge and expertise, while at the same time remediating some very important gaps in knowledge base.

The second reason that intervention groups did not perform as well as the control group could be because the intervention was de-contextualized from the content instruction occurring in the general classroom. Although frequently reminded, students could not see that the use of these strategies would, in fact, improve their marks and the ease with which they could perform academically. The connection between instruction and skill use or class marks was indirect because students did not receive any marks for work completed during the intervention. Students did not get the kind of reinforcement (i.e., marks) that may have been necessary to ensure the sustained and continued use of

the strategies. If strategies were more closely interwoven with classroom content, practices and routine, as illustrated by several authors (e.g., Gear, 2006; Harvey & Goudvis, 2007; Keene & Zimmermann, 2007; Tovani, 2004), it is possible that students could see more immediate pay-offs and become more proficient in using the strategies. Furthermore, changing one's way of thinking, after more than a decade, is no small undertaking. A classroom teacher has the advantage of more time with the students, wherein she or he may be able to provide prompts and reminders during opportune moments. In this way it is surmised that contextualized classroom instruction in reading comprehension strategies may provide stronger increases in student achievement; however, this hypothesis needs to be validated through research.

It is possible that the execution of this study within the school may have altered the regular classroom teaching of participating teachers, either indirectly or directly. A classroom teacher has many learning objectives which must be addressed every day. It is possible that reading comprehension instruction received more emphasis than usual because teachers were thinking about reading comprehension. The researcher often held conversations with teachers about benign topics such as the general performance of students or the importance of reading comprehension skills. It is possible that through these conversations reading comprehension skills resurfaced as a priority in some classrooms. Thus, the suggestion of importance may have caused some classroom teachers to consciously or subconsciously place a greater emphasis on reading comprehension in the course of their regular teaching.

Some of the teachers of students who participated in the control group asked for advice about how to address comprehension difficulties with these students. It was deemed unethical to withhold such information when it may help the student obtain a

credit or otherwise significantly impact learning. Therefore, some of the teachers may have altered their teaching to address comprehension difficulties of their students. One member of the control group, in particular, showed noteworthy initiative during the intervention period. After a short debriefing session with his teacher and the researcher, the student agreed to meet his teacher during free time for extra support. Far from a shortfall, this effect of the study was deemed to be a successful outcome and possibly illustrates the importance and significance of integrating comprehension skill instruction with classroom content.

Effects of instructional methods on reading. Results from this analysis found that students in the MSI group made significant improvements over time in the area of decoding. Although this result falls outside of the main focus of this study, reading comprehension, it is still a crucial finding. Few intervention studies focus on remediating phonics in *adolescent* readers. The *older* readers often referred to in many intervention studies are only in grades four to nine (25 out of 31 of the studies analyzed by Scammacca et al., 2007). This study confirmed other research that suggests adolescent students (grades 10 -12) are amenable to intervention (Scammacca et al., 2007). Furthermore, it provides an age-appropriate method of phonics and vocabulary intervention that is relevant to students, easy to implement, inexpensive, and does not require a large block of time. Two students, in separate groups, made unprompted positive remarks about the decoding intervention, indicating that they were pleased it might help them with their spelling. Interestingly, students were usually prepared for the decoding section of the intervention, and if they were not, this aspect was easy enough to accommodate in the short intervention time. Thus all students actively participated in each and every decoding session. No remarks were heard in complaint of the decoding

aspect of the intervention. Thus anecdotal and empirical data bear out the effectiveness of this method of decoding intervention for adolescent struggling readers.

The pattern of effect sizes also holds some interesting information for researchers. Although effect sizes cannot provide conclusive evidence about the research hypothesis when statistical significance has not been found, they are still useful for the examination of patterns and may suggest some areas of future research (Levine & Hullett, 2002; Sink & Stroh, 2006). In this study, the effect sizes suggested that the MSI group improved on both decoding and fluency, which supports the theory that decoding is a necessary part of fluency (Stahl, 2004). If students become more proficient in decoding, they will also become more proficient in fluency. The MSI group began with the lowest group mean in decoding and made significant improvements, so perhaps these improvements in decoding are coupled with improvements in fluency when students are experiencing more severe delays. It is possible that participants in the MSI group did not have enough time to make the complete transference from decoding to fluency and on to comprehension. This is not to suggest that the decoding intervention on its own could have produced improvements in comprehension. Rather, that decoding must be achieved at a certain level, over a certain period of time (to accrue practice benefits), before cognitive space is released for the conscious application of comprehension strategies whilst reading. If the comprehension strategies are not used after the cognitive space is available, comprehension cannot be expected to spontaneously occur. However, the level of decoding required over what period of time is not known. The lack of statistical significance experienced in the other two groups confirms the hypothesis that an increase in intensity will produce an increase in results, at least with

respect to decoding intervention. However, the pattern of effect sizes for these two groups may still provide some insight into reading processes.

The two other groups experienced a different profile of effect sizes. The FSI group improved in fluency and the Oral Reading Quotient. This group began with a slightly higher mean in decoding, and did not experience a significant increase. The increase in fluency may be due to a practice effect that could take place since decoding skills were not as problematic for this group (Stahl, 2004). Thus the increased opportunity and encouragement to read may have provided this group with enough extra reading that some effect was seen in terms of fluency and overall oral reading. The control group had a large effect size for improvements in all areas, the lowest being in decoding. This group also began with the highest mean in decoding. This suggests that a foundation in decoding may be required before improvement in other skill areas is possible. Most notably, this is the only group that increased in reading comprehension, so a higher level of decoding may be a critical pre-requisite to comprehension improvement. These interpretations should be verified with a research study expressly designed for this purpose.

Contributions of instructional methods and decoding. Decoding becomes a prominent feature again when the multiple regression analysis is employed. Performance on the decoding post-test (i.e., the WIAT-II) accounted for 15.4% of the variance in the reading comprehension sub-test scores. Predictably, group membership did not account for much unique variance in comprehension scores. These findings are consistent with what has already been revealed in the other two analyses. Decoding plays a major role in reading comprehension. It stands to reason that if a student is unable to read a word, she or he will struggle to understand the connected text. Group

membership did not provide statistically significant differences in reading comprehension, hence post-test scores, in this study, were largely unaffected. However, if proficient reading comprehension does, in fact, require a hierarchy of underlying skills, it is possible that the true effect of the comprehension intervention would not be evident until these skills were in place.

Despite these important and revealing results about reading comprehension and decoding in struggling adolescent readers, this study is somewhat limited in its findings. These limitations may serve to reduce generalizability and confounding factors may require the duplication of research to provide a clearer interpretation of results.

Limitations

Sample size. Although the sample size fell within the range observed within the field of reading research, it was sufficiently low to place possible limitations on the applicability of this data. Most notably, the small sample size likely affected the power of parametric tests to detect differences between groups. Moreover, fewer cases mean that data is vulnerable to influence by atypical results. In a large sample, cases at the extremes are a normal part of the distribution and usually occur on both ends to create a balance. The large amount of scores falling in the middle, weight the mean towards the median. However, in a small sample, extreme scores have greater power to pull the mean one way or another, possibly without the benefit of a balance at the other extreme, nor in the middle. Thus this research should be replicated with at least equal or larger groups to verify study results.

Time period. In addition, the study took place over a short period of time, which may have affected results in several ways. First of all, it is not known whether or not students maintained the post-test level of achievement over time. Pre- and post-testing

was completed within a very short time frame. The ultimate effects of the intervention in the long term are not known. Secondly, the rigid duration of the intervention was found to be too limited to adequately address the learning needs of the students. For example, there were several occasions when the instructor noted difficulties in concept attainment. In a real teaching scenario, a teacher would likely re-teach the concept. This time was originally available in the proposed timeline. However, under the constraints that actually occurred, there was little time available to respond to student feedback. Teachers may prefer the short four to five week block of time required for this intervention, but in reality would likely be able to adapt the time frame to suit the learning needs of the student.

In addition, every effort was made to complete post-testing before the commencement of final exams. However, due to scheduling constraints, it was impossible for every student to be tested before finals started. Three of the post-tests occurred right after the students wrote their final English exams, which may have resulted in test scores that were lower than expected. However, this was deemed as the best available option to obtain a post-test score. The limitations that occurred as a result of time may be more a general limitation of the applicability of research data to real world situations and may not necessarily reflect a limitation in the extrapolation of this sample to the larger population, however, there are other issues surrounding practical significance.

Practical significance. Although statistical significance was found in several instances, the practical significance may be questionable. A three point improvement in standard scores between decoding pre-test and post-test measures may not translate into noticeable gains in the classroom. Furthermore, guidelines suggest correlations of .80 or

higher to provide an acceptable level of reliability (Sattler & Hoge, 2006). However, if tests only correlate by a factor of 80%, it is possible that changes in test scores, which are lower than 20%, may be explained by variations in the tests themselves. This variation cannot be controlled easily. Different tests must be given before and after the intervention to reduce the practice effect. The only way to definitively prove that an authentic and practical change can occur as a result of intervention is through the multiple replication of research, or possibly through the assessment of changes over time, using multiple assessment instruments. Other factors, such as the contamination of groups, are similarly difficult to fully control.

Contamination of groups. Although every effort was made to maintain separation of groups, it is impossible to know how much contamination between groups occurred. As previously mentioned, at least one student in the control group was exposed to extra efforts to improve reading comprehension in the regular classroom as a direct result of this study. Other instruction may also have been directly or indirectly affected by the implementation of the study within the school. In this case, comparisons between the control group and intervention groups may not offer a realistic portrayal of gains that may be attained through the intervention process. Furthermore, classmates were commonly placed in different groups where possible, to lessen the effect of differences among teachers. However, students within the same class, and even students in different classes, may have spoken to each other about the kind of intervention occurring in each of the groups. It is normal for participants to be curious about the nature of other test groups. In a natural school setting it is impossible to keep students isolated from one another. Therefore, there is always the possibility of contamination among groups.

Although every effort was made protect groups from contamination, in an authentic and natural school setting, true protection may not be possible.

Confounding factors. There are two main confounding factors which had the potential to affect the data in terms of influencing test scores, and which were beyond the control of the researcher to some degree. The first, as has already been mentioned, is the timing of the research study. Despite all efforts to expedite ethics approval for the study, the late date of approval meant that testing could not get started until well into May. It is hard to believe that any teacher would begin an intervention in mid-May to run until the end of June. This makes the conditions of intervention unlikely to occur in an educational setting. At this time of year students may be distracted by the weather or upcoming holidays. Students themselves noted a lack of motivation, especially on sunny days. With the academic semester coming to a close, some students needed to redouble efforts within the general classroom in order to obtain credits. Conversely, other students seemed to give up on attending school if they felt they could not raise their marks above passing. Absences were reported due to illness, preparation for graduation, attendance at a concert out of town, extra-curricular involvement (track and field), fulfillment of classroom requirements, classroom testing, in addition to several unexplained absences. A better time might be at the beginning or middle of the term, when students are still in an academic mindset. The timing of the intervention may have not only diminished the actual gains in achievement, but also affected the demonstration of gains in the standardized testing situation. Immediately before final exams, students may have been suffering anxiety, fatigue or a lack of attention or motivation to perform on the test. The late start also meant that the intensity of the intervention was somewhat

diminished since the full six weeks were not possible to administer within the available time frame. These factors may have combined to reduce the observable effect.

The second confounding factor was the unexpected occurrence of two deaths within the community during the post-testing period. These two young men were recent graduates and likely formed part of the peer group of some of the participants. In a small community such as this, it is not unreasonable to suggest that the untimely death of these two young men likely had some impact on the majority of students at the high school. One or two participants were observed to be upset at the time of post-testing. When prompted by the researcher, they did not disclose the reason for their distress, and explicitly chose to participate in the testing, even when discouraged to do so. If a student were not able to give their full attention to the test, which is a completely reasonable state of mind in these circumstances, scores may not be an exact representation of that student's ability.

These factors may serve to obscure changes that may have occurred as a result of the intervention, however, each group experienced the same set of environmental factors. Thus the data can be thought of as an accurate representation of trends observed between different groups within this sample of the larger population. The factors may have exerted a larger influence on within-subject analyses by suppressing the full expression of achievement in the post-test condition.

Conclusions

The current research study has explored the best method for teaching reading and reading comprehension to adolescent struggling readers. Reading is a complicated skill that is directed by multiple cognitive processes. Adolescent struggling readers are of particular concern. Although there are some suggestions available to help foster reading

comprehension in high school, few of these have been validated by research. In fact, very little is known about how to teach reading comprehension for optimum results.

Researchers are uncertain about how many strategies should be taught in an effort to remediate reading. Numerous strategies, such as setting a purpose, visualization, making connections, asking questions, making inferences, and using fix-up strategies are commonly described in various programs. However, the best combination of strategies, the best method of instruction, and the best sequence of strategies have not been verified in research literature.

The present study addressed some of these gaps in the research. Differences between groups were not sufficient to endorse one method over another, although contextualized comprehension instruction within the classroom setting appears to hold the most promise. Rather by accident, the present study did serve to confirm the importance of decoding, even among adolescents. Furthermore, it was found that the weakest decoders were the most amenable to remediation. Large effect sizes indicate that a sequence of reading skills may exist where improvements in decoding are coupled with improvements in fluency, after which comprehension follows. Thus the results from this study contribute to the present body of research which supports a balanced literacy approach to remediation in struggling adolescent readers.

Implications for Teaching

This study suggests several important guidelines for special education and general classroom teaching. One key recommendation is that struggling adolescent readers be given access to small group pull-out intervention in decoding. Intervention only requires 15 minutes per day and can produce significant improvements in decoding ability. Current guidelines suggest 12 to 20 hours of intervention should be enough to optimize

gains (National Institute of Child Health and Human Development, 2000). Students could receive 10 weeks of intensive intervention for 15 minutes each day. The cumulative effect of this kind of intervention could be dramatic if students were able to capitalize on decoding gains by following up with improvements in fluency and comprehension.

In terms of reading comprehension, the Special Educator requires an age-appropriate highly structured, systematic program of intervention that also recognizes students' proficiency in specific knowledge or skill areas. This program also needs to be embedded in an academic, social or another relevant context to make learning meaningful. The current survey of applicable research and literature could not locate any comprehension programming that meets these criteria. Thus, in the absence of such programming, Special Educators would be best advised to work in a collaborative fashion with Classroom Teachers to integrate comprehension strategies into regular academic practice. Collaboration may include team teaching or planning, professional dialogue, provision of resources, etc. Special Educators should be available to provide support or assistance to teachers in the implementation of a comprehension strategies program as part of their daily teaching.

Pull-out services *may* prove beneficial if a student is highly internally motivated to improve his or her reading comprehension, and there is some way to minimize the effect of time spent away from the regular curriculum. If, for example, a student wanted to meet during a spare or other free time, he or she may find the comprehension intervention to be worthwhile. Any pull-out interventions at the high school level must be weighed against the harm that may be incurred by time away from peers and the regular curriculum. Results from this study do not endorse the use of pull-out

intervention for the purpose of improving reading comprehension, but it is possible that some students may benefit from this kind of instruction.

Importantly, the pattern of effect sizes seems to suggest a sequence of instruction that could be followed, noting that instruction does not need to be discreet. Skill instruction may overlap according to student motivation and engagement. But the basic roadmap suggests that students should first be taught decoding skills, followed by practice in fluency, and then contextualized comprehension strategies. The first two skills could be taught in pull-out programming, since typically achieving high school students have usually mastered these skills and classroom interventions may not be appropriate. This kind of programming could provide the intensity and instructional attention that is required for remediation at this level. After struggling readers have achieved a level of proficiency in these areas, the Classroom Teacher, perhaps in collaboration with the Special Educator, could start introducing comprehension strategies as a part of regular instruction. Classroom instruction of comprehension strategies does not need to be remedial instruction; with numerous programs and theorists suggesting comprehension strategies be a regular part of the curriculum (Block et al., 2004; Gear, 2006; Harvey & Goudvis, 2007; Keene & Zimmermann, 2007; Pressley, 2002a; Pressley, Duke, & Boling, 2004; Tovani, 2004). More proficient readers would be expected to develop more sophisticated understandings of a text. In this way, struggling adolescent readers may hope to overcome difficulties in both decoding and understanding the texts they read.

Future Directions

As touched upon earlier, this study suggests several paths for future research. Primarily, results from this study need to be verified with another group of equal or

larger size, at another time of year when the entire six week intervention can occur. Criteria for inclusion may be altered to more effectively isolate the comprehension variable. If the participants are already fluent readers, they may be cognitively available for learning comprehension strategies. On the other hand, it is a distinct possibility that students who are struggling to comprehend are, in fact, struggling to decode. Before repeating this research, it may be wise to re-visit comprehension lessons to see how more intensive support needed for cognitive re-wiring can be provided. In addition, the lessons may need to be modified to more elaborately recognize, and take greater advantage of, the students' existing expertise. To minimize issues with time, a group measure of reading comprehension would be advisable, although these tests do not usually address fluency (Bell & McCallum, 2008). Lastly, the MSI and FSI groups should match in frequency of intervention, rather than duration. Matching groups in this way removes intensity as a possible confounding factor, more effectively isolating the actual number of strategies as the intervention variable. These modifications may serve to magnify between-group results and verify those found within-subject.

The study also raises a number of interesting questions for further exploration in the population of adolescent struggling readers. The most important area that needs to be explored is the possible requirement of specific foundational skills before reading comprehension can be accomplished. What level of decoding and fluency are required before gains in reading comprehension can become evident? If students are expected to comprehend within the typically developing range, one may expect a similar level of decoding, or higher. How many hours of intervention are optimum for high school students? Can these reading skills be improved upon simultaneously, or do they have to

be learned in a sequential fashion? Answers to these questions are absolutely essential for the effective structuring of remedial programs.

Furthermore, the efficacy of contextualized comprehension instruction as part of regular programming in a high school setting has not been investigated. Researchers still do not know the optimum number and sequence of skills required for effective instruction in reading comprehension. A study may be designed to compare the differences between comprehension instruction occurring in the classroom, an intervention setting, and a control setting. This kind of study could help to focus research on determining the best method for remediating and improving comprehension in general.

Motivation is another area that was not actively studied in this research design, although it may have been greatly influenced by it. It may be valuable to quantify the degree to which achievement is affected by self-esteem so that educators can truly understand the relative importance of this factor. Furthermore, teachers must understand how to best promote and preserve the self-esteem of struggling readers who may have been suffering a compounded lack of self-efficacy over years. Research may discover that this factor is even more important than the intervention itself.

Thus this research provided some insights into the best method of improving overall literacy with adolescent struggling readers. It has set forth a method of remediating decoding skills that has both acceptance from adolescents, and statistical validity. However, further research is required before educators can get a firm grasp on how to best remediate and support reading and reading comprehension among adolescent struggling readers.

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APPENDIX A
SAMPLE LESSON PLAN

Sample Lesson Plan: Questioning (before reading)

Decoding

If students have not brought words, have them look through their books and find one or two unfamiliar or multi-syllabic word. Ask each student to share their words. Write at least one word per student on the whiteboard. As a group, break the word into syllables. Write all of the first syllables in the first column. second syllables in the second column, etc., but it should not be directly beside the original word or it's fellow syllables. Touch on morphology and discuss word meanings and context.

Meet the Words/Find the Syllables

Go through the word set (as many as possible in 5 minutes), using the following script as a guide for the different words.

This word is rhapsodic. What does rhapsodic mean?

What letters stand for the /rap/ sound in rhapsodic? (r,h,a,p)

What sound does r,h,a,p stand for?

What letters stand for the /so/ sound in rhapsodic? (s,o)

What sound does s,o stand for?

What letters stand for the /dic/ sound in rhapsodic? (d,i,c)

What sound does d,i,c stand for?

What is this word? (rhapsodic)

Collect the Words – 5 minutes

Erase the original words. Keep the syllable matrix on the board. Ask individual students to come to the whiteboard. They can choose any word, cross off the syllables, and write the full word. The other students should write the words on the handout, under the section called *Decoding Words*. Repeat this activity until all the words have been put back together or until time is up.

What is that word?

Comprehension: Questioning

Describe the strategy and when a good reader should use it – 3 minutes

- *What do you wonder about?*
- *It can be about anything, but usually these questions do not have easy answers.*
- *For example: I wonder how this recession will change how we do things? I wonder if there is such a thing as bad people, or do people just act badly because they are in pain? I wonder why don't we have a recycling program in our city? I wonder why I'm so interested in vampires lately?*
- *Think about it and write down three questions.*

Give the students a minute to think about it, then share their *I wonder...* questions. They may write more down as we are discussing them.

For this section we are talking about asking questions as a reading strategy. Some literature can help us answer our questions about the world or help us to think about our questions in a different way.

- *Today we are focusing on pre-reading question. What do we look at before we start reading? (title and author, the picture on the front of the book, any write up on the book flap, or we might glance through the book or story to see if it relates to any of the things we wonder about).*
- *Think of some questions using these cues.*
- *If we have no questions before we even start reading the book, it will be just about impossible to make it through the book.*

Demonstrate the strategy using at least one think-aloud – 3 minutes

- *Look at my book (Cirque du Freak) – connect to I wonder question about good/bad*
 - *last book Darren talked about a battle – was it right or wrong to kill the vampire?*
 - *I wonder if the author will pick up on this idea?*
 - *refer to other questions on sticky notes on the cover*
- *What other questions might we have about this book?*
- *Put sticky notes in the appropriate section of the chart on the handout – discuss each section.*

Suggested Feedback and Guidance

- *Think about what you know (it could be movies, tv programs, other books, things you've learned in other classes). How does this information help you think of questions about this book?*
- *Good questions will help you interact with the author, discover what you care about, help you figure out what you want to learn, and help you make sense of your reading.*
- *What else does this question make you think about?*

Apply strategy to material of increasing difficulty – 7 minutes

- *Use one of their books – generate questions for this book – students can write the questions on their chart.*

Remember, it has to be a question you actually care about. If you don't care about the answer, why bother asking it? Our questions may or may not have easy answers.

Use the strategy independently – 7 minutes

- *Put 5 questions or sticky notes in the chart – so before you begin reading think of a few questions and jot them down*
- *Reflect on this strategy – how does asking questions before you read help you understand what you are reading?*

HANDOUT 8

2 long or unfamiliar words:

1.

2.

Decoding Words:

3 Things you wonder about:

1.

2.

3.

5 Questions you thought of before you started reading (write or put sticky notes on the back of this page)

How does asking questions before you read help you understand what you are reading?

Questions Answered by the Text	Questions to Think About
Questions that Need Research	Questions I Can Answer
Clarifying Questions	

APPENDIX B

**STUDENT APPLICATION FOR APPROVAL OF A RESEARCH PROTOCOL
UNIVERSITY OF SASKATCHEWAN**

**Student Application for Approval of a Research Protocol
University of Saskatchewan**

Information Required:

1. **Name of researcher(s)** and/or supervisor (s) and related department(s).

1a. Name of student(s), if a student study, and type of study (e.g., B.A., Hon., M.A., Ph.D.)

Student: Nikki Yee

Master's Candidate

Department of Educational Psychology and Special Education

College of Education

University of Saskatchewan

Type of Study: Master's Thesis – M. Ed.

Supervisor: Dr. Laureen McIntyre

Department of Educational Psychology and Special Education

College of Education

University of Saskatchewan

1b. Anticipated start date of the research study (phase) and the expected completion date of the study (phase).

Project Deadlines:

Starting date (yy/mm/dd): 09/03/30 Ending date (yy/mm/dd): 09/05/15

2. Title of Study

Project Title: *Understanding Comprehension: Multiple and Focused Strategy Interventions for Struggling Adolescent Readers*

3. Abstract (100-250 words)

Provide a brief statement of the hypotheses to be examined.

The purpose of this study is to determine 1a) whether or not small group pull-out intervention in reading can produce enough gains for adolescents to justify the time and resources it requires; 1b) whether or not a more frequent six week intervention involving a large number of comprehension strategies will produce larger gains in reading comprehension than a less frequent intervention focussing on two specific strategies; and 2) how much unique variance comprehension instruction contributes to reading comprehension scores after intensity and decoding are removed from the analysis.

It is hypothesized that the largest gains will be experienced by the more intensive pull out group learning multiple comprehension strategies. Any increase in decoding is expected to lead to significant gains in overall reading comprehension, but the use of specific comprehension strategies may also contribute at least moderate gains.

5. Expertise

Not applicable. No special or vulnerable populations are involved in this study.

6. Conflict of Interest

For approximately 5 days during the 2008/09 school year, the researcher acted as a substitute teacher in high school that is the research site for the present study. However, due to the very limited amount of time spent in the school, this situation did not provide an adequate basis for a teacher-student relationship to fully develop. A collegial relationship exists between the researcher and the teachers in the school who may help to recruit participants. No financial benefits will accrue for recruiting participants or conducting the research. No foreseen limits exist on the publication or distribution of findings.

7. Participants

Describe the procedures for recruiting, selecting and assigning participants.

There are two main issues of concern to the committee:

a) the potential for coercion that arises.

b) a possible loss of privacy or anonymity.

Potential participants will be drawn from the student population in a high school in Northern Saskatchewan. Potential participants will be identified by distributing criteria to the school's administration and requesting a list of candidates who may meet these criteria. Criteria for inclusion in this study are as follows:

- demonstrated lack of response to instruction: students' final marks in English should fall below the 10th percentile of the school's average over the last two years; or students may be placed in modified or alternate English classes;
- Standard Scores more than one standard deviation below the norm on Gray's Oral Reading Test-4, as confirmed through pre-testing procedures;
- and an absence of sensory or cognitive impairment (according to assessments contained in school records)

To keep the study as unintrusive and confidential as possible, the sample will be coded so that the names of students will not be released to the researcher. Records may include basic information required to stratify and match groupings appropriately (i.e., educational placement, age, gender, mother's occupation). Using this method, participants can be selected through a stratified, random procedure before they are asked to participate. School staff (such as an Educational Assistant or Special Education Teacher) will be asked to approach these students to gauge interest in participation in the study, using an invitation protocol (see attached). Voluntary participation will be emphasized during this time. Spoken communication with potential participants is preferable to written communication due to possible literacy difficulties with this population. If students are interested they may meet with the researcher for further information and consent/assent. Coercion is effectively controlled since school personnel are only asking students about their interest in such a study. The researcher, who is effectively removed from the school power dynamic, will be discussing issues of consent with students.

7a. Letters of invitation should provide the following information:

1. Clear statement that the project is a research study.

2. Name and contact information of the researcher.

3. Procedures of the study and what is expected of the participant.

4. Amount of time required to participate.

5. The following standard statement, “If you are interested in learning more about this study, please contact X and more details will be provided”.

6. REB approval and contact information statement.

Refer to Appendix A: Invitation Protocol

8. Consent

In addition, the committee requests that researchers describe:

- 1. The process by which participants consent to participate in the research project.**
- 2. The procedures that will be in place to ensure timely opportunities to give or withdraw consent.**

Both the School Division and School Administration will be asked for signed endorsement to proceed with the study (see Appendixes B and E).

Participants will meet with the researcher individually to discuss participants’ rights and to provide more information about the study. A letter of assent or consent will be presented to participants, read aloud, and discussed (Appendix C). If participants agree to take part in the study they may sign the consent form. Since most participants will be under the age of 18, they will then be given a parental consent form (see attached) to take home to have signed. If participants are over 18, or live apart from a parent/guardian, a parental consent form will not be sent home. All letters of invitation and consent include contact information for both the researcher and college supervisor so that participants have expanded opportunities to ask for further information, or to withdraw from the study at any time. It is anticipated that study will begin one week after these meetings take place.

Voluntary participation is a key component of the study. School personnel will mention during the invitation protocol that participation is voluntary. This component will also be reiterated when participants meet with the researcher. Care will also be taken to ensure that participants will not feel penalized for participation in or withdrawal from the study.

Consider whether any of the following concerns apply:

a) Alternative consent protocols

Participants and parents will be provided with a consent form. The researcher will meet with students individually to read through and discuss the consent form. Rights of the participant will be made explicit through verbal discussion before students are asked to sign the consent form.

b) Recruitment from organizations

Once ethics approval has been obtained, the school division’s Board of Education will receive a letter of intent (Appendix B). The letter will seek permission to work with struggling adolescent readers in a specific high school. A similar letter will also be formally sent to the administration of the high school (Appendix E).

c) Children under 18 years of age

Parents/guardians of all students under the age of 18 will be asked to sign the Parent/Guardian Consent Form (Appendix D) to indicate their knowledge of, and consent for their children to participate in the study. The Consent Form clearly outlines participant rights, including the right

to withdraw from the study at any time. Confidentiality measures are also detailed in the Consent Form. In addition, all students will be asked to sign an assent/consent form to indicate that they understand their rights and voluntarily agree to participate in the study.

If a student consents to a study, but parental consent cannot be confirmed, the researcher will make all reasonable efforts to contact the parent either by mail or telephone. A waiver of parental consent may be sought only in special cases where parental consent cannot be confirmed, *and* the participant is 16 years old or older. In this case, the Special Education Teacher, Classroom Teacher or Principal will be asked to verify the student's capacity to consent. Only in these rare situations would a waiver of parental consent be entertained. In situations where participants are above 18 years of age or live away from their parents, parental consent will not be sought.

d) Participants are in a dependent relationship to the researcher

The researcher has had limited experience with this particular population, so no power relationship currently exists beyond what may naturally occur in society between adults and adolescents.

It is important that students understand that they will not be penalized for participation, non-participation or withdrawal from the study. Students may need to miss a portion of their regular educational programming for participation in this study. This is because much of the population is rural and must adhere to a strict bussing schedule. Furthermore, the potential benefits of the intervention could actually facilitate learning in regular programming. Because the interventions are relatively short (30 minutes) students will not be asked to miss an entire class period. Learning contracts can be set up between Classroom Teachers and students so that students are not subject to additional homework or other penalties as a result of participation in the study. The researcher may be required to play a role in gathering information for the Classroom Teacher to assess as part of the learning contract, but all terms of the contract will be defined by the Teacher, in collaboration with the student.

e) Participants are not able to given either consent or assent

Not applicable. The researcher does not foresee any participants not being able to give written consent.

f) Participant-Observation research

Not applicable. Participant-observation or naturalistic-observation research is not being conducted.

g) Research involving small groups

Potential participants will be approached individually by school staff to invite students to participate in the study. They will then meet with the researcher individually to discuss rights and consent. Interventions will occur in a small group setting, but outcomes of the study or learning contracts are in no way dependent upon the on-going participation of individuals within the group. The research does not involve a pre-formed group of individuals. Invitations to participate will be spread out among educational placement (modified, alternate or regular programming) so as to minimize any group pressure to participate.

9. Methods/Procedures

Describe the procedures to obtain research data.

After the participants have been identified, they will be randomly assigned to one of three groups. One group will serve as the control group. Another group will receive a Focused-Strategy Intervention consisting of decoding instruction and comprehension strategy instruction (questioning and inferencing) once per week for six weeks. The last group will receive a Multiple-Strategy Intervention consisting of decoding instruction and multiple comprehension strategy instruction three times per week for six weeks. Each intervention will last 30 minutes and take place in groups of six. Each intervention will have two groups of six, for a total of 36 participants.

Before and after the interventions students will take two norm-referenced standardized tests: Gray's Test of Oral Reading – 4 (GORT – 4), Woodcock-Johnson Tests of Achievement - III (WJ – III; Word Attack subtest). The WJ – III has been widely used in research studies, and in this school division as part of regular academic assessment. The GORT – 4 is often used in research studies. It consists of reading a passage and answering several multiple choice questions about the passage; a format familiar to students. No sensitive issues will be discussed or evaluated, and students are likely to be familiar with the format of each test.

In addition, several of the students who received intervention will be asked to participate in a post-intervention semi-structured interview (Appendix F). The purpose of this interview is to add some qualitative support to the numbers and to verify theoretical constructs (i.e., best ways of learning how to read) from the *learner's* perspective. Interviews will be recorded, transcribed, and coded to protect participants' privacy.

10. Storage of Data

Upon completion of the study, all data will be securely stored and retained by the researcher's graduate supervisor, Dr. Laureen McIntyre, Department of Educational Psychology and Special Education in the College of Education in accordance with the guidelines defined by the University of Saskatchewan. The data will be placed in a locked cabinet for a minimum of five years.

11. Dissemination of Results

Results from this project will be used for my thesis, scientific publications, and presentations to professionals, parents, and educators. The confidentiality of all information gathered from participants will be ensured. All responses obtained from participants will remain confidential.

12. Risk, Benefits, and Deception

This research will provide information to educators regarding the effectiveness of an instructional intervention that is designed to help adolescents improve their reading. No perceived risk or deception is involved in this study. Measures will be taken to ensure that participants are not exposed to any harm, discomforts or perceived harm as a result of participation in this study. Measures may take the form of learning contracts between teachers and students, previously discussed, to ensure that students will not have an increased workload as

a result of participation in the study. Potential participant names will be removed and replaced with a code number. Therefore, there is limited opportunity for loss of privacy, confidentiality, or anonymity.

When assessing the degree of risk entailed by your procedure, please consider the following questions:

a) Are you planning to study a vulnerable population?

No.

b) Are you planning to study a captive or dependent population, such as children or prisoners?

No. In this case students are not attending the treatment protocol as part of their regular educational programming. Furthermore, many of the strategies used in the treatment protocol are already in use in classrooms. The novelty of the study lies in the combination of instructional strategies delivered to adolescent struggling readers in an intensive, pull-out intervention.

c) Is there is an institutional/ power relationship between researcher and participant?

No. As indicated previously, the researcher substitute taught for a few days during the year, however, she is not seen as part of the high school teaching staff and did not have adequate time to form a teacher-student relationship with students.

d) Will it be possible to associate specific information in your data file with specific participants?

No.

e) Is there a possibility that third parties may be exposed to loss of confidentiality/ anonymity?

No.

f) Are you using audio or videotaping?

A brief interview at the end of the study will be conducted with some of the participants to get a better understanding of their learning. This interview will be audio-taped and transcribed. Transcriptions will be coded and audio files destroyed to protect student privacy. Written records will be stored alongside other data from this study.

g) Will participants be actively deceived or misled?

No.

h) Are the research procedures likely to cause any degree of discomfort, fatigue, or stress?

No. Some arrangements may have to be made with teachers so that students who are missing a part of their regular educational programming will not be penalized.

i) Do you plan to ask participants questions that are personal or sensitive? Are there questions that might be upsetting to the respondent?

No.

j) Are the procedures likely to induce embarrassment, humiliation, lowered self-esteem, guilt, conflict, anger, distress, or any other negative emotional state?

Adolescents who do not read well may experience lowered self-esteem due to their current reading level. When this reading level is measured, they may experience some negative emotions, however, in standardized testing procedures great care is taken to refrain from providing specific feedback on correct or incorrect answers. Results of the specific tests will not be released. Gain scores, however, may be released upon the request of adolescents over 18 years of age, or parents/guardians. During the treatment protocol every effort will be made to provide developmentally appropriate instruction and positive re-inforcement to build self-esteem.

k) Is there any social risk?

For adolescents, social reputation is heavily weighted in the formation of self-esteem. There may be some social risk for students who attend a small group reading intervention with other students who are in different programming from their own. Therefore, great pains will be taken to promote the study as testing methods of *improving* reading, without reference to baseline data.

l) Will the research infringe on the rights of participants by, for example, withholding beneficial treatment in control groups, restricting access to education or treatment?

No. Participants in the control group will receive standard educational programming. Participants in treatment groups will spend the majority of their time each week in their regular classes and some time in the intervention, which should provide an increase in skill level that facilitates learning in other classes.

m) Will participants receive compensation of any type? Is the degree of compensation sufficient to act as a coercion to participate?

Participants will be provided with some incentives (e.g., entry in a weekly draw). It is important to have a way of rewarding motivation and diligence in this population since self-esteem may be lower than the typically achieving student population.

n) Can you think of any other possible harm that participants might experience as a result of participating in this study?

No.

13. Confidentiality

As previously mentioned, a pool of potential participants will be compiled by the administration and/or teachers at the school. The school staff will be asked to code the data from the outset so that individuals who do not participate in the study will not be identified by the researcher. The researcher will only meet with those students who are 1) identified by teachers as potentially meeting criteria for inclusion and 2) have demonstrated interest in participating in the study. All consent/assent forms will be kept separately from collected data. One master list will be created to match participants with their code. All data collected will be identified with the code, rather than the name, of the student. Once data collection and analysis are complete, the master list will be destroyed. Therefore, loss of privacy is severely curtailed within this study.

14. Data/Transcript Release

Not applicable.

15. Debriefing and feedback

Participants are provided with information on how the researcher can be contacted if they have questions or concerns in the letter of information describing the study they received. All participants will be informed about the public access to the finished study at the University of Saskatchewan. A copy will be deposited at the University of Saskatchewan library. A copy of the study will also be provided to the school division. A brief executive summary of the project will be provided to each of the participants upon request.

16. Required Signatures

(1) Student Signature

Nikki Yee
Master's Candidate
Department of Educational Psychology and Special Education

(2) Supervisor Signature

Dr. Lauren McIntyre
Department of Educational Psychology and Special Education
University of Saskatchewan

(3) Department Head Signature

Dr. David Mykota
Department of Educational Psychology and Special Education
University of Saskatchewan

Appendix A

INVITATION PROTOCOL

A researcher, Nikki Yee, is coming to our school to do a research study. In this study you could get extra instruction to help you read better, if you're interested. There are three possible groups you could be in. You could be in a small group where you are pulled out of class for half an hour three times a week for six weeks. You could be in a small group who gets pulled out of class less than that, or you might not be pulled out of class at all. All the groups take a test before and after, just to see if your reading has changed. This test doesn't count for marks, it just gives her some information about your reading. You don't have to take part in the study, but you can if you want to. If you are interested in learning more about this study, you can let me know, or tell the office. We will set up a meeting where you can get more information about the study or you can contact Nikki directly at 240-5116 or send an e-mail to nly121@mail.usask.ca

Appendix B

LETTER OF INTENT TO THE SCHOOL DIVISION

March 9, 2009

Dear Mr. _____,

RE: Permission to conduct research in methods of reading intervention for struggling adolescent readers

I am a master's student in the Department of Educational Psychology and Special Education at the University of Saskatchewan, supervised by Dr. Lauren McIntyre. As part of the requirements for the completion of my master's degree, I am conducting a research project to explore optimal methods of providing reading intervention for struggling adolescent readers. The project is entitled, *Understanding Comprehension: Multiple and Focused Strategy Interventions for Struggling Adolescent Readers*.

I am requesting permission to work with struggling adolescent readers in _____ High School. Students will be invited to voluntarily participate in either a control group receiving typical classroom instruction, or one of two small group intervention situations (i.e., once/week for six weeks, or three times/week for six weeks). I would like to conduct the interventions in April/May, 2009. Intervention outcomes will be analyzed through pre- and post-intervention testing using the Woodcock-Johnson III Test of Achievement, and Gray's Oral Reading Test – 4. These scores will provide the basis for analysis of intervention outcomes. Participant's involvement in the research study will be held in strict confidence, and all identifying information will be removed from data after analysis.

Please find enclosed copies of all correspondence to students and parents/guardians. If you require further information, please feel free to contact me at 240-5116 or by e-mail (nly121@mail.usask.ca). The University of Saskatchewan Behavioral Research Ethics Board (Beh-REB) has approved this study on _____. Any questions regarding participant rights may be addressed to the Office of Research Services (966-2084). I look forward to hearing from you.

Respectfully yours,

Nikki Yee

Master's Candidate

Department of Educational Psychology and Special Education

University of Saskatchewan

Appendix C

PARTICIPANT CONSENT FORM

Title of Study:

Understanding Comprehension: Multiple and Focused Strategy Interventions for Struggling Adolescent Readers

Researcher and Supervisor:

Nikki Yee, Master of Education candidate in the Department of Educational Psychology and Special Education at the University of Saskatchewan.

E-mail: nly121@mail.usask.ca

Telephone: 240-5116

Dr. Lauren McIntyre, Assistant Professor, Department of Educational Psychology and Special Education, University of Saskatchewan.

E-mail: laureen.mcintyre@usask.ca

Office Telephone: 966-5266

Purpose of the Study:

You are invited to participate in a study examining different ways of improving reading for teenagers. First of all, reading skills will be measured. Then, participants will be taught different skills to help them improve their reading. This teaching might happen in your regular class, or in a small group. At the end, reading skills will be measured again to see which group made the most improvement. You may be interviewed to get your opinions about the program. These interviews will be recorded and transcribed, but you will not be identified. This information has not been studied before, so it will give teachers and students everywhere some important information about how teenagers can improve their reading. You will not be penalized for participating in this study. Arrangements will be made with your teachers so that your marks in your regular classes do not suffer. You can withdraw from the study at any time and return to your regular classes. The information from the study might be used for this research thesis, scientific publications, and presentations to teachers, parents, and professionals. All the data will be put together so that you can not be identified in any documents resulting from this research.

As a participant in this study:

1. You have been provided with an invitational protocol that talked about project information, contact information and research procedures.
2. You are asked to sign this consent form. This form will be kept separately from any data that is collected about you. A code will be used instead of your name so that no one can identify you from looking at the data. Researchers are the only ones that will be able to connect you to your data.
3. You are also asked to have your parent/guardian sign a consent form.
4. You will be randomly assigned to a reading group. You will find out which group you are in after all the consent forms have been returned.
5. You have the right to withdraw from this study at any time. If you choose to withdraw, the data you provided will be removed from the analysis and destroyed. Withdrawal from this study will not result in any sort of penalty.

6. Your data will be stored in a locked cabinet accessible only by the researchers' supervisor, and safeguarded for at least five years. Information identifying participants will be destroyed.

If you have any questions concerning the study, please feel free to contact the researcher at the number provided. The University of Saskatchewan Behavioural Research Ethics Board (Beh-REB) has approved this study on ethical grounds on _____. Any questions regarding your rights as a participant may be addressed to that committee through the Office of Research Services (966-2084). Participants interested in the results of the study will receive an executive summary upon request by contacting the researcher by phone or e-mail.

I have read and understood the description above. I have been provided with contact information to have any questions addressed. I consent to participate in the study described above, understanding that I may withdraw this consent at any time. A copy of this consent form has been provided for my records.

Name of Participant (please print): _____

Signature: _____

Date: _____

Signature of Researcher: _____

Nikki Yee

Master's Candidate, University of Saskatchewan

Appendix D

PARENT/GUARDIAN CONSENT FORM

Title of Study:

Understanding Comprehension: Multiple and Focused Strategy Interventions for Struggling Adolescent Readers

Researcher and Supervisor:

Nikki Yee, Master of Education candidate in the Department of Educational Psychology and Special Education at the University of Saskatchewan.

E-mail: nly121@mail.usask.ca

Telephone: 240-5116

Dr. Lauren McIntyre, Assistant Professor, Department of Educational Psychology and Special Education, University of Saskatchewan.

E-mail: lauren.mcintyre@usask.ca

Office Telephone: 966-5266

Purpose of the Study:

Your son or daughter has been invited to participate in a study examining different ways of improving reading for teenagers. First of all, reading skills will be measured. Then, participants will be taught different skills to help them improve their reading. This teaching might happen in the regular class, or in a small group. At the end, reading skills will be measured again to see which group made the most improvement. Students may be interviewed to get their opinions about the program. These interviews will be recorded and transcribed, but students will not be identified. This information has not been studied before, so it will give teachers and students everywhere important information about how teenagers can improve their reading. Students will not be penalized for participating in this study. Arrangements will be made with their teachers so that their marks in their regular classes do not suffer. Students can withdraw from the study at any time and return to their regular classes. The information from the study might be used for this research thesis, scientific publications, and presentations to teachers, parents, and professionals. All the data will be put together so that students can not be identified in any documents resulting from this research.

As a participant in this study:

1. Students have been provided with an invitational protocol that talked about project information, contact information and research procedures.
2. Students have been asked to sign a consent form. This form will be kept separately from any data that is collected about them. A code will be used instead of their names so that no one can identify students from looking at the data. Researchers are the only ones that will be able to make this connection.
3. Parents/guardians are asked to sign this consent form, which will also be kept separately from collected data so that students cannot be identified.
4. Students will be randomly assigned to a reading group. Groups will be formed after all the consent forms have been returned.

5. Students have the right to withdraw from this study at any time. If anyone chooses to withdraw, the data that has been provided will be removed from the analysis and destroyed. Withdrawal from this study will not result in any sort of penalty.
6. Student may be withdrawn from this study at any time by parents/guardians without penalty.
7. All data will be stored in a locked cabinet accessible only by the researchers' supervisor, and safeguarded for at least five years. Information identifying participants will be destroyed.

If you have any questions concerning the study, please feel free to contact the researcher at the number provided. The University of Saskatchewan Behavioural Research Ethics Board (Beh-REB) has approved this study on ethical grounds on _____. Any questions regarding your rights as a participant may be addressed to that committee through the Office of Research Services (966-2084). Parents/guardians interested in the results of the study will receive an executive summary upon request by contacting the researcher by phone or e-mail.

I have read and understood the description above. I have been provided with contact information in case I have any questions. I consent to having my son or daughter participate in the study described above, understanding that I may withdraw this consent at any time. A copy of this consent form has been provided for my records.

Name of Participant (please print): _____

Name of Parent/Guardian (please print): _____

Signature: _____

Date: _____

Signature of Researcher: _____

Nikki Yee

Master's Candidate, University of Saskatchewan

Appendix E

LETTER OF INTENT TO THE SCHOOL

March 9, 2009

Dear Mr. _____,

RE: Permission to conduct research in methods of reading intervention for struggling adolescent readers

I am a master's student in the Department of Educational Psychology and Special Education at the University of Saskatchewan, supervised by Dr. Lauren McIntyre. As part of the requirements for the completion of my master's degree, I am conducting a research project to explore optimal methods of providing reading intervention for struggling adolescent readers. The project is entitled, *Understanding Comprehension: Multiple and Focused Strategy Interventions for Struggling Adolescent Readers*.

I am requesting permission to work with struggling adolescent readers in _____ High School. Students will be invited to voluntarily participate in either a control group receiving typical classroom instruction, or one of two small group intervention situations (i.e., once/week for six weeks, or three times/week for six weeks). I would like to conduct the interventions in April/May, 2009. Intervention outcomes will be analyzed through pre- and post-intervention testing using the Woodcock-Johnson III Test of Achievement, and Gray's Oral Reading Test – 4. These scores will provide the basis for analysis of intervention outcomes. Participant's involvement in the research study will be held in strict confidence, and all identifying information will be removed from data after analysis.

Please find enclosed copies of all correspondence to students and parents/guardians. If you require further information, please feel free to contact me at 240-5116 or by e-mail (nly121@mail.usask.ca). The University of Saskatchewan Behavioral Research Ethics Board (Beh-REB) has approved this study on _____. Any questions regarding participant rights may be addressed to the Office of Research Services (966-2084). I look forward to hearing from you.

Respectfully yours,

Nikki Yee

Master's Candidate

Department of Educational Psychology and Special Education
University of Saskatchewan

Appendix F: SEMI-STRUCTURED INTERVIEW

1. What did you learn in the small-group reading instruction?
2. What kind of challenges or obstacles did you face with the reading instruction?
3. How has your reading changed compared with how you read before the reading instruction?
4. What part of the reading instruction was most helpful to you?
5. If other students wanted to improve their reading, what would you tell them about this program?
6. In this program you had to leave your regular class for a certain period of time. How did this affect you?
7. Please read a paragraph from a book you're reading right now, and tell me which strategies you're using as you read.

APPENDIX C

BEHAVIOR RESEARCH ETHICS BOARD CERTIFICATE OF APPROVAL



**UNIVERSITY OF
SASKATCHEWAN**

Behavioural Research Ethics Board (Beh B)

Certificate of Approval

PRINCIPAL INVESTIGATOR

Lauren McIntyre

DEPARTMENT

Educational Psychology and Special Education

BEH#

09-77

INSTITUTION(S) WHERE RESEARCH WILL BE CONDUCTED

University of Saskatchewan

STUDENT RESEARCHERS

Nikki Yee

SPONSOR

UNFUNDED

TITLE

Understanding Comprehension: Multiple and Focused Strategy Interventions for Struggling Adolescent Readers

ORIGINAL REVIEW DATE

28-Mar-2009

APPROVAL ON

05-May-2009

APPROVAL OF:

Ethics Application
Consent Protocol

EXPIRY DATE

04-May-2010

Full Board Meeting

Date of Full Board Meeting:

Delegated Review

CERTIFICATION

The University of Saskatchewan Behavioural Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

ONGOING REVIEW REQUIREMENTS

In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month of the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for further instructions: http://www.usask.ca/research/ethics_review/

John Rigby, Chair

University of Saskatchewan
Behavioural Research Ethics Board

Please send all correspondence to:

Research Ethics Office
University of Saskatchewan
Box 5000 RPO University, 1602-110 Gymnasium Place
Saskatoon SK S7N 4J8